

# Pregnancy and Mental Health Among Women Veterans Returning from Iraq and Afghanistan

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## Abstract

**Background:** Veterans of Operations Enduring Freedom and Iraqi Freedom (OEF/OIF) may experience significant stress during military service that can have lingering effects. Little is known about mental health problems or treatment among pregnant OEF/OIF women veterans. The aim of this study was to determine the prevalence of mental health problems among veterans who received pregnancy-related care in the Veterans Health Administration (VHA) system.

**Methods:** Data from the Defense Manpower Data Center (DMDC) deployment roster of military discharges from October 1, 2001, through April 30, 2008, were used to assemble an administrative cohort of female OEF/OIF veterans enrolled in care at the VHA ( $n = 43,078$ ). Pregnancy and mental health conditions were quantified according to ICD-9-CM codes and specifications. Mental healthcare use and prenatal care were assessed by analyzing VHA stop codes.

**Results:** During the study period, 2966 (7%) women received at least one episode of pregnancy-related care, and 32% of veterans with a pregnancy and 21% without a pregnancy received one or more mental health diagnoses ( $p < 0.0001$ ). Veterans with a pregnancy were twice as likely to have a diagnosis of depression, anxiety, post-traumatic stress disorder (PTSD), bipolar disorder, or schizophrenia as those without a pregnancy.

**Conclusions:** Women OEF/OIF veterans commonly experience mental health problems after military service. The burden of mental health conditions is higher among women with an identified instance of pregnancy than among those without. Because women do not receive pregnancy care at the VHA, however, little is known about ongoing concomitant prenatal and mental healthcare or about pregnancy outcomes among these women veterans.

## Introduction

SINCE THE INCEPTION OF THE WARS in Iraq (Operation Iraqi Freedom, OIF) and Afghanistan (Operation Enduring Freedom, OEF), unprecedented numbers of women have served in the U.S. military. More than 170,000 female soldiers have been deployed to Iraq and Afghanistan, more than 20-fold the number who served in the Vietnam era (7,500) and more than four times the number deployed to the Gulf war (41,000).<sup>1</sup>

Many returning OEF/OIF veterans struggle with mental health issues.<sup>2</sup> although women are excluded from serving in direct combat roles in the military, they serve in positions (e.g., convoy driver, patrol) that put them in the line of direct enemy fire and may cause significant stress.<sup>3</sup> Like the men, many women returning from military service may experience mental health problems,<sup>4</sup> but the juxtaposition of pregnancy and mental health-related issues is of special concern because pregnancy itself can precipitate or exacerbate mental health conditions, and maternal anxiety during

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pregnancy can give rise to preterm deliveries and lower birth weights.<sup>5,6</sup>

Untreated mental health conditions during pregnancy may give rise to poor pregnancy outcomes, including preterm delivery, low birth weight, and other adverse pregnancy outcomes.<sup>7–13</sup> If mental health problems persist and remain untreated after pregnancy, they may impair the infant's healthcare needs and cognitive and emotional development.<sup>14–18</sup> Several studies have begun to focus on the importance of mental health treatment for pregnant women, although sustaining mental health treatment throughout the duration of the pregnancy remains a challenge.<sup>19</sup> Several studies have examined pregnancy outcomes, including fertility disorders, miscarriages, and birth defects among veterans,<sup>20,21</sup> but, little is known about the prevalence of mental health problems among pregnant veterans or the degree to which they receive treatment for their mental health conditions. Understanding care use patterns and health outcomes among pregnant veterans is challenging, as women traditionally have not used Veterans Health Administration (VHA) healthcare.<sup>22</sup> Large-scale studies examining women veterans' health outcomes are currently underway.<sup>23</sup> Interestingly, these studies suggest that OEF/OIF women are among the fastest growing segments of new VHA users,<sup>24</sup> with as many as 44% of women returning from OEF/OIF electing to use the VHA.<sup>25</sup>

Although increasing numbers of OEF/OIF women veterans use VHA services, the VHA does not provide routine prenatal care. Because women remain a numerical minority in the VHA, a majority of VHA facilities refer pregnant veterans to community obstetrical providers via fee basis or contract mechanisms.<sup>26,27</sup> However, although women veterans may leave the VHA to receive prenatal care, those who struggle with concomitant physical and mental health problems during pregnancy may choose to remain in the VHA system for provision of care for these conditions. This dual system of care may lead to lack of coordination among care providers, which may present problems for medical management of pregnancy if non-VHA obstetrical providers are unaware of women veterans' mental health problems or medications they may be taking for these problems.

The recent legislation allowing for 5 full years of healthcare for new combat veterans has resulted in and may continue to result in larger numbers of women entering VHA for their healthcare needs. It is important to understand the patterns of mental health diagnoses in these women, to understand what role pregnancy may be playing in the care of female veterans, and to understand the overlap between pregnancy and mental health conditions in these women. Such an understanding will assist healthcare providers in identifying groups of veterans at potential risk for poor clinical outcomes and highlight the need for coordination of care for some veterans across VHA and non-VHA healthcare.

