Increased Health Care Utilization and Costs Among Veterans With a Positive Screen for Military Sexual Trauma

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Background: The effects of sexual trauma on long-term health care utilization and costs are not well understood due to infrequent documentation of sexual trauma history in health care systems. The Veteran's Health Administration provides a unique opportunity to address this constraint as sexual trauma is actively screened for as part of routine care.

Methods: We used a retrospective cohort design to analyze Veteran's Health Administration mental health and medical service utilization and costs as a function of a positive screen for exposure to military sexual trauma (MST) among Veterans of recent conflicts in Iraq and Afghanistan. We computed adjusted 5-year estimates of overall utilization and costs, and utilization and costs determined not to be related to MST.

Results: The cohort included 426,223 men and 59,611 women. A positive MST screen was associated with 50% higher health care utilization and costs relative to a negative screen. Overall, a positive relative to negative MST screen was associated with a 5-year incremental difference of 34.6 encounters and $10,734 among women, and 33.5 encounters and $11,484 among men. After accounting for MST-related treatment, positive MST screen was associated with 11.9 encounters and $4803 among women, and 19.5 encounters and $8001 among men.

Conclusions: Results demonstrate significant and consistent differences in health care utilization and costs between Veterans with a positive relative to negative MST screen. Even after accounting for MST-related care, a positive screen was associated with significantly higher utilization and costs. MST-related needs may be more readily recognized in women relative to men.

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Sexual trauma is associated with a wide range of adverse psychiatric[1–4] and medical[1–5] outcomes, as well as sexual revictimization,[6,7] homelessness,[7] and suicide.[8] The acute psychiatric symptoms of sexual trauma, when left untreated, may worsen over time, resulting in greater distress and ultimately negatively affecting a broad range of health and psychosocial domains.[9,10] Studies of sexual trauma sequelae indicate a substantial burden, both individually, in terms of pain, suffering, and lessened quality of life, and societally, in terms of lost productivity and public service expenditures.[11–13]

Several studies suggest higher health service utilization and costs among sexual trauma survivors.[14–19] However, sexual trauma status is rarely documented in administrative health care data, which generally precludes the precise evaluation of its effects on long-term health care utilization and associated costs across various categories of utilization. Further, few studies on utilization and costs related to sexual trauma have included samples of men, and fewer still have had the statistical power to compare men and women. This comparison is important, as men may be less likely than women to receive care following sexual trauma,[20] and sexual trauma has been found to confer stronger risks for men relative to women for several outcomes, including bipolar disorders and psychosis.[1,7,21–23]

The Veterans Health Administration (VHA) represents a health care setting in which many of these limitations can be addressed. In 2002, VHA initiated universal screening for military sexual trauma (MST), which is defined as sexual assault or repeated, threatening sexual harassment occurring during military service.[1] The adverse psychological, medical, and social sequelae associated with MST are largely similar to those seen in sexual trauma in a civilian setting.[1,4] The documentation of MST status in the medical record provides a unique opportunity to examine long-term health care utilization and costs as they relate to adult sexual trauma. Moreover, VHA treatment for conditions determined to be MST-related are designated as such in administrative records, allowing for comparison of health care utilization and costs overall, and by MST-related status.

A detailed evaluation of the association between MST and long-term health care utilization and costs overall and as they relate to treatment for MST, including a comparison between men and women, would not only provide a precise illustration of health-related burdens, but also provide important information for service provision planning. These insights may ultimately inform targeted strategies and opportunities for improved treatment for those who experience MST, and sexual trauma more generally. Finally, illustration of the tangible effects of MST along with the well-described effects on quality of life helps to underscore the importance of primary prevention efforts.

Therefore, our goal is to use a large cohort of VHA-enrolled Veterans to examine the relationship between MST status and long-term utilization and costs of the following health care services: mental health, substance use, social work, emergency services, homeless services, and medical care. We sought to determine (1) the association between a positive MST screen and health care utilization and costs; (2) the degree to which differences in utilization and costs are attributable to MST-related treatment; and (3) how differences in utilization and costs vary between women and men. The identification of areas of increased service utilization among individuals with a positive MST screen will extend our understanding of the role of MST on overall health, highlight treatment settings where provider sensitivity to MST and trauma-informed care may be especially important, and inform treatment strategies aimed at preventing and mitigating adverse health outcomes among individuals who experience MST.

