

# Sexual Behaviors and Sexually Transmitted Infections in a Nationally Representative Sample of Women Veterans and Nonveterans

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## Abstract

**Background:** Women veterans are a growing population with unique characteristics and documented health disparities. Few studies have examined their sexual behaviors and rates of sexually transmitted infections (STIs), and none have compared women veterans to nonveterans to identify potential sexual health disparities.

**Methods:** We used data from the 1999–2010 National Health and Nutrition Examination Survey, a nationally representative U.S. survey. We compared lifetime sexual history (age at first intercourse, number of partners), sexual activity in the last year, and STIs between women veterans ( $n=151$ ) and nonveterans ( $n=8738$ ), adjusting for age, race/ethnicity, education, marital status, binge drinking, and survey year.

**Results:** Compared to nonveterans, women veterans reported a younger age at first intercourse and a greater number of female and male lifetime sexual partners, and they were more likely to have ever had sex with a woman. They were also more likely than nonveterans to have genital herpes and genital warts.

**Conclusions:** Women veterans reported higher rates of sexual activity and STIs than nonveterans. Future research is needed to assess high-risk behaviors and determine what factors may underlie these associations. Providers should ensure thorough screening and intervention services are provided for this growing population.

## Introduction

**D**URING THE LAST DECADE, the number of women serving in the military has increased as has the number of women veterans.<sup>1,2</sup> Previous studies show that women veterans report greater rates of trauma,<sup>3</sup> including sexual trauma, as well as worse mental and physical health<sup>4</sup> compared with women nonveterans. Nonetheless, very little is known regarding sexual behaviors and sexually transmitted infections (STIs) in this population, or whether there are differences compared with women nonveterans.<sup>5</sup>

Evidence suggests that active duty women frequently engage in high-risk sexual behaviors, defined by the U.S. Preventive Services Task Force as using condoms inconsistently, having multiple concurrent partners, having a new partner, or

having sex while under the influence of alcohol or drugs.<sup>6</sup> For example, a number of surveys with active duty women suggest that only a minority report using condoms regularly<sup>7–9</sup> and that nearly a third report having sex under the influence of alcohol or drugs.<sup>10,11</sup> Studies have consistently demonstrated higher rates of chlamydia infections among active duty compared with civilian women, although these results may be at least partially due to differential screening rates.<sup>10,12–15</sup> Data on the prevalence of other STIs among active duty women, including herpes simplex virus (HSV), are lacking.

In comparison to active duty women, little is known about sexual behaviors and STIs among women veterans. The prevalence of high-risk behaviors, including multiple concurrent sexual partners and unintended sex after substance

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use, appears to decrease after women leave the military.<sup>11</sup> Nonetheless, a survey of nearly 1000 women veterans indicated that 17% reported having unintended sex after drinking alcohol or using drugs and 28% reported that their sexual partner had concurrent partners,<sup>11</sup> a known risk factor for STIs.<sup>16</sup> Beyond these markers of high-risk sexual behaviors, surveys among U.S. adults have indicated that self-identified lesbian and bisexual women are more likely to have served in the military compared with heterosexual women.<sup>17,18</sup> This aspect of one's sexuality, in addition to other facets of sexual behavior, is important to address in healthcare settings in order to ensure an open patient-physician relationship that fully addresses patients' concerns and relevant health needs.<sup>19</sup>

There is a deficit of knowledge regarding women veterans' sexual behaviors and rates of STIs. In particular, research has not yet compared women veterans to nonveterans on sexual behaviors and STIs, examined rates of STIs beyond chlamydia, or included measures across multiple behaviors and multiple STIs in a single study. Such data are important to improve women veterans' reproductive health with targeted screening and interventions.<sup>5</sup> Therefore, the objectives of this study were to examine lifetime sexual history, sexual activity in the last year, and STIs among women veterans and nonveterans who participated in the National Health and Nutrition Examination Survey (NHANES) between 1999 and 2010.

## Materials and Methods

### Study population

NHANES is a nationally representative, cross-sectional survey of the U.S. civilian noninstitutionalized population that utilizes a stratified, multistage probability sampling scheme based on the most current U.S. Census information.<sup>20</sup> The survey, conducted every year, consists of an interview component in addition to a physical examination. The interview component includes demographic, socioeconomic, dietary, and health-related questions. The examination component consists of medical, dental, and physiological measurements, as well as laboratory tests administered by highly trained medical personnel. Descriptions of the standardized protocols used for all the interviews and examinations have been previously published.<sup>21</sup> Between 1999 and 2010, response rates ranged from 78% to 84% for the interview and from 75% to 78% for the physical examination. During the examination, adults 20–59 years old were asked a series of questions regarding their sexual behavior using audio computer-assisted self-interviewing techniques. Our study included all women who participated in NHANES between 1999 and 2010 who completed a physical exam, were 20–59 years old, indicated having ever been sexually active, and answered questions regarding their sexual behavior during the exam.

