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Sexual Assault during the Time of Gulf War I: A Cross-sectional Survey of US Service Men who Later Applied for Department of Veterans Affairs PTSD Disability Benefits

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Abstract

Objectives: To estimate the cumulative incidence of sexual assault during the time of Gulf War I among male Gulf War I Veterans who later applied for Department of Veterans Affairs (VA) PTSD disability benefits and to identify potential risk and protective factors for sexual assault within the population.

Method: Mailed, national, cross-sectional survey supplemented with VA administrative and clinical data.

Results: Of 2,415 Veterans sampled, 1,700 (70%) responded. After adjusting for non-ignorable missing data, the cumulative incidence of sexual assault during Gulf War I in this population ranged from 18% [95% confidence intervals (CI): 5.0%-51.9%] to 21% (95% CI: 20.0-22.0). Deployment was not associated with sexual assault [Odds Ratio (OR), 0.96; 95% CI: 0.75-1.23], but combat exposure was (OR, 1.80; 95% CI: 1.52-2.10). Other correlates of sexual assault within the population included working in a unit with greater tolerance of sexual harassment (OR, 1.80;

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95% CI: 1.52-2.10) and being exposed to more sexual identity challenges (OR, 1.76; 95% CI: 1.55-2.00).

Conclusions: The 9-month cumulative incidence of sexual assault in this particular population exceeded the lifetime cumulative incidence of sexual assault in US civilian women. While Persian Gulf deployment was not associated with sexual assault in this population, combat exposure was.

Keywords

Military Personnel; Male; Questionnaires; Unites States/epidemiology; Sex Offenses; Crime Victims

Of the nearly12% to18% of Gulf War I Veterans in the United States with post-deployment, posttraumatic stress disorder (PTSD) symptoms,[1-3] the substantial subset of men (~60%) who apply for Department of Veterans Affairs (VA) PTSD disability benefits appears particularly likely to have experienced sexual assault. On average, nearly 4% of male combat Veterans and 13% of non-combat Veterans who apply for such benefits report sexual assault during their military service.[4] Further analysis of these data, however, suggested that most male sexual assault cases occurred in Gulf War I era applicants, whose reports of sexual assault during military service were nearly 5 times higher than that of earlier wartime Veterans. Despite comprehensive efforts to catalog Gulf War I era Veterans' many other occupational exposures, [5,6] we know of only one other study to evaluate their sexual assault experiences. Specifically, Kang et al.[7] indicated that approximately 0.2% of male Gulf War I Veterans reported sexual assault while deployed to the Persian Gulf, a 9-month figure comparable to the lifetime cumulative incidence of sexual assault for US civilian men.[8,9]

Unidentified sexual assault could confound many serious problems reported by male Gulf War I veterans [c.f,10]—particularly among those with PTSD. Our goal, therefore, was to reliably estimate the cumulative incidence of sexual assault during the time of Gulf War I among the subset of men who apply for VA PTSD disability benefits. Secondarily, because of this population's likely elevated rate of sexual assault history, we wished to leverage the power benefits offered by the group to identify other potential risk and protective factors for sexual assault. Not only would such information help us understand the context of sexual assault in this particular population, but it might also suggest hypotheses that could be tested in other or more general military samples. Using an ecological framework,[11] we anticipated that three military contextual factors comprising of deployment to Persian Gulf during Gulf War I; bunking in crowded conditions, regardless of deployment status; and working in units that tolerated sexual harassment would be associated with increased odds of reporting sexual assault in this population,[11-18] while a fourth factor, being in combat, would be associated with reduced odds of reporting sexual assault.[4,19] We anticipated that 8 individual factors operating during Gulf War I would also be associated with higher odds of sexual assault in this population, including markers of lower organizational power, such as younger age, minority race/ethnicity, and enlisted rank[15]; attributes at odds with the military's hypermasculine ideal, such as a non-heterosexual orientation; and National Guard or Reserve status versus regular component status. Social disruptions of National Guards/Reservists activated for Gulf War I were known to be severe,[5,20] and we speculated that this might lead to higher odds of sexual assault.[11] We also examined associations between

experiencing sexual identity challenges, a commonly reported form of sexual harassment by male military members,[21] and sexual assault during the time of Gulf War I. Sexual identity challenges include hostile, harassing comments about a target's supposedly inadequate masculinity or sexual orientation. Finally, we investigated whether well-established connections between childhood maltreatment and adult sexual victimization described for women [22] would hold true for the men in this population.