METHODS

A retrospective cohort design was used to analyze health care utilization and costs. The working dataset was created by merging demographic and military service information from the Operation Enduring Freedom/Operation Iraqi Freedom (OEF/OIF) roster file with VHA clinical data. The roster file included Veterans who deployed to post-9/11 conflicts in Iraq and Afghanistan, and separated from the military through fiscal year 2011. The roster contained the following demographic and military service variables: age, education, race, marital status, branch of service, rank, and component (Active Duty, Reserve, National Guard). Nationwide utilization and cost data were extracted from the Managerial Cost Accounting National Data Extracts, and were included for fiscal year 2005 through 2015. Variables for costs, utilization, health status, and MST screen results (described below) were computed using visit-level clinical data.

A 5-year period of administrative follow-up was selected, allowing for long-term measurements that reflect sustained differences in service utilization and costs. During the present study's follow-up period, 665,138 OEF/OIF Veterans using VHA care were screened for MST. The final analytic dataset included 485,884 (73.1%) Veterans who were included on the roster, had a valid MST-screen result on file, and had at least 5 years of available follow-up from the time of their initial VHA encounter to the end of administrative surveillance.

MST Classification

During the observation period of the present study, MST screening consisted of the following 2 items: "While you were in the military … (a) *Did you receive uninvited and unwanted sexual attention, such as touching, cornering, pressure for sexual favors, or verbal remarks?* (b) *Did someone ever use force or threat of force to have sexual contact with you against your will?*" Veterans may respond "Yes," "No," or "Decline" to either item. The screen is considered positive if either item is endorsed, and results of the screening are represented as a single variable in VHA administrative data. Cases with a response of "Decline" were excluded (approximately 0.2%).

Health Care Utilization

Health care utilization was represented by VHA outpatient and inpatient encounter counts over the 5-year follow-up period. Using clinic stop codes that denote encounter types, outpatient and residential utilization was further stratified into the following categories: mental health, substance use, primary care, emergency department/urgent care, social work, homeless services, and "other" outpatient. Inpatient utilization was further stratified into the following categories of utilization based on treatment specialty codes: psychiatric, substance use, and medical.

For all outpatient encounters, providers determine whether the treatment provided is related to documented MST. If treatment is determined to be MST-related, it is designated as such and provided to the Veteran free of charge. Thus, 2 sets of all utilization variables were created. The first set included overall utilization, and the second set included non–MST-related utilization only. Because inpatient services are not characterized as MST-related in administrative data, overall and non–MST-related variables are identical for inpatient services.

Health Care Costs

Health care costs were represented by VHA direct and indirect health care production costs corresponding to usage over the 5-year follow-up period. Costs were computed for each category of utilization described in the previous section, as well as an additional variable for combined inpatient and outpatient costs. As described for utilization, costs were also created in 2 sets: overall and non–MST-related. All costs were inflation-adjusted to 2016 Consumer Price Index values.[24]

Health Status

To evaluate potential differences in health status between Veterans with positive and negative MST screen that may help to explain differences in health care utilization and costs, clinical diagnoses were retrieved from VHA administrative data during the same period of follow-up period using primary International Classification of Diseases (ICD) 9th edition codes. The enhanced Elixhauser comorbidity index algorithm[25] was used to create a set of health status indicators based on recorded diagnoses. This index is a widely used method for classifying ICD diagnoses in large administrative datasets into chronic medical and mental health indicators, and is used for predicting mortality and

health care expenditures.[26] Veterans who received one or more diagnosis within a given category during follow-up were assigned a positive value for that category. Of note, while ICD-9-CM code 309.81 (posttraumatic stress disorder) is represented in the Enhanced version algorithm under the "Depression" diagnostic category. Complete code mappings for the Enhanced Elixhauser Comorbidity Index are included in eTable 1, Supplementary Digital Content 1 (http://links.lww.com/MLR/B420).