### Measures

Consistent with previous approaches to measuring veteran status,<sup>4,22–24</sup> the independent variable was veteran status based on the response to the question: "Did you ever serve in the Armed Forces of the United States?" NHANES excludes active duty military members. Our outcome variables included information on lifetime sexual behaviors, past year sexual behaviors, and STIs.

**Lifetime and past year sexual behaviors.** Participants were first asked whether they had ever had oral, anal, or vaginal sex. Being sexually active was defined as stating yes to this question (i.e., those who had any type of sex in their lifetime). These women were asked at what age they had first had sex as well as the number of male and female partners they had over their entire life and within the last year. We calculated the total number of sexual partners, as well as the total number of female sex partners and male sex partners. Women who had at least one female sexual partner were categorized as "ever having a female partner," and those who reported having at least one male sexual partner and at least one female sexual partner were categorized as having had sexual partnerships with both men and women. Variables for past year sexual behaviors were calculated in a similar manner. Finally, in order to examine indicators of high-frequency sexual behavior, we also used the cut-off of  $\geq 10$  total lifetime partners, given that the upper 25th percentile of the sample indicated having nine lifetime sexual partners. For past year high-frequency sexual behavior, we used the cutoff for  $\geq 2$  sexual partners, given that the upper 25th percentile of the sample indicated having one past year sexual partner. These cutoffs have both been previously used as indicators of risky sexual behaviors.<sup>25</sup>

**Sexually transmitted infections.** Blood samples were tested for HSV-2 using type-specific enzymatic immunodot assay<sup>26,27</sup> for women ages 20–49 years only, and individuals were classified as either positive or negative. Participants were asked if they had ever been told by a doctor that they had genital warts (yes, no), chlamydia (yes, no), or gonorrhea (yes, no).

**Demographic variables.** Demographic variables included age at the time of the survey, current marital/partner status, race/ethnicity (Hispanic/Mexican American, Non-Hispanic White, Non-Hispanic Black, Other), income ( $< \$20,000$ ,  $\$20,000$ – $\$74,999$ ,  $\geq \$75,000$ ), and educational attainment (less than high school, high school graduate, more than high school). Binge drinking was defined as consuming more than five alcoholic drinks at one time at least once in the last year (yes, no). Beginning in 2001, participants were asked what they considered their sexual orientation. Minority sexual orientation was considered to be any orientation other than heterosexual.

### Statistical analysis

Participant characteristics were summarized and compared across the women veterans and nonveterans. Continuous variables were compared using Student's *t*-test, and categorical variables were compared using the Wald test if cell sizes were  $\geq 5$  and Pearson's exact test if cell sizes were  $< 5$ . Bivariate analyses were used to describe differences in sexual behaviors and STIs by veteran status. Multivariable linear regression was used to estimate the coefficients and 95% confidence intervals (CIs) for the associations of veteran status with continuous outcomes. As several of the categorical outcomes were not rare ( $> 10\%$ ), general linear models were used to directly estimate the relative risks and 95% CIs for the associations of veteran status and categorical outcomes.<sup>28</sup> All multivariate analyses adjusted for age, race/ethnicity, education, and marital status because each of these factors is associated with sexual practices and risk of STIs and were expected to vary between women veterans and

nonveterans.<sup>8,29–34</sup> Due to minor wording changes across years, we also adjusted for survey year. Multivariate analyses for past year sexual behaviors also adjusted for binge drinking in the last year because this variable has also been associated with sexual behavior.<sup>11,35</sup> All analyses were weighted to account for the survey design, and statistical tests were at a two-sided alpha level of 0.05. Analyses were completed using SAS software and STATA 12.<sup>36</sup>

There were no missing values on age, race/ethnicity, or education, and the frequency of missing values was low for marital status (0.02%), binge drinking (0.002%), and minority sexual orientation (0.01%). As is typical for the NHANES and similar representative surveys, 12% of the sample was missing data on income.<sup>37</sup> Missing values for the main outcomes were uncommon (e.g., 0.4% on total number of lifetime sexual partners to 1.3% on age at first intercourse).