MATERIALS AND METHODS

Protocol

Data were collected between July 1, 2007 and July 31, 2008. A cover letter describing the elements of consent, including the risks and benefits of participation; a cash incentive; and a 17-page questionnaire were mailed to Veterans' homes. The survey's return signified consent to participate in the study. Non-respondents were sent a postcard reminder and two more surveys at two-week intervals. Because of the survey's sensitivity, data collection was anonymized by affixing a tracking number to the return envelope only. Upon return, surveys were immediately separated from envelopes, thus breaking the link between respondents and surveys. The Minneapolis VA Medical Center's Human Studies Subcommittee reviewed and approved the study protocol. The questionnaire is available upon request.

Setting and Population

Eligible Veterans were those who: served in the Armed Forces between August 2, 1990 and July 31, 1991 as Regular or activated National Guard/Reservists; applied for VA PTSD disability benefits between August 2, 1990 and May 29, 2007; and had a valid address. From this population of approximately 47,000 Veterans, 2,415 were randomly selected to provide 95% confidence of estimating the true cumulative incidence of sexual assault within a 2.2% margin of error, assuming a 68% survey response rate.

Seventy percent of veterans returned surveys (N = 1,700). In the subsample with Military Sexual Trauma (MST) data (see "Supplemental Data," below), Veterans with negative MST screens trended toward higher survey response than Veterans with positive MST screens (67.1% versus 61.8%, p = 0.07).

Measures

Main Outcome

Sexual assault during the time of Gulf War I.: Veterans were considered to have experienced the study outcome if they reported someone had attempted or successfully forced them to have sex against their will during the time of Gulf War I. Sexual assault was assessed with three questions from the criminal sexual misconduct subscale of the Sexual Harassment Inventory,[23] which assesses sexual assault by co-workers, supervisors, or superior officers, plus a fourth question which assesses sexual assault by other individuals. In a study of 11 female disability claimants, the first three items plus an open-ended question about other unwanted sexual experiences in the military had 90% sensitivity and 100% specificity for third-party documentation of sexual assault during military service.[24]

Potential Correlates

Military Contextual Factors

Deployment to the Persian Gulf.: A single survey item ascertained whether Veterans had deployed to the Persian Gulf during Gulf War I.

Crowded living conditions.: A single survey item asked Veterans to rate how crowded their living situation was during the time of Gulf War I, regardless of their deployment status. Response options ranged from 1 to 5, where 5 = "extremely crowded" and 1 = "positively roomy."

Unit's tolerance of sexual harassment.: Veterans were asked to report the degree to which the unit they served in during Gulf War I tolerated sexual harassment using the Perceived Tolerance of Sexual Harassment in the Military scale [25] ($\alpha = 0.92$). Higher scores indicate more perceived tolerance.

Combat exposure.: Among those who deployed, an adaptation of the Combat Exposure Inventory [26] assessed combat exposure during Gulf War I ($\alpha = 0.89$). We dichotomized combat exposure as "any" versus "none."

Individual Factors

Service characteristics.: Army service during Gulf War I versus another branch was obtained from VA administrative data. Single survey items assessed Veterans' rank and their Regular versus National Guard/Reserve component status during Gulf War I. Rank was dichotomized as "enlisted" versus "other" for analysis.

Sexual identity challenges.: Six items adapted from Waldo et al.'s [27] Gender Role Enforcement subscale of the Sexual Harassment of Men scale ($\alpha = 0.81$) assessed whether and how often participants had personally been subjected to sexual identity challenges during Gulf War I. Higher scores indicate more sexual identity challenges.

Childhood maltreatment.: Items from Bernstein, et al.'s [28] Childhood Trauma Questionnaire assessed childhood history of physical and emotional abuse, emotional and physical neglect, sexual abuse, and growing up in a non-supportive family ($\alpha = 0.79$-0.95). Higher scores indicate more maltreatment.