Veterans must utilize services to receive diagnoses. Thus, diagnostic variables are intrinsically linked to utilization and cost variables, and are unsuitable for use as covariates in utilization and cost modeling. For this reason, health status variables are presented descriptively.

Data Analysis

Descriptive statistics stratified by MST status and sex were computed for demographic, health status, and health care utilization and cost variables. To assess the role of MST in utilization and costs overall, and non–MST-related utilization and costs specifically, models were computed for both sets of outcomes. All outcomes were modeled as a function of MST screen status and the interaction between MST screen status and sex, as well as demographic covariates age, education, marital status, race, rank, component, and branch of service.

Because most Veterans do not use every available treatment type, utilization and cost outcome variables included many zeros. This violates the assumptions of many traditional methods. Therefore, 2-part hurdle models[27] for mixed discrete-continuous outcomes were used. These models include 2 portions. In the first portion, odds for any utilization or costs are estimated. In the second portion, only those with nonzero utilization or costs are included, and rates of utilization or costs are estimated. Logistic regression was used for the first portion of the models (ie, any utilization or any cost vs. none). For the second portion of the models, negative binomial regression with a log link was used to model utilization outcomes (encounters), and generalized linear modeling with a gamma distribution and log link was used to model cost outcomes (dollars). Traditional models were used to model total combined utilization and costs, since all Veterans included in the sample had at least one encounter and associated costs. For combined utilization, standard negative binomial regression with a log link was used. For combined costs, generalized linear modeling with a gamma distribution and log link was used. Model results were used to compute adjusted average marginal effects[28] of MST and their 1% margins of error. Marginal effects represent the incremental difference in health care utilization or costs associated with a positive MST screen relative to a negative screen. Analyses were conducted using R[29] and Stata[30] through the Veterans Informatics and Computing Infrastructure secure workspace.[31] Approval for this study was granted by the appropriate Institutional Review Boards.

RESULTS

Of 485,884 Veterans included in the sample, 87.7% were male and 12.3% were female. The overall rate of positive screen for MST was 2.6%. Table 1 includes a summary of sample demographic and military service characteristics, and Table 2 includes health status as evidenced by Elixhauser diagnostic indicators, each stratified by MST status and sex. Both men and women with a positive MST screen were more likely to have one or more diagnoses in Elixhauser categories "alcohol abuse," "drug abuse," "psychoses," "depression," "chronic pulmonary disease," and "other neurological disorder." Relative to those with a negative MST screen, women with a positive screen were more likely to have one or more diagnoses in Elixhauser categories "paralysis," "hypothyroidism," "peptic ulcer disease," and "obesity," and men with a positive screen were more likely to have one or more diagnoses in Elixhauser categories "acquired immune deficiency virus/human immunodeficiency virus" and "rheumatoid arthritis/collagen vascular diseases."

Tables 3 and 4 include mean overall health care utilization and costs by MST screen status and sex, incremental effects of a positive versus negative MST screen on each category of utilization for both overall and non–MST-related utilization and costs, and a statistical comparison of incremental effects between men and women. Supplementary eTable 2, Supplementary Digital Content 2 (http://links.lww.com/MLR/B421) provides adjusted odds and rate ratios and their confidence intervals both portions of the hurdle models for overall utilization and costs.

All Utilization and Costs

In models for overall utilization (Table 3 and eTable 2, Supplementary Digital Content 2, http://links.lww.com/MLR/B421), positive MST screen was associated with significantly more encounters in nearly all categories of utilization. In the binomial portion of these models, a positive MST screen was associated with significantly higher odds for utilization across all categories except for primary care. Odds ratios tended to be highest for outcomes relating to outpatient and inpatient mental health and substance use treatment (adjusted odds ratio range was 1.7–2.8).

In the count process portions of models for rate of utilization among those who used a given treatment type, a positive MST screen was associated with a significantly higher rate of utilization for outpatient treatment types mental health, substance use, primary care, emergency department, social work, and other outpatient (range of adjusted rate ratio was 1.14–1.64). Overall, a positive MST screen was associated with a 40% higher rate of encounters.

