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Reproductive and other health outcomes in Iraq and Afghanistan women veterans using VA health care: Association with mental health diagnoses

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Abstract

Background—An increasing number of women serve in the military and are exposed to trauma during service that can lead to mental health problems. Understanding how these mental health

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problems affect reproductive and physical health outcomes will inform interventions to improve care for women veterans.

Methods—We analyzed national VA data from women Iraq and Afghanistan veterans who were new users of VA healthcare from 10/7/2001 through 12/31/2010 (N=71,504). We used ICD-9 codes to categorize veterans into 5 groups by mental health diagnoses (MH Dx), those with: no MH Dx, PTSD, depression, comorbid PTSD and depression, and MH Dx other than PTSD and depression. We determined the association between mental health category and reproductive and other physical health outcomes defined by ICD-9 codes. Categories included sexually transmitted infections, other infections (e.g. urinary tract infections), pain-related conditions (e.g. dysmenorrhea and dsypareunia), and other conditions (e.g. polycystic ovarian syndrome, infertility, sexual dysfunction). Models were adjusted for sociodemographics and military service factors.

Results—31,481 (44%) received at least one mental health diagnosis. Women veterans with any mental health diagnosis had significantly higher prevalences of nearly all categories of reproductive and physical disease diagnoses (p <.0001 for adjusted prevalences). There was a trend of increasing prevalence of disease outcomes in women with PTSD, depression, and comorbid PTSD and depression (p for trend <.0001 for all outcomes).

Conclusions—Iraq and Afghanistan women veterans with mental health diagnoses had significantly greater prevalences of several important reproductive and physical health diagnoses. These results provide support for VA initiatives to address mental and physical health concerns and improve comprehensive care for women veterans.

Introduction

Over 220,000 women have served in Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF), and 14% of currently active military personnel are women (Street, Vogt, & Dutra, 2009). Women represent not only the fastest growing population of new military recruits but also a rapidly increasing portion of patients who utilize Department of Veterans Affairs (VA) healthcare (Friedman et al., 2011; Yano et al., 2010). Several studies have investigated the health of this population of returning women veterans, with a systematic review finding more studies were published on women veterans from 2004-2008 than in the preceding 25 years (Bean-Mayberry et al., 2011). Understandably, the majority of studies on health conditions have focused on mental health, finding post-traumatic stress disorder (PTSD) and depression, including single and recurrent episodes of major depressive disorder, are common in returning women veterans (Bean-Mayberry et al., 2011). Several studies of women veterans from prior eras have linked PTSD to increasing rates of physical symptoms and poorer physical health status, with more limited data on gender-specific conditions, such as abnormal pap smears, polycystic ovarian syndrome, and pelvic pain (Araneta et al., 2004; Dobie et al., 2004; Frayne et al., 2004; Pierce, 1997; Wagner, Wolfe, Rotnitsky, Proctor, & Erickson, 2000). In addition, though returning women OEF/OIF veterans commonly access care for gender-specific services, few studies have examined connections between mental health disorders and gender-specific physical health problems in women veterans returning from the current conflicts (Frayne et al., 2010; Haskell et al.,

2011). More detailed study in this area may improve the provision of health services and treatment for this latest generation of women veterans (Maguen, Cohen et al., 2011).

With the lack of distinct front lines in the current wars, an increasing number of women are exposed to the psychological and physical trauma of combat (Zinzow, Grubaugh, Monnier, Suffoletta-Maierle, & Frueh, 2007). A recent study found that women serving in Iraq and Afghanistan were more likely to suffer a combat-related injury than women who served in the Gulf War (7% vs. 2%) and were also more likely to be exposed to death during combat (31% vs. 14%) (Maguen, Luxton, Skopp, & Madden, 2011). Women also may experience non-combat trauma, such as sexual assault, during military service, which may be associated not only with PTSD, but also with poorer physical health (Kimerling et al., 2010; Martin, Rosen, Durand, Knudson, & Stretch, 2000; Smith et al.; Suris & Lind, 2008). The women who have served in these recent conflicts are also primarily of reproductive age; thus reproductive health disorders, such as sexually transmitted infections, menstrual disorders, and infertility, and their association with combat-related mental health disorders are particularly important areas to investigate. In a survey of 1,206 women veterans seen at a single VA medical center, self report of cervical cancer, sexually transmitted infections, and chronic pelvic pain was significantly greater in women veterans who screened positive for PTSD (Dobie et al., 2004). Focusing on women Iraq and Afghanistan veterans in an examination of national VA administrative data from 12,831 patients, Frayne and colleagues found women veterans with a diagnosis of PTSD had a significantly greater number of medical conditions than those without mental health conditions (7.0 vs. 4.5) (Frayne et al., 2010).

Most prior research on the association of mental and physical health problems in women veterans has focused on the effects of PTSD, but recent findings suggest that depression is also important to consider with women veterans. Several studies have now found that women returning from OEF/OIF are more likely to be diagnosed with depression than their male counterparts (Adamson et al., 2008; Lapierre, Schwegler, & Labauve, 2007; Luxton, Skopp, & Maguen, 2010). Indeed, in a study of 329,049 OEF/OIF veterans seeking VA care, 23 % of women vs. 17% of men received a depression diagnosis (Maguen, Ren, Bosch, Marmar, & Seal, 2010). Patients with comorbid PTSD and depression are also less likely to engage in or be retained in mental health treatment (Bryant et al., 2008; McDonagh et al., 2005). Consequently, when evaluating the effect of mental health problems on physical health outcomes, it is important to consider not only the effects of PTSD but also the effects of depression as well as comorbid PTSD and depression on physical health outcomes.

Therefore, the primary objective of this study was to expand upon prior work on the mental and physical health of women veterans to examine the associations of PTSD, depression, comorbid PTSD and depression, and other mental disorders with a broad range of reproductive and physical health outcomes using national-level data from all returning women OEF/OIF veterans who sought care at VA facilities over an extended time period. In evaluating depression, we included single and recurrent episodes of major depressive disorder as well as dysthymic disorder and depression not otherwise specified. In addition, we explored whether differences in demographics, military service characteristics, or utilization of primary care services explained these associations.

Method

Data Source

The VA OEF/OIF Roster is a register of veterans who have been deployed to OEF/OIF military service, have separated from service, and have accessed VA healthcare (Seal, Bertenthal, Miner, Sen, & Marmar, 2007). The OEF/OIF Roster includes information on veterans' demographic characteristics as well as aspects of their military service, such as their rank and the branch of the military with which they served. Scrambled social security numbers were used to link OEF/OIF Roster data to VA clinical data contained in the VA National Patient Care Database (NPCD) through December 30, 2010. The VA NPCD includes data from outpatient and inpatient visits to any of the approximately 150 VA hospitals and over 900 VA clinics nationwide. The electronic record includes the date of the visit, a code designating the type of visit, and the diagnosis(es) associated with the visit classified using the International Classification of Diseases, Ninth Revision Clinical Modification (ICD-9-CM) codes. Data on the distance to and type of nearest VA medical facility based on each veteran's zip code were determined from the VA Planning Systems Support Group.

Participants and Procedures

Because our research questions focused on mental health diagnoses associated with OEF/OIF military service, we made exclusions to yield a study population of women OEF/OIF veterans who were new users of VA healthcare after the beginning of OEF or OIF. There were 78,689 women OEF/OIF veterans in the Roster with a VA encounter before the study end date of December 31, 2010. We excluded 7,185 women veterans with a first visit prior to October 7, 2001, the date of the US invasion of Afghanistan and the start of OEF. Our final study population consisted of 71,504 separated OEF/OIF women veterans who were new users of VA healthcare after October 7, 2001 and were followed through December 31, 2010.