Sociodemographic characteristics.: Current age was obtained from VA administrative data, then dichotomized to <50 years versus >=50 years. Single survey items assessed race/ethnicity and sexual orientation. Veterans were to check all race/ethnicity options that applied. Options included: "White," "Black or African-American," "Indian (American), Eskimo, or Aleut," "Asian or Pacific Islander," "Spanish/Hispanic origin or descent," or "Other race (Please specify)." Results were then dichotomized to compare anyone selecting "white" to those who did not select "white." Sexual orientation options were: "completely heterosexual," "mostly heterosexual," "bisexual," "mostly homosexual," "completely homosexual," or "unsure." Responses were then dichotomized to "completely heterosexual" versus all other responses. Although not considered risk factors for sexual assault during

Gulf War I, single survey items assessed Veterans' current educational achievement as well as marital, employment, and disability aid status to better characterize the sample.

Supplemental Data

Military Sexual Trauma (MST) screening results.: Since 2000, all Veterans using VA medical services undergo screening for MST. Two standardized items ask about: 1) uninvited or unwanted sexual attention [in the military], such as touching, cornering, pressure for sexual favors or inappropriate verbal remarks, and 2) unwanted sexual contact resulting from the use or threat of force or punishment. Any positive response indicates MST. Note the screener is not equivalent to the present study's outcome. MST data were available for 1,601 Veterans.

Analysis

Sexual assault during the time of Gulf War I and related correlates are reported before and after adjusting for item-level and survey-level non-response. We used Student's *t* or Yates' continuity-corrected $\chi^2$to compare respondents' military contextual and individual factors as well as their sociodemographic characteristics by sexual assault status. When cell sizes were small, we used Barnard's unconditional exact test with Suissa and Shuster's Z-pooled modification.[29] Effect sizes, reported as odds ratios (OR) with 95% confidence intervals (CI), were generated using logistic regression or bootstrapping as appropriate. Odds ratios between continuously measured correlates and the outcome are reported for a one standard deviation change in the continuous measure.

Non-response bias—We used 3 progressively more plausible assumptions about non-response in analyses. Least plausible but most common, the first analysis assumes that non-response bias is nonexistent. Respondents answering a survey question are assumed to represent perfectly the responses of the entire, underlying population of eligible Veterans for that question.[30]

Intermediate in plausibility, a second set of analyses assumed that men with and without sexual assault histories were equally likely to return a survey once other predictors of survey return, such as race and age, were controlled. However, the two groups were allowed to have different probabilities of answering certain questions, leading to potential non-response bias only at the *item-level.* For example, sexual assault survivors might be more likely than others to skip questions about sexual assault because they find the questions upsetting, or—conversely—they may be especially likely to complete such items because they find the questions important. To address this potential bias, we used multiple imputation [31] and propensity methods [32] to impute missing items. Results are based on 5 combined, multiply-imputed datasets.

A third analysis set rested on the most plausible non-response assumptions -namely, sexual assault survivors would differ systematically from other Veterans in their probability of returning a survey at all and, when a survey was returned, in their probability of responding to particular items. Thus, non-response occurs both at the *survey-level* and at the *item-level.* Investigators can only rarely address this type of bias, because it requires information about

both respondents and non-respondents that is independent of the survey and strongly related to the outcome of interest. Here, supplemental MST data were available for a substantial subsample of both survey respondents and non-respondents and had 0.13 sensitivity but 0.98 specificity for reporting sexual assault during Gulf War I. Taking advantage of these relationships, we used Ibrahim and Lipsitz's [33] expectation-maximization algorithm, Qin, et al.'s [34] maximum likelihood method, and Little and Rubin's [35] Bayesian method to estimate the prevalence of sexual assault during Gulf War I. The expectation-maximization algorithm and Bayesian method draw on all available information for the entire sample of 2,415 eligible Veterans, whereas the maximum likelihood function draws on information from just those Veterans with MST data. We used bootstrapping to estimate 95% CI for each method. We also used multiple imputation or the maximum likelihood method to adjust for non-response when examining associations between hypothesized correlates and sexual assault during Gulf War I.