The purpose of this study is threefold: 1) to examine the prevalence of pregnancy-related care among OEF/OIF veterans of childbearing age enrolled for care in the VHA, (2) to examine the degree to which women with pregnancy-related care suffer from mental health ailments, and (3) to examine the extent to which women with a pregnancy diagnosis receive mental healthcare at the VHA.

## Materials and Methods

The VHA OEF/OIF roster is a database of veterans who have separated from OEF/OIF military service and enrolled in VHA healthcare between October 1, 2001, and April 30, 2008 ( $n = 406,802$ ). The roster uses data from the Department of Defense Manpower Data Center's (DMDC) Contingency Tracking System and includes information on veterans' sex, race, date of birth, deployment dates, armed forces branch (Army, Navy, Air Force, Marines, or Coast Guard) and component (National Guard, Reserve, or active duty). We included women who were of childbearing age (up to 50 years of age) who had made at least one VHA visit. Our final sample included 43,078 women who served in OEF/OIF and received VHA healthcare after return from deployment.

Data on women veterans identified through the OEF/OIF roster were then linked to administrative and clinical data contained within the VHA National Patient Care Database (NPCD) and Decision Support Systems (DSS). These databases provide healthcare use information and cost data, pharmacy and laboratory data, and health encounters and coded diagnostic and procedure data associated with inpatient and outpatient encounters.

Pregnancy and mental health conditions were quantified by grouping diagnoses according to *International Classification of Diseases, Ninth Revision, Clinical Modification* codes and specifications.<sup>28</sup> To ensure independence of observations (i.e., one pregnancy per veteran), an index pregnancy was identified as the unit of analysis. The index pregnancy was defined as the first pregnancy identified during the study period. An index pregnancy was determined if a female veteran had any one pregnancy-related ICD-9, current procedural terminology (CPT), or V code within the 5-year observation period of the available DSS data. Pregnancy-related codes included ICD-9 codes for normal pregnancy and delivery (650–659), ectopic or molar pregnancy (630–633), miscarriage or abortion (634–639), and complications of pregnancy (ICD-9 650–659, 630–633, 634–639, 640–649). CPT codes were as follows: normal pregnancy and delivery (59000–59430), ectopic pregnancy (59130, 59140, 59135, 59136, 59151, 59150), abortion (59855–59857, 59850–59852, 59840, 59841, 59830, 59851, 59852, 59850), miscarriage (59812, 59820, 59821), cesarean section (59618–59622, 59514, 59515, 59510, 59610–59614, 59525), and vaginal delivery (59409, 59410, 59610–59614, 59425–59426, 59430, 59400). V codes are codes used to describe a reason for a healthcare encounter and are often used as a status code for pregnancy. V codes used for pregnancy included V22 (normal pregnancy), V23 (supervision of high-risk pregnancy), V24 (postpartum care and evaluation), V27 (outcome of delivery), and V28 (antenatal screening).<sup>28</sup>

Because the VHA does not routinely capture pregnancy outcomes, it is difficult to determine the period of pregnancy among women veterans, and it is, therefore, difficult to capture any services that may occur during this period. To address this problem, we created a pregnancy window that extended from 10 months before the first pregnancy-related code to 10 months after the first pregnancy-related code. The width of the pregnancy window allows for differences in the time that women may have first come to the VHA with pregnancy. It allows us to capture data for the full terms of women who receive an early pregnancy-related code, such as at the time of a 6-week pregnancy test, but also allows us to

capture data for women who had no prior VHA pregnancy-related care until labor and delivery.

We focused on mental health conditions (major and minor depression, bipolar disorder, posttraumatic stress disorder [PTSD], schizophrenia, and anxiety disorder) that are highly prevalent and often disabling conditions among veterans in the VA. Veterans were considered to have mental health diagnoses if they had two or more outpatient or one or more inpatient ICD-9-CM codes for major and mild depression, bipolar disorder, PTSD, schizophrenia, anxiety disorder, alcohol abuse or dependence, or drug abuse or dependence at any time during the 5-year study period. In prior studies, we have found that this requirement substantially improves the accuracy of these codes for the actual clinical diagnosis.<sup>29</sup> Mental health conditions were identified using ICD-9 codes grouped into clusters of psychiatric disease diagnoses as previously reported.<sup>30,31</sup> Mental healthcare use was assessed using VHA stop codes, which are codes the VHA uses to identify the clinical group responsible for provision of care.<sup>32</sup> To evaluate mental healthcare during the index pregnancy window, we used individual mental health clinic and psychiatry codes (stop codes 502, 509, 510), PTSD group and individual counseling codes (stop codes 516, 540, 562), substance abuse counseling codes (stop code 513), and sexual trauma counseling for women codes (stop code 524).