The incremental effect of a positive MST screen on overall utilization was 34.6 encounters for women and 33.5 encounters for men. Other notable findings included a significant incremental effect of positive MST screen for outpatient mental health (10.7 encounters for women and 9.4 encounters for men), and "other outpatient" (20.2 encounters for women and 20.8 encounters for men). The comparison between men and women for the incremental effect of a positive MST screen varied across outcome types; while differentially larger among women for outpatient mental health, it was differentially larger among men for inpatient psychiatric services.

TABLE 1. Demographic and Military Service Characteristics for US Veterans With Military Sexual Trauma Screen Results and 5 Years of Available Follow-up as Initial Veterans Health Affair Encounter (Fiscal Year 2005–2015)

	Women (N = 59,611) (12.3%) [n (%)]			Men (N = 426,223) (87.7%) [n (%)]		
	MST (–) (83.8%)	MST (+) (16.2%)	t/χ^2 (*P*)	MST (–) (99.2%)	MST (+) (0.8%)	t/χ^2 (*P*)
Age [mean (SD)] (y)	31.2 (8.7)	31.0 (8.5)	—	32.3 (9.4)	32.7 (9.3)	—
Education						
High school or equivalent	36,817 (74.7)	7294 (76.3)	—	33,8497 (81.0)	2543 (81.2)	—
Higher than high school	12,446 (25.3)	2263 (23.7)	—	79,154 (19.0)	589 (18.8)	—
Marital status			***			***
Never married	29,080 (58.5)	5334 (55.3)		216,385 (51.2)	1607 (50.5)	
Married	16,329 (32.8)	3366 (34.9)		188,921 (44.7)	1435 (45.1)	
Divorced/other	4327 (8.7)	940 (9.8)		17,139 (4.1)	140 (4.4)	
Race			***			***
White	18983 (38.0)	3940 (40.7)		213,741 (50.5)	1388 (43.5)	
Black	10,460 (21.0)	1506 (15.5)		40,820 (9.6)	382 (12.0)	
Hispanic	5391 (10.8)	998 (10.3)		45,895 (10.8)	379 (11.9)	
Other	3131 (6.3)	627 (6.5)		19,301 (4.6)	163 (5.1)	
Unknown	11,960 (24.0)	2615 (27)		103,278 (24.4)	876 (27.5)	
Rank			—			—
Enlisted	45,869 (91.9)	8945 (92.3)		395,626 (93.5)	3014 (94.5)	
Officer/warrant	4056 (8.1)	741 (7.7)		27,409 (6.5)	174 (5.5)	
Component			***			***
Active duty	28,627 (57.3)	6505 (67.2)		244,912 (57.9)	2100 (65.9)	
Guard	11,030 (22.1)	1548 (16.0)		116,357 (27.5)	651 (20.4)	
Reserve	10,268 (20.6)	1633 (16.9)		61,766 (14.6)	437 (13.7)	
Branch of service			***			***
Army	32,084 (64.3)	5936 (61.3)		266,500 (63.0)	1924 (60.4)	
Navy/Coast Guard	8002 (16.0)	1777 (18.3)		51,086 (12.1)	595 (18.7)	
Marines	1961 (3.9)	502 (5.2)		66,901 (15.8%)	368 (11.5)	
Air Force	7878 (15.8)	1471 (15.2)		38,548 (9.1)	301 (9.4)	

MST indicates military sexual trauma.
*$P<0.05$.
**$P<0.01$.
***$P<0.001$.

Because Veterans only incurred costs in a given category of utilization when they had one or more encounters in that category, the results for the binomial portion of cost models are identical to those described for utilization models. In the count process portion of overall cost models (Table 4 and eTable 2, Supplementary Digital Content 2, http://links.lww.com/MLR/B421), positive MST screen status was similarly associated with significantly higher costs in every category of utilization measured except for inpatient substance use for both men and women, and inpatient medical for men. Overall, a positive MST screen was associated with a 52% higher rate of costs. The incremental effect for a positive MST screen on overall costs was $10,734 for women and $11,484 for men.