RESULTS

Descriptive Statistics

Tables 1 and 2 show respondents' unadjusted characteristics overall and by their sexual assault status during the time of Gulf War I. Slightly more than half the respondents were under age 50 or white, and almost three quarters had at least some college experience. Those reporting sexual assault during the time of Gulf War I tended to be younger than other respondents and were about twice as likely to say they were unemployed or disabled.

During Gulf War I, 65% of the sample's participants had served in the Army and 92% had been in the enlisted ranks. Almost three quarters had been regular active component status, and 69% had deployed to the Persian Gulf. Of those who deployed, nearly 85% reported combat exposure. Among participants who deployed, men reporting sexual assault during the time of Gulf War I trended toward reporting more combat exposure than other men. Per Table 2, men reporting sexual assault during the time of Gulf War I described more crowding, more perceived tolerance of sexual harassment, and more sexual identity challenges during Gulf War I as well as more childhood abuse and neglect than did other men in the sample.

Population-Specific Estimates of Sexual Assault during Gulf War I

Of survey responders, 100 (6%) reported sexual assault during the time of Gulf War I. Reported events included attempted sexual assault only ($n = 60$), completed sexual assault only ($n = 14$), or both ($n = 26$). Among those reporting completed sexual assault, half identified a coworker or supervisor as the assailant. Ten percent reported more than one completed or attempted sexual assault.

Table 3 shows the estimated, population-specific cumulative incidence of sexual assault during Gulf War I using the 3 progressively more plausible assumptions about non-response. Estimated, population-specific cumulative incidence of sexual assault during Gulf War I increased from 6% in the unadjusted analysis to slightly more than 7% in the second set of analyses. When both item- and survey- level non-response were allowed to differ

systematically by sexual assault status in the third analysis set, the estimated cumulative incidence ranged from 18% to 21%.

Population-Specific Correlates

Table 4 lists the association between these Veterans' sexual assault status during the time of Gulf War I and our hypothesized correlates under the three non-response assumptions. After accounting for item- and survey-level non-response in the third analysis set, younger age and currently reporting a sexual orientation other than "completely heterosexual" were associated with higher odds of reporting sexual assault during the time of Gulf War I, but race/ethnicity was not. Among those reporting a sexual orientation other than "completely heterosexual," the distribution of responses also differed significantly according to sexual assault status. While enlisted rank at the time of Gulf War I was associated with higher odds of reporting sexual assault during the same time frame, as expected, serving in the National Guard/Reserve component during Gulf War I was unexpectedly associated with lower odds of reporting sexual assault during that time relative to those who had served in the Regular component. Living in more crowded conditions or working in units with more perceived tolerance of sexual harassment during the time of Gulf War I were each associated with higher odds of reporting sexual assault during the same time frame, as was reporting more sexual identity challenges during Gulf War I or more maltreatment as a child. Unexpectedly, once item- and survey- level non-response were accounted for, deployment to the Persian Gulf was not associated with sexual assault during the time of Gulf War I, but combat exposure was.

DISCUSSION

Among men who served during Gulf War I and then applied for VA PTSD disability benefits, perhaps as many as one in five experienced an attempted or completed sexual assault during the time of Gulf War I, regardless of deployment status. Contrary to expectations, combat Veterans in this sample had higher, not lower odds of reporting sexual assault during the time of Gulf War I than non-combatants, while National Guard/Reserve Veterans had lower odds of reporting sexual assault during Gulf War I than Regular component Veterans. Other hypotheses in the sample were supported: living in a more crowded situation, working in units that were perceived to be more tolerant of sexual harassment, and experiencing more sexual identity challenges were each associated with higher odds of reporting sexual assault during the time of Gulf War I, as was being younger, in the enlisted ranks, currently reporting a sexual orientation other than "completely heterosexual," and reporting greater maltreatment as a child.

These Veterans obviously comprise a unique subset of all Veterans who served during Gulf War I, and their experiences cannot be assumed to generalize to the remainder. Depending on which set of non-response assumptions are accepted, results indicate Veterans in this population had a 9-month cumulative incidence of sexual assault during the time of Gulf War I that was 8- to 26-fold higher than the lifetime cumulative incidence of rape in US civilian men and only slightly lower than the lifetime cumulative incidence of sexual assault in US civilian women.[8] Their 9-month cumulative incidence of sexual assault during the

time of Gulf War I was also approximately 30- to 105-fold higher than that reported by Kang et al. [7] for deployed male Gulf War I Veterans overall.