To account for differences in use that may arise because of physical trauma incurred during military service, we included ICD-9 codes for the most commonly diagnosed conditions among returning war veterans,<sup>33</sup> including ICD-9 codes 720.1–720.9 for back problems and 713.0–716.9, 716.21–716.99, 718.1–718.29, and 718.5–719.99 for joint disorders. We also assessed differences in use because of female genital disorders (a diagnostic group of conditions comprising ovarian, uterine, and vaginal disorders and abnormal Pap smears), including ICD-9 codes 619.0–625.9. For physical trauma-related conditions, we limited the data to diagnostic codes that occurred either once or more for an inpatient stay or twice or more for an outpatient visit. This methodology has been used in identification of psychiatric disorders in administrative data<sup>34</sup> and in identification of HIV in Medicaid data.<sup>35</sup> For reproductive health codes, because these may have represented well-screening visits rather than diagnoses, we accepted any one inpatient or outpatient diagnostic code.

We used univariate statistics to describe the characteristics of pregnant women veterans, and bivariate statistics, including the *t* test for continuous variables and the chi-square test for ordinal or dichotomous variables, to compare the demographic and clinical characteristics of women veterans with and without pregnancy. Statistical analyses were performed using SAS version 9.1.3 (SAS, Inc., Cary, NC). All statistical tests were two-tailed.

## Results

A total of 43,078 women veterans enrolled in VHA care during the 5-year study period and were between the ages of 18 and 50 during the study period. Overall, 2,966 of these women (7%) had at least one code for a pregnancy-related condition during the 5-year study period. Veterans with a pregnancy during the study period were younger and more likely to be Hispanic and unmarried and to have a high school education or less compared with veterans without a pregnancy-

related condition ( $p < 0.0001$ ) (Table 1). Veterans with a pregnancy were also more likely to be enlisted service members rather than officers and more likely to be active duty service members at the time of last deployment rather than members of the Guard or Reserves. Veterans with a pregnancy were also more likely to have separated from the military between the years 2001 and 2004 than veterans without a pregnancy. On average, women veterans experienced their index pregnancy nearly 2 years after return from their last military deployment. Veterans with a pregnancy were also significantly more likely to have a service-connected disability than those without a pregnancy and were more likely to receive treatment for female genital disorders. There were no significant differences between the two groups in terms of diagnosis of musculoskeletal or joint disorders.

The number of women veterans who had an index pregnancy grew steadily each year from 12 in 2002 to a maximum of 955 in 2006, representing approximately 4% of eligible OEF/OIF women veterans seen at the VHA each year (data not shown). Most pregnancy-related care for women veterans was provided on a fee-for-service basis or by contract providers outside the VHA (Table 2). A small proportion of women sought VHA care for miscarriages or spontaneous abortions (4%) or for molar or ectopic pregnancies (2%). For the large proportion of women veterans (75%) who had V codes for pregnancy-related issues at the VHA, care was sought for reasons other than the pregnancy, although the pregnancy was recorded at the time of the visit. In contrast, a large proportion of women received inpatient (55%) or outpatient (44%) non-VHA care for normal pregnancy and delivery.

Overall, 32% of women veterans with an index pregnancy received one or more distinct mental health diagnoses, compared with 21% of women veterans without a pregnancy-related condition ( $p < 0.0001$ ) (Table 3). Compared with all women veterans enrolled in VHA care, women with a pregnancy were more likely to have a diagnosis of major depression, mild depression, PTSD, anxiety, schizophrenia, bipolar disorder, and alcohol and drug abuse/dependence during the 5-year study period. The most common mental health diagnoses among veterans with a pregnancy were anxiety, depression, and PTSD, with these veterans experiencing over twice the rates of anxiety, depression, and PTSD as veterans without a pregnancy. Sixteen percent of veterans with a pregnancy had a single mental health diagnosis, 11% had two distinct diagnoses, and nearly 6% had three or more different mental health diagnoses. In contrast, 11% of nonpregnant women had a single mental health diagnosis, 7% had two distinct mental health diagnoses, and 2% had three or more different mental health diagnoses during the study period ( $p < 0.0001$ ). More than half of all veterans with a pregnancy who had mental health conditions were diagnosed with their mental health condition at VHA facilities on or before their first pregnancy-related code. The proportion of women with a mental health diagnosis who received their diagnosis before pregnancy was 66% for PTSD, 62% for depression, and 55% for bipolar disorder. In contrast, only 5% of women were diagnosed with anxiety disorder before their pregnancies.