Measures

We used the OEF/OIF Roster to obtain dates of birth, sex, race/ethnicity, marital status, component type (Active Component versus National Guard or Reserve), military rank (enlisted versus officer), service branch (Army, Air Force, Marines, Navy/Coast Guard), and whether a veteran had been deployed more than once. Data were also obtained on the distance to and type of nearest VA facility (VA medical center versus VA community-based outpatient clinic). For this study, we defined mental health diagnoses as ICD-9-CM diagnostic codes 290.0-319.0, excluding codes for alcohol and drug use disorders, which correspond to mental health disorders in the Diagnostic and Statistical Manual-Fourth Edition (DSM-IV) (APA, 2000). We used ICD-9-CM codes associated with VA outpatient or inpatient visits during the study period to categorize veterans into 5 groups: (1) those with no mental health diagnoses, (2) those with PTSD but not depression, (3) those with depression but not PTSD, (4) those with both depression and PTSD, and (5) those with other types of mental health diagnoses (not PTSD or depression). We chose these groupings because PTSD and depression are the most common MH diagnoses of OEF/OIF veterans

enrolled in VA healthcare (Seal et al., 2009). Specific codes for the mental health categories are presented in the Appendix in Table A1.

We used Clinical Classifications Software (CCS), a validated coding algorithm that groups ICD-9 codes into reproductive and physical health diagnostic categories to evaluate several broad outcomes categories, such as sexually transmitted infections and menstrual disorders. However, several outcomes of interest, including cervical dysplasia and sexual dysfunction are not represented as individual CCS categories. When CCS categories were not available, potential ICD-9 codes were reviewed independently by two VA internists (BC and KS) and an obstetrician/gynecologist (VJ) to create a coding algorithm. A complete list of codes used in this study and whether they are based on CCS categories is presented in Table A1. Several categories that were initially examined were subsequently excluded due to low frequency of diagnostic codes, including HIV (prevalence = 0.03%), and concerns that these conditions may be under-coded as women would typically be referred outside of the VA for specialized treatment, including cervical cancer (prevalence = 0.3%) and spontaneous abortion/miscarriage (0.8%).

Statistical Analyses

We compared the proportion of veterans in each of the five mental health groups receiving the health outcome diagnoses using the Chi-square Test of Association with no mental health diagnoses as the reference category. We then created separate binary logistic regression models for each health outcome, using each of the five mental health groups as independent variables and adjusting for potential confounders by adding them as covariates in the logistic regression models. These included age, race, marital status, military component type, rank, branch, multiple deployments, distance to and type of nearest VA facility. All health outcomes were treated as binary variables (received the diagnosis vs. did not receive the diagnosis), including the composite sexually transmitted infections variable, which was coded as positive if the person received any of the diagnoses in this CCS category. We also conducted additional analyses to evaluate whether differences in the prevalence of substance use disorders explained the associations between mental health diagnoses and health outcomes. To examine this, we repeated the adjusted logistic regressions adding a covariate indicating whether the Veteran had been diagnosed with an alcohol or drug use disorder (see Table A1 for ICD-9 codes used to define substance use disorders). Finally, to explore potential ascertainment bias from increased use of medical services by women veterans with mental health disorders, we ran alternate logistic regression models which included the potential confounders described above (demographics, military service characteristics, distance to and type of nearest VA facility) plus each veteran's number of primary care encounters entered as a continuous covariate. All analyses were performed using SAS software (version 9.2, Cary, NC)

Results

Baseline characteristics of the study population by mental health status are presented in Table 1. The majority of women veterans (56.4%) did not receive a mental health diagnosis. Six percent received a diagnosis of PTSD without depression, 13.6 % received a diagnosis

of depression without PTSD, 15.4% had diagnostic codes for both PTSD and depression, and 8.5% received another type of mental health diagnosis. The mean age of women veterans was 28.5-29.5 years in all categories. Due to the large sample size, statistically significant differences existed across mental health categories for most sociodemographic and military service variables. Practically, demographics were generally similar across mental health categories, though women with mental health disorders were particularly more likely to be non-officers and to have served in the Army.

Table 2 shows the unadjusted diagnostic prevalence of each health outcome by mental health category (unadjusted odds ratios are presented in Table A2). Compared to women without mental health disorders, those with mental health disorders had significantly greater prevalences of all outcomes including sexually transmitted infections, other infections such as urinary tract infections, pain-related conditions such as dysmenorrhea, and other diagnoses such as infertility. For example, the diagnostic prevalence of urinary tract infections ranged from a low of 6% in the group without mental health diagnoses to 19% in those with diagnoses for both PTSD and depression.

Findings were similar after adjusting for demographics, military service characteristics, and distance to/type of nearest VA medical center (Table 3). In general, women veterans with mental health disorders had two to four times the odds of receiving these reproductive and physical health diagnoses versus women veterans without mental health diagnoses, and prevalences were highest in women with comorbid PTSD and depression. This increased risk was particularly notable for pain-related conditions. For example, the odds of receiving a diagnosis of female genital pain were 4.88 times greater in women with PTSD and depression than in those with no mental health disorders. The most striking difference was in sexual dysfunction, which was a relatively rare outcome, but women diagnosed with mental health disorders had 6-10 times the odds of receiving this diagnosis than those without mental health disorders.

Additional adjustment for alcohol and drug use disorders led to a small reduction in the association of mental health diagnoses and the health outcomes, with the magnitudes of the odds ratios generally being reduced by less than 10% (Table A3). Adjustment for VA primary care utilization did attenuate the magnitude of the odds ratios. The differences in some of the less common sexually transmitted infections were no longer significant and the odds ratio for the composite sexually transmitted infections category in those with the highest risk (comorbid PTSD and depression) was reduced from 2.92 to 1.52 (Table A4). Despite the expected decrease in the magnitude of the odds ratios with this adjustment, we still found women veterans with mental health disorders had significantly higher risk of receiving diagnoses of the majority of conditions.

Discussion

In this study of women OEF/OIF veterans who were new users to VA care over a 9-year period following the start of the current combat operations, we found that those with mental health diagnoses were significantly more likely to receive diagnoses of sexually transmitted infections, cervical dysplasia, dysmenorrhea and gynecologic pain syndromes, and other

reproductive and gynecologic health conditions than women veterans without mental health diagnoses. This was generally not due to differences in demographics, military service characteristics, drug and alcohol use disorders, or primary care utilization. Women with comorbid PTSD and depression diagnoses were at highest risk in all outcome categories.

Our findings extend prior literature demonstrating associations between mental and physical health problems by focusing on specific reproductive health outcomes relevant to the growing number of women veterans returning from the current wars. A recent updated systematic review found an increasing number of studies on women veterans' health in the last several years (Bean-Mayberry et al., 2011). The majority of studies focused on the mental health of women veterans as well as access to and quality of care, but some included physical health outcomes. In a random sample of 30,865 women using VA care, those with PTSD or depression reported a greater number of medical conditions and had significantly worse physical health status (Frayne et al., 2004). A survey of Iraq veterans 1 year after deployment found those with PTSD reported poorer general health and had a greater number of sick call visits and somatic symptoms, but the study population included only 80 women (Hoge, Terhakopian, Castro, Messer, & Engel, 2007).

Several other prior studies have focused on specific reproductive health conditions. In a study of 251 women deployed to Iraq, 21% reported gynecological health problems during deployment and nearly half were not up to date on cervical cancer screening based on current guidelines (Thomson & Nielsen, 2006). Studies have also demonstrated that rates of sexually transmitted infections, including gonorrhea and chlamydia, are higher in female military recruits and personnel than in the general population, though these studies did not examine the connection between mental health disorders and these sexually transmitted infections (Aldous et al., 2011; Boyer, Pollack, Becnel, & Shafer, 2008; Gaydos et al., 1998; Jordan, Lee, Nowak, Johns, & Gaydos, 2011). In a study of VA administrative data from 12,831 women Iraq and Afghanistan veterans seeking care in fiscal year 2006-2007, women with a PTSD diagnosis also had significantly higher risk of receiving diagnoses of urinary tract infections, pelvic inflammatory conditions, and menstrual disorders than those without mental health conditions (Frayne et al., 2010). However, rates of cervical dysplasia, sexually transmitted infections, infertility, or sexual dysfunction were not significantly different. In the current study, we expand on this important prior work by studying a larger sample of women OEF/OIF veterans and by examining additional gender-specific and reproductive health outcomes. Interestingly, we did find significant differences by mental health status for these outcomes, which may be due to our increased power to detect these relatively rare diagnoses in the larger sample.