Non–MST-related Utilization and Costs

In models for non–MST-related utilization only (Table 3), a positive MST screen was associated with an overall incremental effect of 11.9 encounters for women and 19.5 encounters for men. This effect was largely driven by "other outpatient" encounters, where the incremental effect was 12.4 encounters for women, and 15.5 encounters for men. The incremental effect for positive MST screen on non–MST-related utilization varied between men and women for several treatment types, including outpatient mental health, primary care, and social work. For each of these outcomes, the incremental effect of a positive MST screen on non–MST-related treatment was differentially larger for men than for women. This interaction effect was particularly noticeable for outpatient mental health and primary care, were a positive MST screen was associated with fewer encounters for women (−1.6 and −0.4, respectively), but more encounters for men (2.3 and 0.4, respectively).

In models for non–MST-related costs only (Table 4), a positive MST screen was still associated with an overall incremental effect of $4803 for women and $8001 for men. Similar to the effects seen for utilization, this effect was largely driven by "other outpatient" encounters, where the incremental cost was $1832 for women, and $4282 for men. Again, the incremental effect of a positive MST screen had an opposite effect for women and men for outpatient mental health and primary care. Although a positive MST screen was associated with negative incremental effects for women (−$482 and −$168, respectively) it was associated with positive incremental effect for men ($771 and $85, respectively).

DISCUSSION

Primary prevention of sexual trauma in the community, in college campuses, and in the military is a societal imperative and is key to mitigating the adverse impacts of such trauma on individual health and well-being. Illustrating the significant downstream effects of sexual trauma in terms

TABLE 2. Prevalence of Medical Diagnoses Among Operation Enduring Freedom/Operation Iraqi Freedom US Veterans During the First 5 Years of Veteran's Health Administration Service Usage (Fiscal Year 2005–2015)

	Women (N = 59,611) (12.3%) [n (%)]			Men (N = 426,223) (87.7%) [n (%)]		
	MST (–) (83.8%)	MST (+) (16.2%)	t/χ^2 (*P*)	MST (–) (99.2%)	MST (+) (0.8%)	t/χ^2 (*P*)
Diagnostic category						
Congestive heart failure	110 (0.2)	19 (0.2)	—	1280 (0.3)	11 (0.3)	—
Cardiac arrhythmias	1473 (3.0)	331 (3.4)	**	13,378 (3.2)	107 (3.4)	—
Valvular disease	283 (0.6)	50 (0.5)	—	1674 (0.4)	9 (0.3)	—
Pulmonary circulation disorders	116 (0.2)	34 (0.4)	**	836 (0.2)	7 (0.2)	—
Peripheral vascular disorders	146 (0.3)	32 (0.3)	—	1469 (0.3)	15 (0.5)	—
Hypertension, uncomplicated	4950 (9.9)	915 (9.4)	—	70,969 (16.8)	543 (17.0)	—
Hypertension, complicated	49 (0.1)	8 (0.1)	—	836 (0.2)	7 (0.2)	—
Paralysis	97 (0.2)	39 (0.4)	***	1404 (0.3)	13 (0.4)	
Other neurological disorders	800 (1.6)	255 (2.6)	***	7463 (1.8)	93 (2.9)	***
Chronic pulmonary disease	4799 (9.6)	1133 (11.7)	***	27,182 (6.4)	272 (8.5)	***
Diabetes, uncomplicated	1114 (2.2)	220 (2.3)	—	14,797 (3.5)	123 (3.9)	—
Diabetes, complicated	114 (0.2)	18 (0.2)	—	1874 (0.4)	20 (0.6)	—
Hypothyroidism	2286 (4.6)	526 (5.4)	***	6103 (1.4)	56 (1.8)	—
Renal failure	83 (0.2)	18 (0.2)	—	1789 (0.4)	8 (0.3)	—
Liver disease	371 (0.7)	70 (0.7)	—	5338 (1.3)	48 (1.5)	—
Peptic ulcer disease	117 (0.2)	42 (0.4)	***	1258 (0.3)	13 (0.4)	—
AIDS/HIV	22 (0.0)	3 (0.0)	—	660 (0.2)	28 (0.9)	***
Lymphoma	54 (0.1)	8 (0.1)	—	567 (0.1)	2 (0.1)	—
Metastatic cancer	54 (0.1)	6 (0.1)	—	382 (0.1)	2 (0.1)	—
Solid tumor without metastasis	714 (1.4)	129 (1.3)	—	4096 (1.0)	33 (1.0)	—
Rheumatoid arthritis/collagen vascular diseases	875 (1.8)	193 (2.0)	—	3485 (0.8)	44 (1.4)	***
Coagulopathy	150 (0.3)	38 (0.4)	—	1126 (0.3)	10 (0.3)	—
Obesity	5155 (10.3)	1123 (11.6)	***	30,553 (7.2)	256 (8.0)	—
Weight loss	283 (0.6)	71 (0.7)	—	1815 (0.4)	10 (0.3)	—
Fluid and electrolyte disorders	509 (1.0)	119 (1.2)	—	2920 (0.7)	30 (0.9)	—
Blood loss anemia	80 (0.2)	17 (0.2)	—	89 (0.0	0	—
Deficiency anemia	1179 (2.4)	227 (2.3)	—	1374 (0.3)	8 (0.3)	—
Alcohol abuse	1819 (3.6)	703 (7.3)	***	40,042 (9.5)	436 (13.7)	***
Drug abuse	1300 (2.6)	472 (4.9)	***	25,776 (6.1)	286 (9.0)	***
Psychoses	1051 (2.1)	355 (3.7)	***	10,432 (2.5)	214 (6.7)	***
Depression	23,653 (47.4)	7006 (72.3)	***	217,494 (51.4)	2305 (72.3)	***