## Results

### *Participant characteristics*

Between 1999 and 2010, 62,160 individuals participated in NHANES (30,585 men and 31,575 women), including 30,086 women who completed both the interview and exam portion of the survey. Of the 30,086 women who completed the interview and examination, 10,683 were between 20 and 59 years old. Of these, 425 women (422 nonveterans, three veterans) were excluded because they had never been sexually active, and an additional 1369 women (1352 nonveterans, 17 veterans) were excluded due to completely missing data for the sexual activity questionnaire. The final sample thus consisted of 8889 women who had ever been sexually active, including 8738 nonveterans and 151 veterans (weighted percent: 98.2% nonveterans, 1.8% veterans).

The majority of women in our study sample were married and had more than a high school education. Veterans were more likely than nonveterans to be between ages 35–39, racial/ethnic minorities, and to have more than a high school education (Table 1).

### *Sexual behaviors and STIs*

Table 2 shows bivariate comparisons of sexual behaviors and STIs for sexually active women veterans and nonveterans, including weighted means for continuous outcomes and weighted proportions for categorical outcomes. Compared with nonveterans, women veterans were significantly more likely to report a greater number of lifetime male sex partners and  $\geq 10$  lifetime sexual partners. In the last year, there was a trend toward a higher prevalence of having sex with a woman among women veterans than nonveterans (5.2% vs. 2.6%,  $p=0.06$ ). Women veterans were also significantly more likely than nonveterans to test positive for HSV-2 and report a history of chlamydia.

Table 3 presents findings from multivariate analysis for the comparisons that adjusted for age, race/ethnicity, education, marital status, and survey year. Compared with nonveterans, women veterans reported a younger age at first intercourse, had a greater number of female and male lifetime sexual partners, and were more likely to have had  $\geq 10$  lifetime sexual partners. They were also more likely to have ever had sex with a woman as well as to have had sexual partnerships with both men and women. In the last year, women veterans were more

likely than nonveterans to have had sex with a woman. With respect to STIs, women veterans were more likely to have positive HSV-2 serologies and to report a history of genital warts than nonveterans. There were too few cases of chlamydia reported to conduct a multivariate regression analysis.

## Discussion

The goal of the current study was to compare women veterans and nonveterans on lifetime and past-year sexual behaviors as well as on history of STIs. Based on NHANES data from 1999–2010, women veterans had higher rates of lifetime sexual activity than nonveterans, including younger age at first intercourse and greater number of male and female sexual partners. There were fewer differences with regard to past year sexual behaviors, although women veterans were more likely to have had sex with a woman. Finally, there was a higher frequency of lab-positive findings of HSV and self-reported history of genital warts for women veterans compared to nonveterans.

Women veterans were more likely than nonveterans to have had sex with a woman in their lifetime and in the past year; however, women veterans were no more likely than nonveterans to self-identify as lesbian or bisexual, as would be expected based on previous studies.<sup>17,18</sup> This finding may be due to reluctance to disclose sexual identity as lesbian or bisexual, or it may highlight the fact that sexual identity and sexual behaviors are not perfectly correlated.<sup>38</sup> Women veterans were also more likely than nonveterans to report having had sexual partnerships with both men and women. Previous research suggests that, compared with women who had sex exclusively with men, women who had sex with both men and women were more likely to report past and recent high-risk sexual behavior.<sup>39</sup> This suggests the need to more thoroughly examine women veterans' sexual practices in light of potential health risks and sequelae.

Similar to previous studies conducted with active duty women, we also detected greater rates of STIs in women veterans compared to nonveterans. In particular, women veterans were more likely to test positive for HSV-2, with almost 40% of veterans testing positive compared to 26% of nonveterans. This rate is particularly high, as a recent report using NHANES data from 2005–2008 suggested that the seropositive rate among women was 20%.<sup>40</sup> This high rate among women veterans is noteworthy as behavioral risk factors for HSV-2 include history of other STIs, increasing number of sexual partners, and younger age of sexual activity initiation.<sup>41</sup> Women veterans were also more likely than nonveterans to report a history of genital warts and, in unadjusted analyses, had a greater prevalence of a history of diagnosed chlamydia. Detection of chlamydia may be higher among women veterans because military policy dictates that all female recruits be tested,<sup>42</sup> and direct comparison of STI rates between veteran and nonveteran women who seek screening are unavailable. However, results for genital herpes and genital warts suggest that women veterans have higher rates of at least some STIs compared with nonveterans.