Several mechanisms may explain the associations between mental and reproductive health conditions (Meyers et al., 2008; von Sadovszky, Ryan-Wenger, Germann, Evans, & Fortney, 2008). One possibility is that increased sexual risk taking behaviors could lead to conditions such as sexually transmitted infections. Upon returning home from deployments, exposure to combat, which is also associated with higher rates of mental health problems, especially PTSD, has been found to be associated with increased risk taking and perceived invincibility, which may include engaging in high risk sexual behaviors (Killgore et al., 2008). In addition, women with a history of trauma, particularly sexual trauma, may avoid

preventive health measures such as cervical cancer screening. In a survey of women veterans seen for pelvic examinations at the VA, Weitlauf and colleagues found that women with a history of sexual violence and PTSD reported higher levels of fear and embarrassment related to the pelvic examination and were also more likely to endorse beliefs that the examination was unnecessary or unsafe (Weitlauf et al., 2010). A survey and chart review of 999 women seen in VA care also found that women with a history of sexual assault were more likely to have abnormal cervical cytology (Sadler, Mengeling, Syrop, Torner, & Booth). Finally, increased alcohol and drug use that can co-occur with mental health problems may decrease inhibition and increase sexual risk-taking behavior (Breslau, Davis, & Schultz, 2003; Jacobsen, Southwick, & Kosten, 2001; Tate, Norman, McQuaid, & Brown, 2007). Substance use may also directly contribute to other reproductive health problems. In our study, we found comorbid substance use disorders were diagnosed in 19% of those with PTSD and 17% of those with depression diagnoses. Additional adjustment for substance use disorders led to a small reduction in the association of mental health and reproductive health outcomes. However, lack of universal screening and stigma surrounding reporting of drug and alcohol use problems may have led to under-coding of substance use in this sample and therefore may have decreased our ability to examine the true effect of these comorbid conditions (Seal et al., 2011).

In addition to these potential behavioral mechanisms, the symptoms of mental health disorders themselves may affect women's reproductive health. Emotional numbing, one of the symptoms of PTSD is associated with poorer sexual functioning (Nunnink, Goldwaser, Afari, Nievergelt, & Baker, 2010). Those with PTSD may be less likely to engage in sexual activity due to avoidance or numbing, or conversely, sexual activity may be increased in an attempt to overcome numbing, resulting in frequent and/or high risk sexual behaviors. Major depressive disorder is also associated with sexual dysfunction, and this may be mediated through a combination of biologic factors, such as changes in neurotransmitter and hormone levels, and psychosocial factors, such as social isolation and relationship difficulties (Clayton, 2010; Fabre & Smith, 2012). Pharmacotherapy for mental health disorders may also have side effects, such as sexual dysfunction (Hirschfeld, 2003; Opbroek et al., 2002). Additional biological factors associated with mental health diagnoses could also influence risk of disease in this population. For example, women OEF/OIF veterans with mental health disorders have higher rates of metabolic problems including obesity, which increase risk for polycystic ovarian syndrome (Cohen, Marmar, Ren, Bertenthal, & Seal, 2009). Polycystic ovarian syndrome could, in turn, be linked to conditions such as infertility. PTSD and depression have also been associated with inflammation and immune dysfunction, which could increase risk for infections and pain syndromes (Duivis et al., 2011; Gill, Saligan, Woods, & Page, 2009; Kendall-Tackett, 2007; von Kanel et al., 2007). Finally, mental health disorders are associated with decreased treatment adherence, which could directly worsen physical health problems or their known risk factors (Gehi, Haas, Pipkin, & Whooley, 2005; Zen, Whooley, Zhao, & Cohen, 2012).

Strengths of this study include the large number of women veterans and the examination of multiple gender-specific health diagnoses. However, our findings should be interpreted in light of several important limitations. This study relied on administrative data, and therefore the mental and physical health conditions we examined could be misclassified. In addition,

our results are from a treatment seeking population enrolled in VA care and may not generalize to women veterans seen in other settings. Prior studies have found veterans who use VA care have lower incomes, worse health status and poorer social support than veterans who use other systems of care (Mengeling, Sadler, Torner, & Booth, 2011; Yano et al., 2010). Still, as large numbers of women veterans are enrolling in VA care, this represents an important population. As statistical methods such as Chi-square tests are affected by sample size, our large sample size could have led to relatively small differences being considered statistically significant, though we have tried to focus on differences that would be clinically meaningful. In addition, this study design cannot establish timing of the development of mental health and physical disorders or causality, and reverse causality is possible as several of the health outcomes examined could cause mental health problems (Dhaliwal, Gupta, Gopalan, & Kulhara, 2004; Mindel & Marks, 2005). Finally, we did not have information on traumatic event history and did not examine military sexual trauma screening results in this study.

Despite these limitations, our study highlights several avenues for further research and clinical care. The VA conducts annual screening for mental health conditions, including PTSD, depression, and alcohol use disorders. The results of this study underscore the importance of recognition and treatment of mental health disorders in this population. However, veterans seen in other care settings may not receive such comprehensive assessment, and in fact may not even be asked about military service. It is important that primary care providers in all settings are aware of women's military service history. In addition to prompting screening for mental health disorders, primary care or other providers should evaluate risk behaviors and counsel patients about safe sexual practices. Providers can also counsel patients about the connection between their mental health and acute or chronic physical problems. Beyond providing pscyhoeducation, providers can refer patients to psychological services for treatment with evidence based therapies (Cloitre, Koenen, Cohen, & Han, 2002; Resick, Williams, Suvak, Monson, & Gradus, 2011).

The work of prior studies also emphasizes the need to improve engagement in preventative screening, particularly for those with a history of trauma who may have discomfort with routine gynecologic examinations. In recognition of the growing number of women veterans, the VA has made a comprehensive effort to study women veteran's health concerns, evaluate their preferences and needs for services, and improve availability and quality of gender-specific care (Bean-Mayberry et al., 2010; Mengeling et al., 2011; Yano et al., 2006; Yano et al., 2010). Our finding that women veterans with any mental health disorder, regardless of whether it is PTSD, depression, or another type, have a greater prevalence of several important health outcomes provides support for the VA's efforts to increase collaboration among mental health and primary care providers. It also lends support to the VA's strategic plan to improve women's health care, which incorporates initiatives in mental health, primary care, and reproductive health services (Department of Veterans Affairs, 2010). Adoption of these VA recommendations has led to improved satisfaction among women veterans (Washington, Bean-Mayberry, Mitchell, Riopelle, & Yano, 2011). As the VA continues its mission to improve healthcare for women veterans (Yano et al., 2010), an increased understanding of the connection between women's mental and physical health outcomes can facilitate identification of high-risk groups that may benefit from

additional evaluation and development of more integrative approaches to mental and physical health care for women veterans.

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Appendix

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Table A1

ICD-9 codes for substance use disorders and women's health outcome categories

Category	ICD-9 codes	Comparison with Clinical Classifications Software (CCS)
Mental Health Disorders		
Post-traumatic stress disorder	309.81	Not a category in CCS
Depression	293.83 296.20, .21, .22, .23, .24, .25, .30, .31, .32, .33, .34, .35 300.4 311	CCS also includes 296.26 and 296.36, which are codes for psychotic depression.
Substance use disorders		
Alcohol abuse or dependence	303.00, .01, .02, .03, .90, .91, .92, .93 305.00, .01, .02, .03	CCS also includes 291.XX codes, which code for alcohol-induced mental disorders and 760.71 (fetal alcohol syndrome) and 980.0 (toxic effect of ethyl alcohol)
Drug abuse or dependence	304.00, .01, .02, .10, .11, .12, .13, .20, .21, .22, .23, .30, .31, .32, .33, .40, .41, .42, .43, .50, .51, .52, .53, .60, .61, .62, .63, .70, .71, .72, .73, .80, .81, .82, .83, .90, .91, .92, .93 305.20, .21, .22, .23, .30, .31, .32, .33, .40, .41, .42, .43, .50, .51, .52, .53, .60, .61, .62, .63, .70, .71, .72, .73, .80, .81, .83, .90, .91, .92, .93	CCS also includes 292.XX codes, which code for drug-induced mental disorders. CCS also includes codes 648.3 X (complications of pregnancy- drug dependence), 655.5X (suspected damage to fetus from drugs), 760.72, .73, and .75 (noxious influences affecting fetus or newborn via placenta or breast milk- narcotics, hallucinogenic agents, cocaine), 779.5 (drug withdrawal syndrome in newborn), 965.0X (poisonings by opiates and related narcotics), and V65.42 (counseling on substance use and abuse)
Sexually transmitted infections		
Cervical dysplasia	622.10, .11, .12	CCS
Genital herpes	054.10, .11, .12, .19	CCS does not have a specific category for genital herpes. CCS herpes category includes all sites as well as HH6, 7, and 8 infections.
Genital warts	078.10, .11	Not a category in CCS
Chlamydia	099.41 099.50, .51, .52, .53, .54, .55, .56, .59,	Not a category in CCS
Gonorrhea	098.0 098.10, .11, .12, .13, .14, .15, .16, .17, .18, .19 098.2 098.30, .31, .32, .33, .34, .35, .36, .37, .38, .39 098.7 0.98.8	Not a category in CCS
Trichomonas	131.00, .01, .02, .09	Not a category in CCS