Diagnostic categories are based on classifications of ICD-9 codes using the Enhanced Elixhauser Comorbidity Algorithm. Code mappings are included as a supplemental table.
AIDS indicates acquired immune deficiency virus; HIV, human immunodeficiency virus; MST, military sexual trauma.
*$P<0.05$.
**$P<0.01$.
***$P<0.001$.

of health care utilization and costs helps to support in a more tangible way the importance of primary prevention efforts. Among US Veterans, a history of exposure to MST as evidenced by a positive MST screen is associated with a 50% increase in health care visits and costs over a 5-year period. These differences amount to an average incremental difference of approximately 35 health care encounters and $11,000 in a 5-year period. Even after accounting for utilization and costs that were designated as MST-related, Veterans with a positive MST screen utilized more services and incurred higher costs across a majority of categories of utilization, registering more than 12–20 additional health care encounters and garnering approximately $5000–$8000 in additional costs.

While the incremental effect of a positive MST screen on utilization and costs overall was largely similar between men and women, it was significantly higher for men relative to women for non–MST-related mental health care, primary care, and outpatient care overall. In fact, a positive MST screen was associated with fewer non–MST-related mental health and primary care visits for women, but more for men. Moreover, the incremental effect of a positive MST screen on non–MST-related outpatient care overall was more than double for men relative to women. These findings collectively suggest that although the overall increase in utilization and costs associated with a positive MST screen is similar between men and women, women have a greater share of their treatment designated as MST-related. Ensuring appropriate recognition of MST-related needs among men is of high importance, particularly in light of their differential risk for certain negative outcomes as a function of MST.

Several of the mental health and substance use diagnoses for which Veterans with a positive screen are at elevated risk are in turn associated with physical illness,[32,33] and positive incremental effects were seen for both mental and physical health-related services. This was also reflected in the clinical diagnoses of this population, as those with a positive MST screen had higher odds for several behaviorally linked physical chronic health conditions. This finding suggests that there may be opportunities to enhance

TABLE 3. Observed Veteran's Health Administration Service Utilization by MST Screen Status, Adjusted Differences in Utilization for a MST Positive Screen Relative to Negative Screen, and Comparison of Adjusted Differences Between Men and Women Among Operation Enduring Freedom/Operation Iraqi Freedom US Veterans Over 5 Years of Veteran's Health Administration Service Usage (Fiscal Year 2005–2015)