We speculate that the subset of Gulf War I era men who applied for VA PTSD disability benefits may also have been exposed to or carried more sexual assault risk factors than their counterparts. For example, the proportion reporting combat in the present sample is approximately 3 times higher than that reported for all US troops who deployed to the Persian Gulf during Gulf War I.[36] Prior research suggesting combat might be protective against sexual assault were primarily based on studies of Veterans who served prior to or during the Vietnam Conflict. Warfare's context, including locales, lengths of time in-theater, and the demographics of those who engage in warfare (e.g., all volunteers) have changed considerably since the Vietnam Conflict: These or other changes could have altered the relationship between combat and sexual assault. Besides reporting more combat, Veterans in the current sample also reported working in units that tolerated sexual harassment more, described more sexual identity challenges, and reported greater childhood sexual and physical abuse compared to other military samples we have studied.[16] While greater exposure to sexual assault risk factors could explain its high cumulative incidence in this population, we cannot attribute our high case-finding to overselection for non-heterosexual men. More than 80% of the men in this sample who reported sexual assault were "completely" heterosexual; furthermore, the proportion describing them self as bisexual or homosexual was approximately one fourth to one eighth that of the US general population.[37]

The correlates studied here were conceptualized as risk or protective factors for sexual assault, but—importantly—alternative interpretations are equally plausible and need to be clarified in future research. For example, sexual orientation may increase risk for sexual assault, or sexual assault experiences might instead alter how men describe their sexual orientation.[38] Instead of combat being a risk factor for sexual assault, sexual assault could be a risk factor for combat exposure. For example, Veterans with sexual assault history might be particularly likely to volunteer for combat duties. Likewise, Veterans with a sexual assault history may prefer crowded sleeping quarters, perhaps seeing greater safety in numbers. Their sexual assault experiences might also color their memories of their work climate, causing them to appraise it as more sexually hostile and challenging than other Veterans would.

In addition to the unresolvable temporal ambiguity of present findings, other limitations apply. Unmeasured variables could have confounded the associations described herein, while mono-method variance biases might have inflated them. Different control groups, such as Veterans with PTSD who did not apply for disability benefits or Veterans without PTSD, might have generated completely different effect sizes or even reversed the directions of effect found. Thus, unless replicated elsewhere, findings must be considered specific to this population. As nearly 20 years have passed since Gulf War I, Veterans' recall may have degraded, and telescoping errors could have led to over- or underestimates of sexual assault events within the time frame we specified. Rumination bias or social desirability response bias could also have caused Veterans to over or under-report events. Collecting data closer to the time of Gulf War I might have rectified some reporting errors, but it must be noted that some Veterans may have needed time to process their experiences before disclosing them to

others. As with most studies, we could not identify and examine the characteristics of sexual assault perpetrators. Contextual and individual risk factors for sexual victimization would matter little if aggressors did not capitalize upon them. We reported 95% confidence intervals based on quintile estimates obtained from nonparametric bootstrapped samples. Their main purpose was to provide precision estimates for our parameters of interest, though we also used them for hypotheses testing. In such cases, the family-wise error rate might be larger than the underlying nominal type I error probability of 0.05.

Whenever possible, survey researchers should seek alternative data sources to adjust for non-response biases, as even high response rates can produce biased estimates.[e.g., 39,40] Our overall response rate was nearly 70%. Therefore, in order to mask a "true" 21% cumulative incidence of sexual assault during the time of Gulf War I in this sample, non-cases of sexual assault had to have responded to the survey at a rate 4 times higher than the cases. A four-fold difference in projected response rates across cases and non-cases is considerably larger than what we observed for men who screened positive versus negative for MST. However, MST screening data are collected in a face-to-face format that likely under identifies sexual assault cases. In the present study, only one tenth of the respondents who reported sexual assault also screened positive for MST. Since questionnaires with sexual content are particularly likely to generate differential response rates,[e.g.,41,42] we believe a four-fold difference in response rates to be plausible. Furthermore, three completely unique methods of accounting for non-random, non-ignorable, non-response bias produced three highly similar sexual assault estimates, which should increase confidence in the final results. However, even if only the lowest estimate of sexual assault generated from the unadjusted analysis were accepted, findings indicate that this population carries a high burden of sexual assault.