There are several potential reasons why women veterans may have some riskier sexual behaviors (e.g., younger age at first intercourse, greater number of sexual partners) and higher rates of STIs than nonveterans. Previous research suggests that women veterans report more frequent childhood abuse and

TABLE 1. CHARACTERISTICS OF WOMEN NONVETERANS AND VETERANS, NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY 1999–2010<sup>a</sup>

	Total (N=8889)	Nonveterans (n=8738)	Veterans (n=151)	p-value <sup>b</sup>
Mean age, (SE)	39.7 (0.15)	39.7 (0.15)	40.8 (0.96)	0.23
Age, <i>n</i> (%)				0.04
20–34	3720 (34.86)	3671 (35.02)	49 (25.69)	
35–49	3394 (41.7)	3320 (41.49)	74 (53.61)	
≥50	1775 (23.44)	1747 (23.49)	28 (20.70)	
Currently married or partnered, <i>n</i> (%)	5515 (66.04)	5435 (66.18)	80 (58.19)	0.08
Race/ethnicity, <i>n</i> (%)				0.001
Hispanic/Mexican American	2506 (13.11)	2487 (13.23)	19 (6.16)	
Non-Hispanic White	4203 (69.50)	4142 (69.66)	61 (60.58)	
Non-Hispanic Black	1798 (12.17)	1738 (11.95)	60 (24.63)	
Other	382 (5.22)	371 (5.16)	11 (8.62)	
Income, <i>n</i> (%)				0.28
<\$20,000	1676 (15.67)	1659 (15.75)	17 (10.90)	
\$20,000–\$74,999	4378 (54.35)	4303 (54.31)	75 (56.80)	
≥\$75,000	1783 (29.98)	1744 (29.94)	39 (32.30)	
Education, <i>n</i> (%)				<0.001
Less than high school	2054 (18.54)	2044 (18.73)	10 (6.54)	
High school graduate	1973 (27.47)	1958 (27.70)	15 (13.20)	
More than high school	3291 (53.99)	3199 (53.57)	92 (80.27)	
Binge drinking, <sup>c</sup> <i>n</i> (%)	1794 (22.26)	1771 (22.35)	23 (17.09)	0.12
Minority sexual orientation, <sup>d</sup> <i>n</i> (%)	434 (5.43)	424 (5.40)	10 (6.99)	0.51

<sup>a</sup>*n* is observed count, % are weighted percentages.

<sup>b</sup>*p*-value from likelihood ratio test.

<sup>c</sup>Defined as consuming more than five alcoholic drinks at one time at least once in the last year.

<sup>d</sup>Defined as anything other than heterosexual; only asked from 2001–2010.

adult sexual assault than nonveterans,<sup>3</sup> and abuse has been associated with adult sexual risk behaviors in the general population.<sup>43,44</sup> Moreover, combat exposure has been associated with increased risk taking, which may also include engaging in high-risk sexual behaviors.<sup>45</sup> Finally, compared with nonveterans, women veterans have higher rates of mental health conditions, including depression and posttraumatic

stress disorder,<sup>4</sup> which may play an intermediate role in explaining their higher rates of certain sexual behaviors.<sup>46,47</sup> Unfortunately, NHANES did not include measures on sexual victimization history or military-related variables such as length of service, discharge status, and combat or deployment history. Data on depression were largely unavailable for most survey years and limited to past 2-week symptoms. Thus,

TABLE 2. SEXUAL BEHAVIORS OF WOMEN NONVETERANS AND VETERANS

	Nonveterans	Veterans	p-value <sup>a</sup>
Lifetime sexual history of sexually active women			
Mean age at first intercourse, (SE)	17.64 (0.06)	17.25 (0.29)	0.18
Mean lifetime no. of sex partners, (SE)	8.09 (0.19)	16.37 (6.08)	0.18
Mean lifetime female sex partners, (SE)	0.27 (0.03)	6.38 (5.96)	0.31
Mean lifetime male sex partners, (SE)	7.81 (0.18)	9.89 (0.83)	0.01
≥10 lifetime partners (male or female), <i>n</i> (%)	2100 (25.56)	58 (38.37)	0.004
Ever had sex with a woman, <i>n</i> (%)	644 (7.51)	17 (9.94)	0.34
Sexual partnerships with men and women, <i>n</i> (%)	621 (7.26)	16 (9.58)	0.36
Sexual activity in the last year of sexually active women			
Mean no. of sex partners, (SE)	1.23 (0.06)	1.40 (0.27)	0.53
Mean female sex partners, (SE)	0.05 (0.01)	0.12 (0.06)	0.20
Mean male sex partners, (SE)	1.18 (0.05)	1.28 (0.24)	0.70
≥2 past year partners (male or female), <i>n</i> (%)	1222 (12.73)	22 (13.02)	0.93
Sex with a woman, <i>n</i> (%)	233 (2.60)	9 (5.23)	0.06
Sexual partnerships with men and women, <i>n</i> (%)	134 (1.54)	3 (2.65)	0.38
Sexually transmitted infections			
HSV-2 seropositive, <i>n</i> (%)	1848 (25.66)	49 (39.87)	0.003
Ever told had genital warts, <i>n</i> (%)	497 (6.69)	15 (9.02)	0.39
Ever told had chlamydia, <i>n</i> (%)	103 (0.75)	3 (3.55)	0.01
Ever told had gonorrhea, <i>n</i> (%)	37 (0.28)	0	n/a