Over 30% of pregnant veterans sought care from VA mental health providers during the index pregnancy, with an average of 6.6 mental health visits during the pregnancy (Table 4). Nine percent of pregnant veterans sought care for PTSD, 2% of pregnant veterans received substance abuse

TABLE 1. CHARACTERISTICS OF OPERATION ENDURING FREEDOM/OPERATION IRAQI FREEDOM WOMEN VETERANS SEEN AT VETERANS HEALTH ADMINISTRATION HEALTHCARE FACILITIES (N= 43,078)

Characteristic	All female veterans without pregnancy diagnosis (n = 40,112) n (%)	All female veterans with pregnancy diagnosis (n = 2966) n (%)	p
Age (mean, SE)	29.18 (0.04)	24.72 (0.08)	<0.0001
Days to pregnancy since return from last deployment (mean, SE)	—	691 (8.52)	—
Race			
White	21,660 (54)	1,483 (50)	<0.0001
Black	12,034 (30)	890 (30)	
Hispanic	4,011 (10)	415 (14)	
Other	1,203 (3)	89 (3)	
Unknown	1,203 (3)	89 (3)	
Marital status			
Never married	22,463 (56)	1,928 (65)	<0.0001
Currently married	13,638 (34)	860 (29)	
Separated/divorced/widowed/annulled	4,011 (10)	178 (6)	
Unknown	40 (.11)	3 (.10)	
Education			
<High school or high school graduate	27,276 (68)	2,402 (81)	<0.0001
Some college or college graduate	10,429 (26)	475 (16)	
Graduate school	2,407 (6)	89 (3)	
Rank			
Officer	3,610 (9)	89 (3)	<0.0001
Enlisted	36,101 (90)	2,847 (96)	
Component			
Guard	9,226 (23)	475 (16)	<0.0001
Reserves	10,830 (27)	564 (19)	
Active duty	20,056 (50)	1958 (66)	
Branch			
Army	26,474 (66)	1,987 (67)	<0.0001
Navy	5,215 (13)	445 (15)	
Air Force	6,819 (17)	386 (13)	
Marines	1,203 (3)	148 (5)	
Coast Guard	120 (.03)	9 (.03)	
Year of return from last deployment			
2001	802 (2)	59 (2)	<0.0001
2002	2,807 (7)	237 (8)	
2003	8,022 (20)	801 (27)	
2004	8,825 (22)	830 (28)	
2005	9,627 (24)	653 (22)	
2006	602 (15)	297 (10)	
2007	4,011 (10)	59 (2)	
2008	281 (0.7)	—	
Service-connected disability			
None	2,849 (71)	1,809 (61)	<0.0001
0–50%	883 (22)	890 (30)	
51%–100%	281 (7)	267 (9)	
Female genital disorders	441 (11)	593 (20)	<0.0001
Joint disorders	80 (2)	89 (3)	0.33
Musculoskeletal disorders	401 (1)	30 (1)	0.47
VHA healthcare use			
General medicine visits (mean, SD)	8.6 (13.2)	12.7 (15.7)	<0.0001
Primary care visits (mean, SD)	4.1 (5.0)	6.6 (6.4)	<0.0001
Psychiatric visits (mean, SD)	3.8 (11.2)	5.8 (20.7)	<0.0001
Use of fee basis/contract care (non-VHA care)	7,139 (20)	2,057 (70)	<0.0001

SD, standard deviation; SE, standard error.

counseling, and 1% of pregnant veterans received care related to sexual trauma.

## Discussion

This is the one of the first studies to examine pregnancy and mental health conditions among female OEF/OIF veterans

using VHA care. Our results suggest that although a relatively small proportion of OEF/OIF women receiving care in the VHA received pregnancy-related care during the study period (7%), a substantial proportion of these women (32%) suffered from a mental health problem. Perhaps most surprisingly, the rates of anxiety, major/minor depression, and

TABLE 2. TYPE AND LOCATION OF PREGNANCY CARE AMONG VETERANS WITH PREGNANCY DIAGNOSIS (N=2966)

Type of pregnancy code	Pregnant veterans with pregnancy-related codes n (%)
VA ICD-9 codes	
Normal pregnancy/delivery (650-659)	42 (1.4)
Ectopic or molar pregnancy (630-633)	61 (2.0)
Miscarriage/spontaneous abortion (634-639)	138 (4.7)
V code	2215 (75)
Fee basis pregnancy care (non-VA, inpatient)	
Normal pregnancy/delivery (650-659)	544 (55)
Ectopic/molar pregnancy (630-633)	47 (1.6)
Miscarriage/spontaneous abortion (634-639)	148 (0.5)
V code	2284 (77)
Fee basis care ICD9-CM codes (non-VA, outpatient)	
Normal pregnancy/delivery (650-659)	889 (44)
Ectopic/molar pregnancy (630-633)	118 (6)
Miscarriage/spontaneous abortion (634-639)	99 (5)
V code	1529 (75)

PTSD were over twice as high among women veterans who had a diagnosis of pregnancy during the study period compared with women veterans without a pregnancy diagnosis. Several possible reasons exist for this difference. One is that women veterans with mental health disorders may be more likely to seek treatment at VHA facilities than women veterans without mental health disorders<sup>22</sup> and may be more likely than their male counterparts to come to the VHA with emotional problems.<sup>36</sup> Consequently, these women may already be seeking VHA care for mental health, and their pregnancies

were recorded during the course of their mental health treatment. Other women veterans who are enrolled in VHA care but are not using mental health or other services may receive prenatal and obstetrical care outside the VHA and not report their pregnancies to the VHA.