Category	ICD-9 codes	Comparison with Clinical Classifications Software (CCS)
Sexually transmitted infections (not hepatitis or HIV)	090.0, .1, .2, .3, .40, .41, .42, .49, .5, .6, .7, .9 091.0, .1, .2, .3, .4, .50, .51, .52, .61, .62, .69, .7, .81, .82, .89, .9 092.0, .9 093.0, .1, .20, .21, .22, .23, .24, .81, .82, .89, .9 094.0, .1, .2, .3, .81, .82, .83, .84, .85, .86, .87, .89, .9 095.0, .1, .2, .3, .4, .5, .6, .7, .8, .9 096 097.0, .1, .9, 098.0, .10, .11, .12, .13, .14, .15, .16, .17, .19, .2, .30, .31, .32, .33, .34, .35, .36, .37, .39, . 40, .41, .42, .43, .49, .50, .51, .52, .53, .59, .6, .7, .81, .82, .83, .84, .85, .86, .89 099.0, .1, .2,.3, .4, .40, .41, .49, .50, .51, .52, .53, .54, .55, .56, .59, .8, .9 795.05, .15, .19 796.75, .79	CCS
Other Infections		
Urinary Tract Infections	032.84 590.00, .01, .10, .11, .2, .3, .80, .81, .9 595.0, .1, .2, .3, .4, .81, .82, .89, .9 597.0, .80, .81. .89 598.00, .01 599.0	CCS
Inflammatory diseases of female pelvic organs	614.0, .1, .2, .3, .4, .5, .6, .7, .8, .9 615.0, .1, .9 616.0, .10, .11, .2, .3, .4, .50, .51 , .8, .81, .89, .9 625.71	CCS
Candida vaginitis	112.1	Not a category in CCS
Pain-related Conditions		
Dysmenorrhea	306.52 625.3	Not a category in CCS
Female genital pain and other symptoms	625.0, .1, .2, .4, .5, .6, .70, .79, .8, .9	CCS
Dyspareunia	302.76 625.0	Not a category in CCS
Other Diagnoses		
Abnormal PAP (Not cancer)	233.1 622.10, .11, .12 795.00, .01, .02, .03, .04, .05, .09	Not a category in CCS
Endometriosis	617.0, .1, .2, .3, .4, .5, .6 .8, .9	CCS
Infertility	628.0, .1, .2, .3, .4, .8, .9	CCS
Polycystic Ovarian Syndrome	256.4	Not a category in CCS
Amenorrhea	626.0	Not a category in CCS

Category	ICD-9 codes	Comparison with Clinical Classifications Software (CCS)
Sexual dysfunction	302.70, .71, .72, .73, .79, .9 799.81	Not a category in CCS

Table A2

Unadjusted odds ratios for women's health outcomes by mental health status

	No MH Dx *N* = 40,347	PTSD (no depression) *n* = 4,279		Depression (No PTSD) *n* = 9,756		PTSD + Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Sexually Transmitted Infections	**Reference**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**
Cervical dysplasia	1	1.94	(1.68, 2.24)	2.37	(2.15, 2.61)	2.60	(2.37, 2.86)	1.99	(1.76, 2.25)
Genital herpes	1	1.73	(1.40, 2.12)	2.60	(2.28, 2.96)	2.58	(2.27, 2.93)	1.92	(1.61, 2.28)
Genital warts	1	1.85	(1.47, 2.33)	2.44	(2.09, 2.85)	2.86	(2.49, 3.30)	2.15	(1.78, 2.59)
Chlamydia	1	1.86	(1.05, 3.31)	2.34	(1.58, 3.44)	2.95	(2.08, 4.18)	2.05	(1.27, 3.32)
Gonorrhea	1	3.05	(1.49, 6.22)	3.88	(2.34, 6.44)	4.86	(3.04, 7.74)	1.50	(0.66, 3.40)
Trichomonas	1	1.64	(1.11, 2.44)	2.59	(2.03, 3.32)	4.04	(3.27, 4.99)	1.99	(1.45, 2.73)
Sexually transmitted infections	1	1.94	(1.61, 2.33)	2.25	(1.98, 2.56)	2.96	(2.64, 3.32)	1.95	(1.66, 2.28)
Other Infections									
Urinary tract infections	1	2.10	(1.89, 2.32)	2.69	(2.50, 2.88)	3.68	(3.46, 3.92)	2.21	(2.03, 2.41)
Inflammatory diseases of pelvic organs	1	2.27	(2.07, 2.49)	2.67	(2.50, 2.84)	3.44	(3.24, 3.64)	2.13	(1.97, 2.31)
Candida vaginitis	1	1.93	(1.63, 2.30)	2.92	(2.61, 3.27)	3.14	(2.82, 3.49)	2.28	(1.97, 2.62)
Pain-related Conditions									
Dysmenorrhea	1	2.48	(2.17, 2.84)	2.67	(2.42, 2.94)	3.65	(3.35, 3.98)	2.47	(2.19, 2.77)
Female genital pain and other symptoms	1	2.73	(2.41, 3.11)	3.51	(3.21, 3.84)	4.92	(4.54, 5.33)	2.76	(2.46, 3.08)
Dyspareunia	1	2.41	(1.83, 3.16)	3.68	(3.08, 4.41)	4.44	(3.76, 5.25)	2.97	(2.38, 3.71)
Other Diagnoses									
Abnormal PAP (Not cancer)	1	1.76	(1.60, 1.93)	2.15	(2.02, 2.29)	2.42	(2.28, 2.57)	2.09	(1.94, 2.26)
Endometriosis	1	2.21	(1.76, 2.78)	2.46	(2.08, 2.89)	3.61	(3.13, 4.16)	1.73	(1.39, 2.15)
Infertility	1	2.24	(1.83, 2.75)	2.29	(1.97, 2.67)	2.91	(2.54, 3.33)	1.81	(1.49, 2.20)
Polycystic ovarian syndrome	1	2.42	(1.91, 3.07)	2.74	(2.31, 3.25)	3.15	(2.69, 3.69)	2.14	(1.73, 2.66)
Amenorrhea	1	2.03	(1.72, 2.39)	2.63	(2.35, 2.94)	3.09	(2.79, 3.43)	1.93	(1.66, 2.23)
Sexual dysfunction	1	6.40	(3.99, 10.25)	7.75	(5.35, 11.23)	10.14	(7.15, 14.39)	7.59	(5.04, 11.44)

Note. MH= Mental Health, Dx=Diagnoses, PTSD=Post-traumatic stress disorder.