	Women (N = 59,611) (12.3%) [n (%)]				Men (N = 426,223) (87.7%) [n (%)]					
	Average Overall Encounters (1% Margin of Error)		Incremental Effect MST+ vs. MST− Screen (1% Margin of Error)		Average Overall Encounters (1% Margin of Error)		Incremental Effect MST+ vs. MST− Screen (1% Margin of Error)		χ^2 *P* for Comparison of Incremental Effects (MST×Sex Interaction)	
	MST (−) (83.8%)	MST (+) (16.2%)	Overall	Non-MST Related	MST (−) (99.2%)	MST (+) (0.8%)	Overall	Non-MST Related	Overall	Non-MST Related
Outpatient services										
Mental health	9.7 (0.3)	20.0 (0.9)	**10.7 (0.7)**	**-1.6 (0.3)**	10.4 (0.1)	19.4 (1.5)	**9.4 (1.1)**	**2.3 (0.7)**	0.009	<0.001
Substance use	0.6 (0.1)	1.5 (0.3)	**0.8 (0.2)**	**0.4 (0.1)**	1.6 (0.1)	2.2 (0.5)	**0.6 (0.4)**	0.1 (0.3)	0.293	0.030
Primary care	9.0 (0.1)	10.4 (0.2)	**1.4 (0.3)**	**-0.4 (0.3)**	6.4 (0.0)	7.8 (0.3)	**1.3 (0.4)**	**0.4 (0.4)**	0.620	<0.001
Emergency	1.3 (0.0)	2.0 (0.1)	**0.6 (0.1)**	**0.5 (0.1)**	1.2 (0.0)	1.9 (0.2)	**0.6 (0.2)**	**0.5 (0.2)**	0.945	0.778
Social work	0.8 (0.0)	1.5 (0.1)	**0.6 (0.1)**	0 (0.1)	1.1 (0.0)	1.8 (0.3)	**0.7 (0.2)**	**0.2 (0.1)**	0.363	0.003
Homeless	0.7 (0.1)	1.3 (0.2)	**0.6 (0.2)**	**0.4 (0.1)**	0.5 (0.0)	1.2 (0.4)	**0.6 (0.2)**	**0.4 (0.2)**	0.703	0.468
Other	63.4 (0.8)	83.4 (2.3)	**20.2 (2.4)**	**12.4 (2.2)**	54.8 (0.3)	75.3 (3.9)	**20.8 (3.6)**	**15.5 (3.3)**	0.706	0.038
Total outpatient	84.8 (1.1)	118.5 (3.3)	**34.6 (3.4)**	**11.9 (2.8)**	74.9 (0.4)	107.8 (5.3)	**33.5 (5.1)**	**19.5 (4.4)**	0.645	<0.001
Inpatient services										
Psychiatric	0.1 (0.0)	0.2 (0.0)	**0.1 (0.0)**	**0.1 (0.0)**	0.1 (0.0)	0.3 (0.1)	**0.2 (0.1)**	**0.2 (0.1)**	0.003	0.003
Substance use	0	0	0	0	0	0	0	0	0.868	0.868
Medical	0.1 (0.0)	0.1 (0.0)	**0**	**0**	0.1 (0.0)	0.1 (0.0)	**0**	**0**	0.582	0.582

Models are adjusted for age, education (high school, posthigh school), marital status (married, never married, divorced/other), race/ethnicity (white, black, Hispanic, other, unknown), rank (enlisted, officer, warrant), component (Active Duty, Reserve, Guard), and branch of service (Army, Navy/Coast Guard, Marines, Air Force).

Bold indicates statistical significance, $P<0.01$.

MST indicates military sexual trauma.

treatment of MST through the integration of prevention strategies targeting physical health.

Furthermore, even when compared with Veterans with a negative MST screen who used the same categories of utilization, those with a positive screen used nearly all categories of utilization at significantly higher rates and incurred significantly higher costs. This may indicate a greater burden of symptoms among Veterans with a positive MST screen even as compared with those with similar treatment type needs. Veterans with a positive MST screen have higher rates of several co-occurring conditions,[34,35] which may explain greater symptom severity and more intensive treatment needs.

Results from this study reveal major economic implications of MST for VHA. The collective scope of excess health care utilization and costs associated with MST can be estimated by extrapolating the 5-year adjusted incremental cost of MST for men and women ($11,484 and $10,734, respectively) for the 12,874 Veterans OEF/OIF Veterans in this sample who screened positive for MST. This equates to an incremental 5-year cost of MST for the VHA of $141 million ($28 million/y) for this sample alone. Importantly, while these estimates represent costs to VHA, additional costs, such as those associated with lost productivity and decreased quality of life, would contribute to an even larger societal burden.