Second, research suggests that combat veterans may be more likely to engage in high-risk behaviors upon return from war.<sup>37</sup> Consequently, women experiencing mental health problems may be more at risk for pregnancy, as depressive symptoms have been associated with unprotected sex among women.<sup>38,39</sup> Finally, although our study found that >60% of women with a pregnancy diagnosis were diagnosed with depression before pregnancy, the higher rates of depression among those with a pregnancy diagnosis may be partially due to postpartum depression. We also found that women with a service-connected disability were more likely to receive a pregnancy diagnosis during the study period. This may be a result of women with service-connected disabilities being more likely to use VHA services<sup>40</sup> and, therefore, being more likely to have their pregnancies recorded while seeking care for other conditions.

By creating our pregnancy window, we were able to determine if pregnant veterans were receiving VHA mental health services during the likely course of their pregnancy. However, because the VHA does not provide routine prenatal care at most of its locations, we were unable to determine if these women were receiving prenatal care or the degree to which prenatal care was coordinated with ongoing VHA mental healthcare. Furthermore, we were not able to determine if these mental health problems had an impact on maternal, fetal, or infant health.

Comparing the findings in this study with other research on psychiatric disorders in pregnancy and women of child-bearing age is important to further our understanding of this field of inquiry. The overall rate of psychiatric disorders in pregnancy experienced among women veterans in the current study was higher than the rate of mental health problems among pregnant civilian women in other published studies, which ranged from 8.5% to 25%.<sup>41-50</sup> Only one other study

TABLE 3. MENTAL HEALTH DIAGNOSES AND BEHAVIOR PROBLEMS AMONG OPERATION ENDURING FREEDOM/OPERATION IRAQI FREEDOM WOMEN VETERANS SEEN AT VETERANS ADMINISTRATION HEALTHCARE FACILITIES 2003-2008

Diagnosis	All female veterans without pregnancy diagnosis n (%)	All female veterans with pregnancy diagnosis n (%)	p	% pregnant women diagnosed with MH condition on or before first pregnancy code
Major depression	2,006 (5)	356 (12)	<0.0001	61
Mild depression	4,011 (10)	712 (24)	<0.0001	62
PTSD	3,610 (9)	623 (21)	<0.0001	66
Anxiety	12,020 (29)	1261 (43)	<0.001	5
Bipolar disorder	401 (1)	89 (3)	<0.0001	55
Schizophrenia	40 (0.11)	10 (0.33)	<0.0001	44
Alcohol abuse/dependence	868 (2)	79 (3)	0.04	58
Drug abuse/dependence	355 (1)	41 (1)	0.004	54
Any MH diagnosis	8,334 (21)	943 (32)	<0.0001	22
1 MH diagnosis	4,412 (11)	475 (16)	<0.0001	13
2 MH diagnoses	2,808 (7)	326 (11)	<0.0001	7
≥3 MH diagnoses	802 (2)	178 (6)	<0.0001	2

MH, mental health; PTSD, posttraumatic stress disorder.

TABLE 4. MENTAL HEALTHCARE USE AMONG PREGNANT WOMEN DURING PREGNANCY WINDOW

<i>Type of visit</i>	<i>% or n pregnant women using services</i>
Mental health clinic, individual (clinic stop code 502)	33%
Average number of mental health clinic visits during index pregnancy window	6.61
PTSD, individual or group (clinic stop codes 516, 540, 562)	9%
Average number of PTSD support group visits during index pregnancy window	6.96
Substance abuse treatment, individual (clinic stop code 513)	2%
Average number of substance abuse treatment visits during index pregnancy window	9.1
Sexual trauma counseling (clinic stop code 524)	1%
Average number of sexual trauma counseling visits during index pregnancy window	8.1
Services for returning veterans (clinic stop code 571, 572)	7%

had an equally high prevalence (32%) of some form of psychiatric condition during pregnancy.<sup>51</sup> The prevalence of depression in this study was similar to that in other published studies,<sup>43,52</sup> but rates for PTSD and anxiety disorder were significantly higher than in other studies.<sup>12,53–56</sup> Making comparisons between veteran women and other study populations remains a challenge, as measurement of psychiatric disorders in pregnancy varies considerably across studies, and with some conditions, such as anxiety, few validated instruments are available for accurate measurement.<sup>57,58</sup>

Observed differences in the prevalence of psychiatric disorders during pregnancy between our study and other published studies may be due to differences in study populations as well as differences in screening instruments and diagnostic criteria for these conditions. Understanding the degree to which war-related experiences, including combat exposure, prolonged and repeated military deployments, and military sexual trauma, affect women veterans during their pregnancies is crucial. Although a recent study evaluated the risk factors for depressive symptoms during pregnancy,<sup>59</sup> surprisingly few studies have examined other mental health conditions that are frequently associated with combat exposure, such as PTSD. Although one study noted a link between PTSD and preterm delivery,<sup>13</sup> no studies have evaluated the link between mental health diagnoses and pregnancy outcomes among women veterans with combat exposure. We were able to assess mental health diagnoses in our study but we were not able to link these diagnoses to combat-related exposure or stress incurred during military service. Future research should investigate the possible link between combat-related exposure and mental health problems during pregnancy.