Table A3

Adjusted odds ratios for women's health outcomes by mental health status, with additional adjustment for alcohol and substance use disorders

	No MH Dx *N* = 40,347	PTSD (no depression) *n* = 4,279		Depression (No PTSD) *n* = 9,756		PTSD + Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Sexually Transmitted Infections	**Reference**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**
Cervical dysplasia	1	1.84	(1.58, 2.13)	2.31	(2.08, 2.56)	2.55	(2.31, 2.82)	1.89	(1.66, 2.14)
Genital herpes	1	1.68	(1.36, 2.07)	2.50	(2.18, 2.86)	2.53	(2.20, 2.90)	1.92	(1.61, 2.28)
Genital warts	1	1.75	(1.39, 2.21)	2.33	(1.99, 2.73)	2.67	(2.29, 3.11)	1.97	(1.63, 2.39)
Chlamydia	1	1.58	(0.88, 2.83)	2.10	(1.41, 3.13)	2.31	(1.58, 3.39)	1.91	(1.18, 3.10)
Gonorrhea	1	2.86	(1.38, 5.94)	3.62	(2.14, 6.13)	3.83	(2.28, 6.44)	1.49	(0.65, 3.40)
Trichomonas	1	1.55	(1.04, 2.32)	2.29	(1.78, 2.96)	3.45	(2.74, 4.34)	1.92	(1.39, 2.65)
Sexually transmitted infections	1	1.79	(1.48, 2.16)	2.16	(1.89, 2.46)	2.73	(2.41, 3.10)	1.86	(1.58, 2.18)
Other Infections									
Urinary tract infections	1	2.03	(1.83, 2.25)	2.53	(2.36, 2.72)	3.48	(3.25, 3.73)	2.11	(1.93, 2.31)
Inflammatory diseases of pelvic organs	1	2.19	(1.99, 2.40)	2.58	(2.41, 2.75)	3.20	(3.00, 3.41)	2.12	(1.95, 2.30)
Candida vaginitis	1	1.91	(1.60, 2.28)	2.84	(2.53, 3.18)	3.06	(2.73, 3.43)	2.27	(1.96, 2.62)
Pain-related Conditions									
Dysmenorrhea	1	2.52	(2.20, 2.89)	2.57	(2.33, 2.84)	3.51	(3.20, 3.86)	2.44	(2.17, 2.75)
Female genital pain and other symptoms	1	2.81	(2.47, 3.20)	3.29	(3.00, 3.61)	4.72	(4.32, 5.14)	2.77	(2.47, 3.10)
Dyspareunia	1	2.40	(1.82, 3.17)	3.41	(2.84, 4.11)	4.22	(3.52, 5.05)	2.97	(2.37, 3.72)
Other Diagnoses									
Abnormal PAP (Not cancer)	1	1.67	(1.52, 1.84)	2.14	(2.00, 2.28)	2.44	(2.28, 2.60)	2.00	(1.85, 2.17)
Endometriosis	1	2.33	(1.85, 2.94)	2.28	(1.93, 2.70)	3.62	(3.11, 4.22)	1.73	(1.38, 2.16)
Infertility	1	2.20	(1.78, 2.72)	2.21	(1.89, 2.58)	2.75	(2.38, 3.19)	1.80	(1.48, 2.19)
Polycystic ovarian syndrome	1	2.56	(2.01, 3.28)	2.68	(2.25, 3.19)	3.41	(2.88, 4.04)	2.19	(1.76, 2.73)
Amenorrhea	1	1.93	(1.63, 2.29)	2.53	(2.25, 2.84)	2.95	(2.63, 3.30)	1.86	(1.60, 2.16)
Sexual dysfunction	1	6.77	(4.19, 10.93)	7.55	(5.17, 11.02)	10.22	(7.09, 14.75)	7.92	(5.23, 12.00)

Note. MH= Mental Health, Dx=Diagnoses, PTSD=Post-traumatic stress disorder. Odds ratios are adjusted for age, race, marital status, component type, rank, branch, multiple deployments, type of nearest VA, distance to nearest VA, and substance use disorder (y/n).

Table A4

Adjusted odds ratios for women's health outcomes by mental health status with additional adjustment for primary care utilization

	No MH Dx *N* = 40,347	PTSD (no depression) *n* = 4,279		Depression (No PTSD) *n* = 9,756		PTSD + Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Sexually Transmitted Infections	**Reference**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**
Cervical dysplasia	1	1.38	(1.19, 1.60)	1.61	(1.44, 1.79)	1.45	(1.30, 1.61)	1.50	(1.32, 1.70)
Genital herpes	1	1.32	(1.06, 1.63)	1.86	(1.62, 2.14)	1.57	(1.36, 1.81)	1.58	(1.33, 1.89)
Genital warts	1	1.33	(1.05, 1.69)	1.66	(1.41, 1.95)	1.58	(1.34, 1.86)	1.58	(1.30, 1.92)
Chlamydia	1	1.24	(0.69, 2.23)	1.57	(1.04, 2.35)	1.50	(1.02, 2.22)	1.55	(0.95, 2.53)
Gonorrhea	1	2.30	(1.10, 4.80)	2.81	(1.66, 4.77)	2.66	(1.58, 4.47)	1.18	(0.51, 2.74)
Trichomonas	1	1.18	(0.79, 1.77)	1.67	(1.29, 2.17)	2.13	(1.68, 2.70)	1.56	(1.12, 2.16)
Sexually transmitted infections	1	1.34	(1.10, 1.62)	1.49	(1.30, 1.71)	1.57	(1.38, 1.79)	1.47	(1.25, 1.74)
Other Infections									
Urinary tract infections	1	1.42	(1.27, 1.58)	1.61	(1.50, 1.74)	1.78	(1.65, 1.91)	1.57	(1.43, 1.72)
Inflammatory diseases of pelvic organs	1	1.45	(1.31, 1.60)	1.53	(1.42, 1.64)	1.44	(1.34, 1.54)	1.50	(1.37, 1.63)
Candida vaginitis	1	1.31	(1.09, 1.57)	1.79	(1.59, 2.02)	1.47	(1.30, 1.66)	1.70	(1.46, 1.97)
Pain-related Conditions									
Dysmenorrhea	1	1.93	(1.68, 2.22)	1.82	(1.64, 2.02)	2.07	(1.88, 2.29)	1.96	(1.74, 2.21)
Female genital pain and other symptoms	1	1.99	(1.74, 2.28)	2.13	(1.93, 2.34)	2.41	(2.20, 2.65)	2.09	(1.86, 2.35)
Dyspareunia	1	1.80	(1.36, 2.39)	2.39	(1.98, 2.90)	2.38	(1.98, 2.88)	2.36	(1.89, 2.97)
Other Diagnoses									
Abnormal PAP (Not cancer)	1	1.20	(1.09, 1.32)	1.42	(1.32, 1.52)	1.27	(1.18, 1.36)	1.54	(1.42, 1.67)
Endometriosis	1	1.81	(1.43, 2.29)	1.66	(1.40, 1.97)	2.18	(1.86, 2.56)	1.40	(1.12, 1.76)
Infertility	1	1.74	(1.41, 2.16)	1.65	(1.41, 1.93)	1.70	(1.46, 1.99)	1.49	(1.22, 1.82)
Polycystic ovarian syndrome	1	2.06	(1.61, 2.65)	2.05	(1.72, 2.46)	2.23	(1.86, 2.66)	1.85	(1.48, 2.31)
Amenorrhea	1	1.49	(1.26, 1.77)	1.83	(1.62, 2.06)	1.79	(1.59, 2.01)	1.51	(1.30, 1.75)
Sexual dysfunction	1	5.40	(3.33, 8.75)	5.76	(3.93, 8.45)	6.47	(4.44, 9.42)	6.61	(4.36, 10.04)

Note. MH= Mental Health, Dx=Diagnoses, PTSD=Post-traumatic stress disorder. Odds ratios are adjusted for age, race, marital status, component type, rank, branch, multiple deployments, type of nearest VA, distance to nearest VA, and number of primary care visits.

References

Adamson, DM.; Burnam, MA.; Burns, RM.; Caldaraone, LB.; Cox, RA.; D'Amico, E., et al. Tanielian, T.; Jaycox, LH., editors. Invisible Wounds of War: Psychological and Cognitive Injuries, Their Consequences, and Services to Assist Recovery. 2008. Available from http://www.rand.org/pubs/monographs/MG720

Aldous WK, Robertson JL, Robinson BJ, Hatcher CL, Hospenthal DR, Conger NG, et al. Rates of gonorrhea and Chlamydia in U.S. military personnel deployed to Iraq and Afghanistan (2004-2009). Military Medicine. 2011; 176:705–710. [PubMed: 21702394]

APA. , editor. Diagnostic and Statistical Manual of Mental Disorders. 4th edition, text revision. American Psychiatric Association; Washington, D.C.: 2000.