As of December 2011, more than 100,000 Gulf War era men had applied for VA PTSD disability benefits (electronic communication, Data & Information Services, Veterans Benefits Administration, Dec. 15, 2011). Unlike returning Operation Enduring Freedom/ Operation Iraqi Freedom Veterans, of whom approximately 55% have utilized VA medical and mental health facilities,[43] nearly three fourths of the men in this population are current users of any VA medical services, and about half, users of mental health services (Murdoch, Baines Simon, Polusny, Bangerter, Grill, Noorbaloochi, Partin; manuscript in preparation). Since even our most conservative estimate identifies this sample as one with high prevalence of both sexual assault and combat, clinicians caring for these Veterans need to be alert to their potentially complex trauma histories. Furthermore, regardless of which sexual assault estimate is chosen, results underestimate this populations' total, lifetime sexual assault burden, because we focused only on the time of Gulf War I. Sexual assault history has been associated with many psychiatric and physical sequelae, including 6-fold higher odds of suicide attempt,[44] persistently elevated risk of substance abuse,[45,46] and—in women—increased odds of reporting heart attacks, obesity, or asthma.[47] These Veterans should be followed forward in time to see if similar associations emerge for them.

Omitting men from sexual assault research may cause researchers and others to overlook potential risk and protective factors for male sexual assault. Present findings, while focused on a large, clinically important but obviously highly selected population, were derived from

a logical ecological framework that might apply to other military samples. For example, although their data are also temporally ambiguous, preliminary research from the Millenium Cohort has also identified an association between combat exposure and sexual assault in some female service members.[48] Besides replication, the temporal ordering and mechanisms through which these factors might influence sexual assault events need elucidation, particularly for unavoidable aspects of military service, such as living in crowded conditions or being exposed to combat. Routinely incorporating sexual assault items into measures of combat exposure might destigmatize such experiences for survivors while providing policy makers and clinicians a better sense of the co-occurrence of sexual assault and combat in other populations and settings.

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Table 1.

Respondents' Discretely Measured Characteristics Overall and by Their Sexual Assault Status During the Time of Gulf War I

Characteristic	**Overall N= 1,700**	**Reported Sexual Assault During the Time of Gulf War I**					
			No *n* =1,552	**Yes *n*= 100**			
	% (N)	***n* Responding to Each Item**	***% (n)*** *	***% (n)*** *	**Test Statistic**	***df***	***p*-value**
Current Sociodemographics							
Current age under 50 years	56.6 (1,684)	1,636	56.0 (861)	70.1 (68)	7.45[a]	1	0.006
Race/ethnicity:		1,627					
White	55.6 (1,672)		56.3 (860)	52.5 (52)	0.53[a]	1	0.47
Black	25.8 (1,672)		25.7 (392)	25.3 (25)	0.008[a]	1	0.93
Latino/Hispanic	8.2 (1,672)		7.9 (121)	9.1 (9)	0.17[a]	1	0.68
Other	10.4 (1,672)		10.1 (155)	13.1 (13)	0.90[a]	1	0.34
Education to date:		1,644					
High school graduate or equivalent	19.8 (1,691)		20.1 (310)	17.0 (17)	0.24[a]	1	0.62
Vocational	5.8 (1,691)		5.9 (91)	3.0 (3)	1.46[b]	NA	0.26
At least some college	74.4 (1,691)		74.0 (1,143)	80.0 (80)	1.76[a]	1	0.19
Sexual Orientation		1,621					
Completely heterosexual	92.5 (1,655)		93.2 (1,419)	81.8 (81)	17.53[a]	1	<0.0001
Other than "Completely heterosexual":	7.5 (1,655)		6.8 (103)	18.2 (18)	4.18[b]	NA	0.002
Mostly heterosexual	3.8 (1,655)		3.4 (51)	9.1 (9)			
Bisexual	0.7 (1,655)		0.6 (9)	2.0 (2)			
Mostly homosexual	0.2 (1,655)		0.2 (3)	1.0 (1)			
Completely homosexual	0.2 (1,655)		0.1 (2)	2.0 (2)			
Unsure	2.6 (1,655)		2.5 (38)	4.1 (4)			
Currently Married	68.7 (1,686)	1,639	69.2 (1,065)	58.0 (58)	5.46[a]	1	0.02