In our study, a substantial proportion of women veterans received their prenatal care from fee basis or contract providers outside the VHA system. Although the VHA has made significant strides in improving the overall quality of care provided to its women veterans through the development of specialized women's health clinics and teams of women's health providers, caring for pregnant veterans presents two major problems for the VHA. First, because the VHA does not provide routine prenatal care at most of its locations and relies on fee basis or contract providers for prenatal and obstetrical care, a system of dual and fragmented care has been established for pregnant veterans. Given that pregnant veterans with concomitant mental health burdens may have difficulty navigating both VA and private healthcare systems, the VHA

should consider practice interventions that integrate care management and support for navigating and coordinating care for these women.

Second, the VHA does not routinely screen or monitor the quality of prenatal care provided by fee basis or contract providers, nor does it routinely collect or evaluate pregnancy outcomes. Consequently, little is known about the quality of prenatal care received by pregnant veterans, the extent to which prenatal care is coordinated with ongoing VHA mental healthcare, or the outcomes of pregnancies among women veterans. To address this problem, the VHA should consider developing a systematic approach to monitoring prenatal care from community obstetrical providers and tracking pregnancy outcomes among its women veterans.

Our study has several limitations. First, as we have no data on women veterans who have not accessed VHA services, our findings are not generalizable to all women veterans. Another limitation is that OEF/OIF veterans were not systematically assessed using validated self-report measures about pregnancy outcomes and mental health conditions. We relied on ICD9-CM, CPT, and V codes in VHA administrative databases to assess pregnancy and mental health conditions. Consequently, we likely underestimated the prevalence of pregnancy among women veterans, and our findings are subject to possible misclassification because of incomplete data. Finally, the width of our pregnancy window may have captured two separate pregnancies from one woman during that time; therefore, our results may be an overestimation of the association between pregnancy and mental health.

Nevertheless, our results point to a need for the VHA to continue to understand the overlap between pregnancy and mental health conditions in VHA patients. By doing so, the VHA will be better able to identify groups of women veterans at potential risk for poor clinical outcomes. In addition, these results highlight the importance of coordination of care for women veterans across VHA and non-VHA healthcare. Future studies should examine the effects of depression and PTSD on pregnancy outcomes among women veterans, the degree to which women veterans are receiving high-quality prenatal care, and the impact of mental health treatment on pregnancy outcomes among women veterans.

#### Acknowledgments

This work was funded by VA HSR&D Merit Award (Cynthia Brandt, p1). The views expressed in this article are

those of the authors and do not necessarily reflect the position or policy of the Department of Veterans Affairs.

### Disclosure Statement

The authors have no conflicts of interest to report.