Araneta MR, Kamens DR, Zau AC, Gastanaga VM, Schlangen KM, Hiliopoulos KM, et al. Conception and pregnancy during the Persian Gulf War: the risk to women veterans. Annals of Epidemiology. 2004; 14:109–116. [PubMed: 15018883]

Bean-Mayberry B, Batuman F, Huang C, Goldzweig CL, Washington DL, Yano EM, et al. Systematic Review of Women Veterans Health Research 2004-2008. VA-ESP Project #05-226. 2010 2010.

Bean-Mayberry B, Yano EM, Washington DL, Goldzweig C, Batuman F, Huang C, et al. Systematic review of women veterans' health: update on successes and gaps. Womens Health Issues. 2011; 21:S84–97. [PubMed: 21724149]

Boyer CB, Pollack LM, Becnel J, Shafer MA. Relationships among sociodemographic markers, behavioral risk, and sexually transmitted infections in U. S. female Marine Corps recruits. Military Medicine. 2008; 173:1078–1084. [PubMed: 19055182]

Breslau N, Davis GC, Schultz LR. Posttraumatic stress disorder and the incidence of nicotine, alcohol, and other drug disorders in persons who have experienced trauma. Archives of General Psychiatry. 2003; 60:289–294. [PubMed: 12622662]

Bryant RA, Moulds ML, Guthrie RM, Dang ST, Mastrodomenico J, Nixon RD, et al. A randomized controlled trial of exposure therapy and cognitive restructuring for posttraumatic stress disorder. Journal of Consulting and Clinical Psychology. 2008; 76:695–703. [PubMed: 18665697]

Clayton AH. The pathophysiology of hypoactive sexual desire disorder in women. International Journal of Gynaecology and Obstetrics. 2010; 110:7–11. [PubMed: 20434725]

Cloitre M, Koenen KC, Cohen LR, Han H. Skills training in affective and interpersonal regulation followed by exposure: a phase-based treatment for PTSD related to childhood abuse. Journal of Consulting and Clinical Psychology. 2002; 70:1067–1074. [PubMed: 12362957]

Cohen BE, Marmar C, Ren L, Bertenthal D, Seal KH. Association of cardiovascular risk factors with mental health diagnoses in Iraq and Afghanistan war veterans using VA health care. Journal of the American Medical Association. 2009; 302:489–492. [PubMed: 19654382]

Department of Veterans Affairs, V. H. A.. VHA Handbook 1330.01, Health care services for women veterans. 2010. Available at: http://www1.va.gov/vhapublications/ViewPublication.asp?pub_ID=2246

Dhaliwal LK, Gupta KR, Gopalan S, Kulhara P. Psychological aspects of infertility due to various causes--prospective study. International Journal of Fertility and Womens Medicine. 2004; 49:44–48.

Dobie DJ, Kivlahan DR, Maynard C, Bush KR, Davis TM, Bradley KA. Posttraumatic stress disorder in female veterans: association with self-reported health problems and functional impairment. Archives of Internal Medicine. 2004; 164:394–400. [PubMed: 14980990]

Duivis HE, de Jonge P, Penninx BW, Na BY, Cohen BE, Whooley MA. Depressive Symptoms, Health Behaviors, and Subsequent Inflammation in Patients With Coronary Heart Disease: Prospective Findings From the Heart and Soul Study. American Journal of Psychiatry. 2011

Fabre LF, Smith LC. The effect of major depression on sexual function in women. Journal of Sexual Medicine. 2012; 9:231–239. [PubMed: 21883948]

Frayne SM, Chiu VY, Iqbal S, Berg EA, Laungani KJ, Cronkite RC, et al. Medical care needs of returning veterans with PTSD: their other burden. Journal of General Internal Medicine. 2010; 26:33–39. [PubMed: 20853066]

Frayne SM, Seaver MR, Loveland S, Christiansen CL, Spiro A 3rd, Parker VA, et al. Burden of medical illness in women with depression and posttraumatic stress disorder. Archives of Internal Medicine. 2004; 164:1306–1312. [PubMed: 15226164]

Friedman SA, Phibbs CS, Schmitt SK, Hayes PM, Herrera L, Frayne SM. New women veterans in the VHA: a longitudinal profile. Womens Health Issues. 2011; 21:S103–111. [PubMed: 21724129]

Gaydos CA, Howell MR, Pare B, Clark KL, Ellis DA, Hendrix RM, et al. Chlamydia trachomatis infections in female military recruits. New England Journal of Medicine. 1998; 339:739–744. [PubMed: 9731090]

Gehi A, Haas D, Pipkin S, Whooley MA. Depression and medication adherence in outpatients with coronary heart disease. Findings from the Heart and Soul Study. Archives of Internal Medicine. 2005; 165:2508–2513. [PubMed: 16314548]

Gill JM, Saligan L, Woods S, Page G. PTSD is associated with an excess of inflammatory immune activities. Perspectives in Psychiatric Care. 2009; 45:262–277. [PubMed: 19780999]

Haskell SG, Mattocks K, Goulet JL, Krebs EE, Skanderson M, Leslie D, et al. The burden of illness in the first year home: do male and female VA users differ in health conditions and healthcare utilization. Womens Health Issues. 2011; 21:92–97. [PubMed: 21185994]

Hirschfeld RM. Long-term side effects of SSRIs: sexual dysfunction and weight gain. Journal of Clinical Psychiatry. 2003; 64(Suppl 18):20–24. [PubMed: 14700451]

Hoge CW, Terhakopian A, Castro CA, Messer SC, Engel CC. Association of posttraumatic stress disorder with somatic symptoms, health care visits, and absenteeism among Iraq war veterans. American Journal of Psychiatry. 2007; 164:150–153. [PubMed: 17202557]

Jacobsen LK, Southwick SM, Kosten TR. Substance use disorders in patients with posttraumatic stress disorder: a review of the literature. American Journal of Psychiatry. 2001; 158:1184–1190. [PubMed: 11481147]

Jordan NN, Lee SE, Nowak G, Johns NM, Gaydos JC. Chlamydia trachomatis reported among U.S. active duty service members, 2000-2008. Military Medicine. 2011; 176:312–319. [PubMed: 21456359]

Kendall-Tackett KA. Inflammation, cardiovascular disease, and metabolic syndrome as sequelae of violence against women: the role of depression, hostility, and sleep disturbance. Trauma Violence Abuse. 2007; 8:117–126. [PubMed: 17545569]

Killgore WD, Cotting DI, Thomas JL, Cox AL, McGurk D, Vo AH, et al. Post-combat invincibility: violent combat experiences are associated with increased risk-taking propensity following deployment. Journal of Psychiatric Research. 2008; 42:1112–1121. [PubMed: 18291419]

Kimerling R, Street AE, Pavao J, Smith MW, Cronkite RC, Holmes TH, et al. Military-related sexual trauma among Veterans Health Administration patients returning from Afghanistan and Iraq. American Journal of Public Health. 2010; 100:1409–1412. [PubMed: 20558808]

Lapierre CB, Schwegler AF, Labauve BJ. Posttraumatic stress and depression symptoms in soldiers returning from combat operations in Iraq and Afghanistan. Journal of Traumatic Stress. 2007; 20:933–943. [PubMed: 18157882]

Luxton DD, Skopp NA, Maguen S. Gender differences in depression and PTSD symptoms following combat exposure. Depression and Anxiety. 2010; 27:1027–1033. [PubMed: 20721909]

Maguen S, Cohen B, Ren L, Bosch J, Kimerling R, Seal K. Gender differences in military sexual trauma and mental health diagnoses among Iraq and Afghanistan Veterans with posttraumatic stress disorder. Women's Health Issues. 2012; 22:61–66.