Characteristic	Overall N= 1,700	Reported Sexual Assault During the Time of Gulf War I					
			No *n* =1,552	Yes *n*= 100			
	% (N)	*n* Responding to Each Item	*% (n)**	*% (n)**	Test Statistic	*df*	*p*-value
Current employment:		1,634					
Worker for pay	49.6 (1,680)		50.9(781)	33.0 (33)	12.05[a]	1	<0.001
Retired	13.1(1,680)		13.1 (201)	9.0 (9)	1.41[a]	1	0.24
Unemployed	6.4(1,680)		5.9 (91)	14.0 (14)	10.16[a]	1	0.001
Disabled	29.6 (1,680)		28.8 (442)	42.0 (42)	7.83[a]	1	0.005
Receiving VA disability benefits	91.3 (1,693)	1,645	91.3 (1,413)	88.8 (87)	0.75[a]	1	0.39
Service Characteristics during Gulf War I							
Served in the Army	65.1 (1,342)	1,309	65.1 (806)	66.2 (47)	0.04[a]	1	0.85
Enlisted rank	92.2 (1,669)	1,630	92.2 (1,411)	95.0 (94)	1.02[a]	1	0.31
Served in the Regular, Active component	76.5 (1,653)	1,608	76.0 (1,148)	81.4 (79)	1.51[a]	1	0.22
Served in the National Guard/Reserve	23.5 (1,653)	1,608	24.0 (363)	18.6 (18)	1.51[a]	1	0.22
Military Contextual Factors during Gulf War I							
Deployed to the Persian Gulf	69.1 (1,674)	1,637	69.2 (1,063)	63.0 (63)	1.66[a]	1	0.20
Exposed to combat (among those deployed)	85.2 (1,157)	1,126	84.5 (898)	92.1 (58)	2.67[a]	1	0.10

*Among those responding to the survey item and to the sexual assault questions. Numbers in the “No” and “Yes” columns will not always add up to 1,552 and 100, respectively, because of missing values.

[a]Yates’ continuity-corrected χ^2

[b]Barnard’s unconditional exact test with Z-pooled modification

NA = Not applicable

Table 2.

Respondents' Continuously Measured Characteristics Overall and By Their Sexual Assault Status During the Time of Gulf War I.

Characteristic	Overall		Reported Sexual Assault During the Time of Gulf War I						
	N =1,700		No *n* = 1,552		Yes (*n* = 100)				
	Mean	SD	Mean	SD	Mean	SD	Test statistic	df	*p*-value
Military contextual factors during Gulf War I									
Crowded living conditions	3.48	1.25	3.40	1.26	3.80	1.15	2.62	1,551	0.009
Unit's perceived tolerance of sexual harassment	13.94	5.24	13.66	5.09	18.00	5.8	−8.09	1,553	<.0001
Individual factors									
Sexual identity challenges during Gulf War I	1.13	2.34	0.94	2.07	4.17	3.91	−13.97	1,628	<.0001
Childhood Maltreatment									
Non-supportive family	11.37	5.06	11.31	5.0	12.61	5.65	2.49	1,622	0.013
Childhood sexual abuse	3.94	2.29	3.83	2.13	5.61	3.56	−7.56	1,601	<.0001
Childhood physical abuse	12.45	4.98	12.32	4.87	14.82	5.99	−4.86	1,618	<.0001
Childhood neglect	6.44	2.77	6.36	2.68	7.70	3.53	−4.71	1,608	<.0001

Table 3.