### References

- Meehan S. Improving health care for women veterans. *J Gen Intern Med* 2006;21:s1-s2.
- Seal K, Bertenthal D, Miner C, Sen S, Marmar C. Bringing the war back home: Mental health disorders among 103,788 U.S. veterans returning from Iraq and Afghanistan seen at Department of Veterans Affairs facilities. *Arch Intern Med* 2007;167:476-482.
- Hogue C, Clark J, Castro C, Commentary. Women in combat and the risk of posttraumatic stress disorder and depression. *Int J Epidemiol* 2007;36:327-329.
- Haskell S, Brandt C, Krebs E, Skanderson M, Kerns R, Goulet J. Pain among veterans of Operations Enduring Freedom and Iraqi Freedom: Do men and women differ? *Pain Med* 2009;10:1167-1173.
- Copper R, Goldenberg R, Das A, et al. The preterm prediction study: Maternal stress is associated with spontaneous preterm birth at less than thirty-five week's gestation. *Am J Obstet Gynecol* 1996;175:1286-1292.
- Wadhwa P, Sandman C, Porto M, Dunkel-Schetter C, Garite T. The association between prenatal stress and infant birth weight and gestational age at birth: A prospective investigation. *Am J Obstet Gynecol* 1993;169:858-865.
- Diego M, Jones N, Field T, et al. Maternal psychological distress, prenatal cortisol, and fetal weight. *Psychosom Med* 2006;68:747-753.
- Hedegaard M, Henriksen T, Sabroe S, Secher N. Psychological distress in pregnancy and preterm delivery. *BMJ* 1993;307:234-239.
- Li D, Liu L, Odouli R. Presence of depressive symptoms during early pregnancy and the risk of preterm delivery: A prospective cohort study. *Hum Reprod* 2009;24:146-153.
- Manucuso R, Schetter C, Rini C, Roesch S, Hobel C. Maternal prenatal anxiety and corticotrophin-releasing hormone associated with timing of delivery. *Psychosom Med* 2004;66:762-769.
- Orr S, Miller C. Maternal depressive symptoms and the risk of poor pregnancy outcome. Review of the literature and preliminary findings. *Epidemiol Rev* 1995;17:165-171.
- Rogal S, Poschman K, Belanger K, et al. Effects of post-traumatic stress disorder on pregnancy outcomes. *J Affect Disord* 2007;102:137-143.
- Steer R, Scholl T, Hediger M, Fischer R. Self-reported depression and negative pregnancy outcomes. *J Clin Epidemiol* 1992;45:1093-1099.
- Anderson L, Campbell M, daSilva O, Freeman T, Xie B. Effect of maternal depression and anxiety on use of health services for infants. *Can Fam Physician* 2008;54:1718-1719.
- Civic D, Holt V. Maternal depressive symptoms and child behavior problems in a nationally representative normal birthweight sample. *Matern Child Health J* 2000;4:215-221.
- Flynn H, Davis M, Marcus S, Cunningham R, Blow F. Rates of maternal depression in pediatric emergency department and relationship to child service utilization. *Gen Hosp Psychiatry* 2004;26:316-322.
- Miller L. Postpartum depression. *JAMA* 2002;287:762-765.
- Webster J, Pritchard M, Linnane J, Roberts J, Hinson J, Starrenburg S. Postnatal depression: Use of health services and satisfaction with health care providers. *J Qual Clin Pract* 2001;21:144-148.
- Smith M, Shao L, Howell H, Wang H, Poschman K, Yonkers K. Success of mental health referral among pregnant and postpartum women with psychiatric distress. *Gen Hosp Psychiatry* 2009;31:155-162.
- Kang H, Magee C, Mahan C, et al. Pregnancy outcomes among U.S. Gulf War veterans: a population-based survey of 30,000 veterans. *Ann Epidemiol* 2001;11:504-511.
- Verret C, Jutand M, DeVigan C, et al. Reproductive health and pregnancy outcomes among French Gulf War veterans. *BMC Public Health* 2008;8:141-151.
- Hoff R, Rosenheck R. Utilization of mental health services by women in a male dominated environment: The VA experience. *Psychiatr Serv* 1997;48:1408-1414.
- Yano E, Hayes P, Wright S, et al. Integration of women veterans into VA quality improvement research efforts: What researchers need to know. *J Gen Intern Med* 2009;25(Suppl 1):56-61.
- Yano E. What does women's health care look like in the Veterans Health Administration? Results of a national organizational survey. Presented at Academy Health Annual Research Meeting, June 10, 2008.
- Hayes P. Provision of quality healthcare. VA Primary Care National Meeting, Washington, DC: Office of Women Veterans Health Strategic Healthcare Group, VA Central Office, August 2008.
- Seelig M, Yano E, Bean-Mayberry B, Lanto A, Washington D. Availability of gynecological services in the Department of Veterans Affairs. *Womens Health Issues*. 2007;18:47-56.
- Yano E, Washington D, Goldzweig C, Caffrey C, Turner C. The organization and delivery of women's health care in the Department of Veterans Affairs Medical Centers. *Womens Health Issues* 2003;13:55-61.
- Centers for Disease Control and Prevention. ICD-9-CM official guidelines for coding and reporting 2005.
- Justice A, Dombrowski E, Conigliaro J, et al. Veterans aging cohort study (VACS): Overview and description. *Med Care* 2006;44(Suppl 2):S13-S24.
- Goulet J, Fultz S, McGinnis K, Justice A. Relative prevalence of comorbidities and treatment contraindications in HIV-mono-infected and HIV/HCV-co-infected veterans. *AIDS* 2005;19(Suppl 3):S99-105.
- Goulet J, Fultz S, Rimland D, et al. Aging and infectious diseases: Do patterns of comorbidity vary by HIV status, age, and HIV severity? *Clin Infect Dis* 2007;45:1593-1601.
- Department of Veterans Affairs VHA. Decision support system outpatient identifiers. VHA directive 2008-069.
- Jackonis M, Deyton L, Hess W. War, its aftermath, and U.S. health policy: Toward a comprehensive health program for America's military personnel, veterans, and their families. *J Law Med Ethics* 2008;36:677-688.
- Lurie N, Popkin M, Dysken M, Moscovice I, Finch M. Accuracy of diagnoses of schizophrenia in Medicaid claims. *Hosp Community Psychiatry* 1992;43:69-71.
- Walkup J, Wei W, Sambamoorthi U, et al. Sensitivity of an AIDS case-finding algorithm: Who are we missing? *Med Care* 2004;42:756-763.
- Katz L, Bloor L, Cojucar G, Draper T. Women who served in Iraq seeking mental health services: Relationships between military sexual trauma, symptoms, and readjustment. *Psychol Serv* 2007;4:239-249.