Maguen S, Luxton DD, Skopp NA, Madden E. Gender differences in traumatic experiences and mental health in active duty soldiers redeployed from Iraq and Afghanistan. Journal of Psychiatric Research. 2011; 46:311–316. [PubMed: 22172997]

Maguen S, Ren L, Bosch JO, Marmar CR, Seal KH. Gender differences in mental health diagnoses among Iraq and Afghanistan veterans enrolled in veterans affairs health care. American Journal of Public Health. 2010; 100:2450–2456. [PubMed: 20966380]

Martin L, Rosen LN, Durand DB, Knudson KH, Stretch RH. Psychological and physical health effects of sexual assaults and nonsexual traumas among male and female United States Army soldiers. Behavioral Medicine. 2000; 26:23–33. [PubMed: 10971881]

McDonagh A, Friedman M, McHugo G, Ford J, Sengupta A, Mueser K, et al. Randomized trial of cognitive-behavioral therapy for chronic posttraumatic stress disorder in adult female survivors of childhood sexual abuse. Journal of Consulting and Clinical Psychology. 2005; 73:515–524. [PubMed: 15982149]

Mengeling MA, Sadler AG, Torner J, Booth BM. Evolving Comprehensive VA Women's Health Care: Patient Characteristics, Needs, and Preferences. Womens Health Issues. 2011; 21:S120–129. [PubMed: 21724131]

Meyers D, Wolff T, Gregory K, Marion L, Moyer V, Nelson H, et al. USPSTF recommendations for STI screening. American Family Physician. 2008; 77:819–824. [PubMed: 18386598]

Mindel A, Marks C. Psychological symptoms associated with genital herpes virus infections: epidemiology and approaches to management. CNS Drugs. 2005; 19:303–312. [PubMed: 15813644]

Nunnink SE, Goldwaser G, Afari N, Nievergelt CM, Baker DG. The role of emotional numbing in sexual functioning among veterans of the Iraq and Afghanistan wars. Military Medicine. 2010; 175:424–428. [PubMed: 20572475]

Opbroek A, Delgado PL, Laukes C, McGahuey C, Katsanis J, Moreno FA, et al. Emotional blunting associated with SSRI-induced sexual dysfunction. Do SSRIs inhibit emotional responses? International Journal of Neuropsychopharmacology. 2002; 5:147–151. [PubMed: 12135539]

Pierce PF. Physical and emotional health of Gulf War veteran women. Aviation Space and Environmental Medicine. 1997; 68:317–321.

Resick PA, Williams LF, Suvak MK, Monson CM, Gradus JL. Long-term outcomes of cognitive-behavioral treatments for posttraumatic stress disorder among female rape survivors. Journal of Consulting and Clinical Psychology. 2011

Sadler AG, Mengeling MA, Syrop CH, Torner JC, Booth BM. Lifetime sexual assault and cervical cytologic abnormalities among military women. Journal of Womens Health (Larchmont). 20:1693–1701.

Seal KH, Bertenthal D, Miner CR, Sen S, Marmar C. Bringing the war back home: mental health disorders among 103,788 US veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. Archives of Internal Medicine. 2007; 167:476–482. [PubMed: 17353495]

Seal KH, Cohen G, Waldrop AE, Cohen BE, Maguen S, Ren L. Substance use disorders in Iraq and Afghanistan veterans in VA healthcare, 2001–2010: Implications for screening, diagnosis and treatment. Drug and Alcohol Dependence. 2011; 116:93–101. [PubMed: 21277712]

Seal KH, Metzler TJ, Gima KS, Bertenthal D, Maguen S, Marmar CR. Trends and risk factors for mental health diagnoses among Iraq and Afghanistan veterans using Department of Veterans Affairs health care, 2002-2008. American Journal of Public Health. 2009; 99:1651–1658. [PubMed: 19608954]

Smith BN, Shipherd JC, Schuster JL, Vogt DS, King LA, King DW. Posttraumatic stress symptomatology as a mediator of the association between military sexual trauma and post-deployment physical health in women. Journal of Trauma & Dissociation. 12:275–289. [PubMed: 21534096]

Street AE, Vogt D, Dutra L. A new generation of women veterans: stressors faced by women deployed to Iraq and Afghanistan. Clinical Psychology Review. 2009; 29:685–694. [PubMed: 19766368]

Suris A, Lind L. Military sexual trauma: a review of prevalence and associated health consequences in veterans. Trauma Violence Abuse. 2008; 9:250–269. [PubMed: 18936282]

Tate SR, Norman SB, McQuaid JR, Brown SA. Health problems of substance-dependent veterans with and those without trauma history. Journal of Substance Abuse Treatment. 2007; 33:25–32. [PubMed: 17588486]

Thomson BA, Nielsen PE. Women's health care in Operation Iraqi Freedom: a survey of camps with echelon I or II facilities. Military Medicine. 2006; 171:216–219. [PubMed: 16602519]

von Kanel R, Hepp U, Kraemer B, Traber R, Keel M, Mica L, et al. Evidence for low-grade systemic proinflammatory activity in patients with posttraumatic stress disorder. Journal of Psychiatric Research. 2007; 41:744–752. [PubMed: 16901505]

von Sadovszky V, Ryan-Wenger N, Germann S, Evans M, Fortney C. Army women's reasons for condom use and nonuse. Womens Health Issues. 2008; 18:174–180. [PubMed: 18359640]

Wagner AW, Wolfe J, Rotnitsky A, Proctor SP, Erickson DJ. An investigation of the impact of posttraumatic stress disorder on physical health. Journal of Traumatic Stress. 2000; 13:41–55. [PubMed: 10761173]

Washington DL, Bean-Mayberry B, Mitchell MN, Riopelle D, Yano EM. Tailoring VA Primary Care to Women Veterans: Association with Patient-Rated Quality and Satisfaction. Womens Health Issues. 2011; 21:S112–119. [PubMed: 21724130]

Weitlauf JC, Frayne SM, Finney JW, Moos RH, Jones S, Hu K, et al. Sexual violence, posttraumatic stress disorder, and the pelvic examination: how do beliefs about the safety, necessity, and utility of the examination influence patient experiences? Journal of Womens Health (Larchmont). 2010; 19:1271–1280.

Yano EM, Bastian LA, Frayne SM, Howell AL, Lipson LR, McGlynn G, et al. Toward a VA Women's Health Research Agenda: setting evidence-based priorities to improve the health and health care of women veterans. Journal of General Internal Medicine. 2006; 21(Suppl 3):S93–101. [PubMed: 16637953]

Yano EM, Hayes P, Wright S, Schnurr PP, Lipson L, Bean-Mayberry B, et al. Integration of women veterans into VA quality improvement research efforts: what researchers need to know. Journal of General Internal Medicine. 2010; 25(Suppl 1):56–61. [PubMed: 20077153]

Zen AL, Whooley MA, Zhao S, Cohen BE. Post-traumatic stress disorder is associated with poor health behaviors: Findings from the Heart and Soul Study. Health Psychology. 2012; 31:194–201. [PubMed: 22023435]

Zinzow HM, Grubaugh AL, Monnier J, Suffoletta-Maierle S, Frueh BC. Trauma among female veterans: a critical review. Trauma Violence Abuse. 2007; 8:384–400. [PubMed: 17846179]

Table 1

Characteristics of women veterans by mental health status

	Total *N* = 71,504		No MH Dx *n* = 40,347		PTSD (no depression) *n* = 4,279		Depression (no PTSD) *n* = 9,756		PTSD+Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Age	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
	29.3	8.2	29.5	8.4	28.5	7.6	29.3	7.9	29.4	8.0	28.5	7.6
Race	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
White	28398	39.7	15857	39.3	1881	44.0	3737	38.3	4236	38.4	2687	44.1
Black	13048	18.3	7231	17.9	818	19.1	1639	16.8	2327	21.1	1033	16.9
Hispanic	7597	10.6	4228	10.5	477	11.1	1012	10.4	1229	11.2	651	10.7
Other/Unknown	22461	31.4	13031	32.3	1103	25.8	3368	34.5	3232	29.3	1727	28.3
Marital status												
Married	23682	33.1	13340	33.1	1366	31.9	3246	33.2	3880	35.2	1850	30.3
Never Married	41890	58.6	23860	59.1	2561	59.9	5636	57.8	6025	54.7	3808	62.5
Divorced/ Widowed/Other	5932	8.3	3147	7.8	352	8.2	874	9.0	1119	10.1	440	7.2
Component												
Active Component	40659	56.9	22701	56.3	2325	54.3	6007	61.6	6295	57.1	3331	54.6
Nat'l Guard/Reserve	30845	43.1	17646	43.7	1954	45.7	3749	38.4	4729	42.9	2767	45.4
Officer												
Enlisted	64861	90.7	35601	88.2	4004	93.6	9173	94.0	10416	94.5	5667	92.9
Officer	6643	9.3	4746	11.8	275	6.4	583	6.0	608	5.5	431	7.1
Branch												
Army	44335	62.0	23220	57.6	3251	76.0	5682	58.2	8282	75.1	3900	63.9
Marines	2903	4.1	1594	3.9	238	5.5	348	3.6	472	4.3	251	4.1
Navy/Coast Guard	11652	16.3	7087	17.6	354	8.3	2000	20.5	1183	10.7	1028	16.9
Air Force	12614	17.6	8446	20.9	436	10.2	1726	17.7	1087	9.9	919	15.1
Multiple Deployment												
Single deployment	49382	69.1	27751	68.8	2840	66.4	6966	71.4	7539	68.4	4286	70.3
Multiple deployments	22122	30.9	12596	31.2	1439	33.6	2790	28.6	3485	31.6	1812	29.7