Estimated Cumulative Incidence of Sexual Assault During the Time of Gulf War I in Men who Applied for Department of Veterans Affairs PTSD Disability Benefits, Based on Different Non-Response Assumptions

Analysis Set	Analysis Method	Assumptions About Non-Response		Sexual Assault During the Time of Gulf War I		
		At Item Level	At Survey Level	*N*	Estimated Cumulative Incidence (%)	95% CI
1	Unadjusted for Non-response	*Ignorable*; items are missing completely at random	*Ignorable*; surveys are missing completely at random	1,652	6.0	(5.0-7.3)
2	Multiple Imputation and Propensity [31,32]	*Non-ignorable;* items are not missing at random.	*Ignorable*; missing surveys are not related to military sexual assault status once other characteristics are controlled	2,415	7.3	(6.1-8.6)
3	Expectation-Maximization[33]	*Non-ignorable*; items are not missing at random.	*Non-ignorable*; missing surveys are directly related to military sexual assault status	2,415	19.9	(19.2-20.7)
	Maximum Likelihood[34]	*Non-ignorable*; items are not missing at random.	*Non-ignorable*; missing surveys are directly related to military sexual assault status	1,061	18.0	(5.0-51.9)
	Bayesian[35]	*Non-ignorable*; items are not missing at random.	*Non-ignorable*; missing surveys are directly related to military sexual assault status	2,415	21.0	(20.0-22.0)

CI = Confidence Intervals

Table 4.

Correlates of Reporting Sexual Assault During the Time of Gulf War I by Non-Response Assumption

Correlate	Odds Ratio of Reporting Sexual Assault During the Time of Gulf War I					
	Analysis Set 1: Unadjusted for Non Response		Analysis Set 2: Adjusted for Item Level Non-Response Only		Analysis Set 3: Adjusted for Item Level and Survey Level Non-response	
	OR	95% CI	OR	95% CI	OR	95% CI
Current sociodemographics						
Current age < 50 years	**1.85**	(1.18-2.86)	1.49	(0.98-2.27)	**2.50**	(1.67-3.57)
Non-white	1.16	(0.78-1.75)	1.28	(0.88-1.87)	1.15	(0.80-1.64)
Responded other than “completely” heterosexual	**3.06**	(1.77-5.30)	**2.60**	(1.55-4.38)	**2.12**	(1.30-3.47)
Service characteristics during the time of Gulf War I						
Served in the Army	1.05	(0.63-1.74)	1.10	(0.72-1.70)	0.97	(0.72- 1.30)
Enlisted rank	1.60	(0.64-4.00)	1.20	(0.51-2.82)	**1.57**	(1.06-2.35)
Served in National Guard/Reserve component	0.72	(0.43-1.22)	0.72	(0.44-1.19)	**0.70**	(0.56-0.91)
Military contextual factors during the time of Gulf War I						
Deployed to the Persian Gulf	0.76	(0.50-1.16)	0.87	(0.58-1.29)	0.96	(0.75-1.23)
Exposed to combat (of those deployed only)	2.13	(0.84-5.39)	2.27	(0.93-5.53)	**2.10**	(1.39-3.16)
Crowded living situation *	**1.77**	(1.15-2.72)	1.56	(1.00-2.43)	**1.73**	(1.38-2.16)
Unit’s perceived tolerance of sexual harassment *	**2.26**	(1.83-2.79)	**1.99**	(1.56-2.52)	**1.80**	(1.52- 2.10)
Additional individual factors						
Sexual identity challenges during the time of Gulf War I *	**2.11**	(1.84-2.42)	**2.05**	(1.76-2.38)	**1.76**	(1.55-2.00)
Childhood maltreatment						
Non-supportive family *	**1.28**	(1.05-1.55)	1.20	(0.99-1.44)	**1.19**	(1.08-1.32)
Childhood sexual abuse *	**1.60**	(1.39-1.83)	**1.48**	(1.29-1.71)	**1.47**	(1.27-1.68)
Childhood physical abuse *	**1.52**	(1.26-1.83)	**1.38**	(1.15-1.65)	**1.38**	(1.23-1.55)
Childhood neglect *	**1.49**	(1.26-1.77)	**1.42**	(1.18-1.70)	**1.34**	(1.18-1.53)

OR = Odds Ratio. CI= Confidence Intervals. Odds ratios greater than 1 signify increased odds, and odds ratios less than 1 signify reduced odds of reporting sexual assault during the time of Gulf War I if participants had the listed characteristic relative to those without the characteristic. **Boldface font** signifies statistical significance at $p < 0.05$.

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* Odds Ratios are reported for each one standard deviation increase in scores.