37. Hooper T, Debakey S, Bellis K, et al. Understanding the effect of deployment on the risk of fatal motor vehicle crashes: A nested case-control study of fatalities in Gulf War era veterans, 1991–1995. *Accident Analysis Prev* 2006;38:518–525.
38. Brown A, Yung A, Cosgrave E, et al. Depressed mood as a risk factor for unprotected sex in young people. *Australas Psychiatry* 2006;14:310–312.
39. Orr S, Celentano D, Santelli J, Burwell L. Depressive symptoms and risk factors for HIV acquisition among black women attending urban health centers in Baltimore. *AIDS Educ Prev* 1994;6:230–236.
40. Kazis L, Miller D, Clark J, et al. Health-related quality of life in patients served by the Department of Veterans Affairs. *Arch Intern Med* 1998;158:626–632.
41. Gaynes B, Gavin N, Meltzer-Brody S, et al. Perinatal depression: Prevalence, screening accuracy, and screening outcomes. Evidence report/technology assessment No. 119. Rockville, MD: Agency for Healthcare Research and Quality (Publication No. 05-E006-2), 2005.
42. Andersson L, Sundström-Poromaa I, Bixo M, Wulff M, Bondestam K, Åström M. Point prevalence of psychiatric disorders during the second trimester of pregnancy: A population-based study. *Am J Obstet Gynecol* 2003;189:148–154.
43. Marcus S, Flynn H, Blow F, Barry K. Depressive symptoms among pregnant women screened in obstetrics settings. *J Womens Health* 2003;12:373–380.
44. Kelly R, Russo J, Katon W. Somatic complaints among pregnant women cared for in obstetrics: Normal pregnancy or depressive and anxiety symptom amplification revisited? *Gen Hosp Psychiatry* 2001;23:107–113.
45. Kelly R, Danielsen B, Golding J, Anders T, Gilbert W, Zatzick D. Adequacy of prenatal care among women with psychiatric diagnoses giving birth in California in 1994 and 1995. *Psychiatr Serv* 1999;50:1584–1590.
46. Kim H, Mandell M, Crandall C, Kuskowski M, Dieperink B, Buchberger R. Antenatal psychiatric illness and adequacy of prenatal care in an ethnically diverse inner-city obstetric population. *Arch Women Ment Health* 2006;9:103–107.
47. Andersson L, Sundstrom-Poromaa I, Wulff M, Astrom M, Bixo M. Depression and anxiety during pregnancy and six months postpartum: a follow-up study. *Acta Obstet Gynecol Scand*. 2006;85:937–944.
48. Faisal-Cury A, Rossi Menezes P. Prevalence of anxiety and depression during pregnancy in a private setting sample. *Arch Women Ment Health*. 2007;10:25–32.
49. Kelly R, Zatzick D, Anders T. The detection and treatment of psychiatric disorders and substance use among pregnant women cared for in obstetrics. *Am J Psychiatry* 2001;158:213–219.
50. Vesga-Lopez O, Blanco C, Keyes K, Olfson M, Grant B, Hasin D. Psychiatric disorders in pregnant and postpartum women in the United States. *Arch Gen Psychiatry* 2008;65:805–815.
51. Mitsuhiro S, Chalem E, Moraes Barros M, Guinsburg R, Laranjeira R. Brief report: Prevalence of psychiatric disorders in pregnant teenagers. *J Adoles* 2009;32:747–752.
52. Gaynes B, Gavin N, Meltzer-Brody S, et al. Perinatal depression: Prevalence, screening accuracy, and screening outcomes. *Evid Rep Technol Assess (Summ)* 2005;119:1–8.
53. Cook C, Flick L, Homan S, Campbell C, McSweeney M, Gallagher M. Post-traumatic stress disorder in pregnancy: Prevalence, risk factors, and treatment. *Obstet Gynecol* 2004;103:710–717.
54. Xiong X, Harville E, Mattison D, Elkind-Hirsch K, Pridjian G, Buekens P. Exposure to Hurricane Katrina, post-traumatic stress disorder, and birth outcomes. *Am J Med Sci* 2008;336:111–115.
55. Sutter-Dallay A, Giaccone-Marcésche V, Glatigny-Dallay E, et al. Women with anxiety disorders during pregnancy are at an increased risk of intense postnatal depressive symptoms: A prospective survey of the MATQUID cohort. *Eur Psychiatry* 2004;19:459–463.
56. Ross L, McLean L. Anxiety disorders during pregnancy and the postpartum period: A systematic review. *J Clin Psychiatry* 2006;67:1285–1298.
57. Ayers S. Assessing psychopathology in pregnancy and postpartum. *J Psychosom Obstet Gynecol* 2001;22:91–102.
58. Johnson R, Slade P. Obstetric complications and anxiety during pregnancy: Is there a relationship? *J Psychosom Obstet Gynecol* 2003;24:1–14.
59. Lancaster C, Gold K, Flynn H, Yoo H, Marcus S, Davis M. Risk factors for depressive symptoms during pregnancy: A systematic review. *Am J Obstet Gynecol* 2010;202:5–14.

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