Means for continuous outcomes and proportions for categorical outcomes are weighted.

<sup>a</sup>*p*-value from the likelihood ratio test if cell sizes ≥5 and the Pearson exact test if cell sizes <5.

HSV, herpes simplex virus.

TABLE 3. ASSOCIATION OF SEXUAL BEHAVIORS WITH VETERAN STATUS

	Coef. (95% CI)	RR (95% CI)	p-value
Lifetime sexual history of sexually active women			
Mean age at first intercourse	-0.93 (-1.47, -0.39)		0.001
Mean lifetime no. of sex partners	2.85 (0.86, 4.84)		0.01
Mean lifetime female sex partners	0.33 (0.08, 0.57)		0.01
Mean lifetime male sex partners	2.57 (0.63, 4.51)		0.01
≥10 lifetime partners (male or female)		1.53 (1.16, 2.00)	0.003
Ever had sex with a woman		1.80 (1.03, 3.12)	0.04
Sexual partnerships with men and women		1.80 (1.01, 3.20)	0.05
Sexual activity in the last year of sexually active women			
Total no. of sex partners	0.47 (-0.22, 1.15)		0.18
No. of female sex partners	0.11 (-0.04, 0.27)		0.16
No. of male sex partners	0.35 (-0.27, 0.98)		0.26
≥2 past year partners (male or female)		1.13 (0.78, 1.69)	0.55
Sex with a woman		2.56 (1.19, 5.53)	0.02
Sexual partnerships with men and women		1.60 (0.33, 7.84)	0.56
Sexually transmitted infections			
HSV-2 seropositive		1.38 (1.03, 1.84)	0.03
Ever told had genital warts		1.91 (1.03, 3.55)	0.04
Ever told had chlamydia <sup>a</sup>		n/a	
Ever told had gonorrhea <sup>a</sup>		n/a	

Adjusted for age, race/ethnicity, education, marital status, and survey year. Analyses for sexual activity in the last year also adjusted for binge drinking in the last year.

<sup>a</sup>Too few cases for regression.

CI, confidence interval; RR, relative risks.

assessment of these factors was beyond the scope of this study. Future research is needed to elucidate whether these or other factors may help explain differences in sexual behaviors and outcomes between veterans and nonveterans.

There are several limitations to the current study. NHANES does not include items assessing variables traditionally considered to be high-risk behaviors, such as having concurrent multiple sexual partners and inconsistent condom use,<sup>6</sup> nor did it include more nuanced information about whether sexual partnerships occurred before, during, or after military service. Additionally, while adjusting for binge drinking in multivariate analyses was a strength of the study, the NHANES item may underestimate the rate of binge drinking because it assessed consuming more than five alcoholic drinks at one time at least once in the last year, as opposed to consuming more than four drinks at one time—the typical definition of binge drinking for women.<sup>48</sup> However, this limitation would have applied consistently across veterans and nonveterans. Finally, even though we combined NHANES data over the course of 11 years to optimize sample size considerations, the number of women veterans was still relatively low. Low sample sizes were especially apparent in analyses on past year sexual behaviors, which suggests that these results need to be viewed cautiously and future research is needed to replicate these findings. Nonetheless, we chose to include them in the present analysis given the clinical relevance these findings may have for providers working with women veterans.

## Conclusions

The current study is one of the first to examine women veterans' sexual behaviors and STIs. Compared to nonveterans, women veterans appear to report an earlier age of first sexual intercourse, a greater number male and female lifetime

sexual partners, an increased lifetime likelihood of having sexual partnerships with women and with both men and women, and an increased likelihood of genital herpes and genital warts. Future research is needed to determine whether women veterans are more likely to exhibit high-risk sexual behaviors compared with nonveterans and the factors underlying these disparities. Veterans Health Administration (VHA) providers and non-VHA providers should ensure that thorough screening and intervention services related to sexual health are provided for this growing population.

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## Author Disclosure Statement

No competing financial interests exist.

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