Note. All $p < .0001$ for comparison to No mental health diagnoses group

Table 2

Unadjusted prevalences of health outcomes by mental health status

	Total *N* = 71,504		No MH Dx *n* = 40,347		PTSD (no depression) *n* = 4,279		Depression (No PTSD) *n* = 9,756		PTSD + Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Sexually Transmitted Infections	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Cervical dysplasia	3188	4.46	1171	2.90	234	5.47	645	6.61	796	7.22	342	5.61
Genital herpes	1666	2.33	602	1.49	109	2.55	369	3.78	414	3.76	172	2.82
Genital warts	1296	1.81	453	1.12	88	2.06	263	2.70	347	3.15	145	2.38
Chlamydia	204	0.29	71	0.18	14	0.33	40	0.41	57	0.52	22	0.36
Gonorrhea	118	0.17	31	0.08	10	0.23	29	0.30	41	0.37	7	0.11
Trichomonas	532	0.74	167	0.41	29	0.68	104	1.07	182	1.65	50	0.82
Sexually transmitted infections	1970	2.76	702	1.74	142	3.32	374	3.83	549	4.98	203	3.33
Other Infections												
Urinary tract infections	7161	10.01	2405	5.96	502	11.73	1419	14.54	2085	18.91	750	12.30
Inflammatory diseases of pelvic organs	8605	12.03	2981	7.39	656	15.33	1711	17.54	2371	21.51	886	14.53
Candida vaginitis	2402	3.36	790	1.96	159	3.72	538	5.51	650	5.90	265	4.35
Pain-related Conditions												
Dysmenorrhea	3560	4.98	1128	2.80	285	6.66	696	7.13	1047	9.50	404	6.63
Female genital pain and other symptoms	4280	5.99	1166	2.89	322	7.53	923	9.46	1407	12.76	462	7.58
Dyspareunia	966	1.35	257	0.64	65	1.52	225	2.31	305	2.77	114	1.87
Other Diagnoses												
Abnormal PAP (Not cancer)	9024	12.62	3577	8.87	625	14.61	1688	17.30	2102	19.07	1032	16.92
Endometriosis	1194	1.67	393	0.97	91	2.13	230	2.36	378	3.43	102	1.67
Infertility	1388	1.94	491	1.22	115	2.69	268	2.75	381	3.46	133	2.18
Polycystic ovarian syndrome	1054	1.47	343	0.85	87	2.03	224	2.30	290	2.63	110	1.80
Amenorrhea	2445	3.42	837	2.07	176	4.11	515	5.28	678	6.15	239	3.92
Sexual dysfunction	319	0.45	43	0.11	29	0.68	80	0.82	118	1.07	49	0.80

Note. MH= Mental Health, Dx=Diagnoses, PTSD=Post-traumatic stress disorder. All $p \leq .01$ for comparison to No mental health diagnoses group except Chlamydia in PTSD (no depression), $p = .03$ and Gonorrhea in Other MH Dx, $p = .20$. The sexually transmitted infections category is from the Clinical Classifications Software and is not a composite of the preceding individual diagnoses (see Table A1 for complete codes).

Table 3

Adjusted odds ratios for women's health outcomes by mental health status

	No MH Dx *n* = 40,347	PTSD (no depression) *n* = 4,279		Depression (No PTSD) *n* = 9,756		PTSD + Depression *n* = 11,024		Other MH Dx *n* = 6,098	
Sexually Transmitted Infections	**Reference**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**	***OR***	**95% CI**
Cervical dysplasia	1	1.86	(1.61, 2.16)	2.35	(2.12, 2.59)	2.65	(2.41, 2.91)	1.90	(1.68, 2.16)
Genital herpes	1	1.69	(1.36, 2.08)	2.51	(2.20, 2.87)	2.55	(2.24, 2.91)	1.92	(1.62, 2.29)
Genital warts	1	1.83	(1.45, 2.31)	2.44	(2.09, 2.86)	2.97	(2.56, 3.43)	2.02	(1.67, 2.45)
Chlamydia	1	1.66	(0.93, 2.96)	2.21	(1.49, 3.27)	2.58	(1.80, 3.70)	1.96	(1.21, 3.17)
Gonorrhea	1	3.12	(1.51, 6.44)	3.99	(2.38, 6.71)	4.74	(2.91, 7.71)	1.55	(0.68, 3.55)
Trichomonas	1	1.60	(1.08, 2.39)	2.38	(1.85, 3.06)	3.75	(3.01, 4.66)	1.95	(1.42, 2.69)
Sexually transmitted infections	1	1.83	(1.52, 2.21)	2.21	(1.95, 2.53)	2.92	(2.59, 3.28)	1.89	(1.61, 2.22)
Other Infections									
Urinary tract infections	1	2.09	(1.88, 2.32)	2.61	(2.43, 2.81)	3.74	(3.50, 3.99)	2.14	(1.96, 2.34)
Inflammatory diseases of pelvic organs	1	2.24	(2.04, 2.46)	2.65	(2.48, 2.83)	3.40	(3.20, 3.62)	2.15	(1.98, 2.33)
Candida vaginitis	1	1.92	(1.61, 2.30)	2.86	(2.55, 3.20)	3.11	(2.79, 3.47)	2.27	(1.97, 2.63)
Pain-related Conditions									
Dysmenorrhea	1	2.56	(2.24, 2.94)	2.62	(2.37, 2.89)	3.66	(3.34, 4.00)	2.46	(2.19, 2.77)
Female genital pain and other symptoms	1	2.85	(2.50, 3.24)	3.34	(3.05, 3.66)	4.88	(4.49, 5.30)	2.79	(2.49, 3.12)
Dyspareunia	1	2.44	(1.85, 3.22)	3.47	(2.89, 4.17)	4.38	(3.68, 5.20)	2.99	(2.39, 3.75)
Other Diagnoses									
Abnormal PAP (Not cancer)	1	1.69	(1.54, 1.85)	2.16	(2.02, 2.30)	2.48	(2.34, 2.64)	2.01	(1.86, 2.17)
Endometriosis	1	2.35	(1.86, 2.96)	2.30	(1.94, 2.72)	3.69	(3.19, 4.28)	1.73	(1.39, 2.16)
Infertility	1	2.18	(1.76, 2.69)	2.18	(1.87, 2.54)	2.68	(2.33, 3.09)	1.79	(1.47, 2.18)
Polycystic ovarian syndrome	1	2.52	(1.98, 3.22)	2.63	(2.21, 3.13)	3.28	(2.79, 3.87)	2.17	(1.75, 2.71)
Amenorrhea	1	1.97	(1.66, 2.33)	2.58	(2.30, 2.89)	3.08	(2.77, 3.43)	1.88	(1.62, 2.18)
Sexual dysfunction	1	6.78	(4.20, 10.93)	7.55	(5.18, 11.02)	10.24	(7.15, 14.67)	7.93	(5.24, 12.00)

Note. MH= Mental Health, Dx=Diagnoses, PTSD=Post-traumatic stress disorder. Odds ratios are adjusted for age, race, marital status, component type, rank, branch, multiple deployments, type of nearest VA, distance to nearest VA