This study has several limitations. First, MST screening results are based on self-report. Sexual trauma, including MST, tends to be underreported.[36] In addition, there is no way to determine how long ago MST occurred, which may relate to symptoms and associated service usage. We also have no information regarding premilitary or postmilitary experiences of sexual trauma. Given high rates of sexual revictimization, it is possible that non-MST may account for some differences among those with a positive screen. Next, the sample is based on users of VHA care. This may limit generalizability, as there may be important differences between those who do and do not use VHA services.

Even among those who use VHA services, several factors associated with MST may relate to higher rates of VHA service usage. For example, due to MST-related symptoms that may interfere with employment or marriage, Veterans with a history of MST may be less likely to have access to alternative insurance. Relatedly, they may be more likely to be eligible for low-cost VHA care due to MST-related service-connected disability benefits or lower socioeconomic status. Notably, the provision of free treatment under the MST-related care mandate only eliminates copayments for approximately 3% of Veterans, as most are not responsible for copayments due to other eligibility factors.[37] As this sample is comprised of OEF/OIF-deployed Veterans, many qualify for 5 years of free care for combat-related conditions regardless of MST screen status or service-connection rating. This likely results in more comparable copayment requirements between those with positive and negative screens for MST.

Future research may extend the findings of this study by including a broader sample that includes non-OEF/OIF Veterans, and by examining how clinical comorbidities and treatment utilization relate to serious adverse outcomes linked to sexual trauma such as homelessness[7] and suicide[6] among survivors of sexual trauma in Veteran and civilian populations alike.

TABLE 4. Observed Average Costs by MST Screen Status, Adjusted Differences in Costs for a MST Positive Screen Relative to Negative Screen, and Comparison of Adjusted Differences Between Men and Women Among Operation Enduring Freedom/Operation Iraqi Freedom US Veterans Over 5 Years of Veteran's Health Administration Service (Fiscal Year 2005–2015)

	Women (N = 59,611) (12.3%) [n (%)]				Men (N = 426,223) (87.7%) [n (%)]					
	Average Overall Cost (1% Margin of Error)		Incremental Effect MST+ vs. MST– Screen (1% Margin of Error)		Average Overall Cost (1% Margin of Error)		Incremental Effect MST+ vs. MST– Screen (1% Margin of Error)		χ^2 *P* for Comparison of Incremental Effects (MST×Sex Interaction)	
	MST (–) (83.8%)	MST (+) (16.2%)	Overall	Non-MST Related	MST (–) (99.2%)	MST (+) (0.8%)	Overall	Non-MST Related	Overall	Non-MST Related
Outpatient services										
Mental health	$2792 ($82)	$5797 ($271)	**$3102 ($327)**	**-$482 ($142)**	$3027 ($27)	$5718 ($450)	**$2823 ($551)**	**$771 ($366)**	0.261	<0.001
Substance use	$115 ($16)	$269 ($58)	**$149 ($57)**	**$53 ($41)**	$294 ($9)	$406 ($94)	**$123 ($121)**	$3 ($90)	0.614	0.196
Primary care	$2756 ($31)	$3219 ($83)	**$462 ($92)**	**-$168 ($78)**	$1866 ($8)	$2261 ($98)	**$363 ($104)**	$85 ($93)	0.069	<0.001
Emergency	$692 ($19)	$1042 ($59)	**$340 ($60)**	**$278 ($57)**	$650 ($6)	$1001 ($89)	**$334 ($94)**	**$279 ($89)**	0.882	0.982
Social work	$262 ($13)	$498 ($49)	**$239 ($74)**	$25 ($49)	$376 ($9)	$612 ($89)	**$250 ($150)**	$87 ($119)	0.862	0.217
Homeless	$182 ($20)	$362 ($71)	**$174 ($76)**	**$101 ($64)**	$132 ($6)	$326 ($100)	**$153 ($97)**	**$112 ($86)**	0.661	0.791
Other	$11,337 ($609)	$14,841 ($547)	**$3441 ($978)**	**$1982 ($890)**	$10,096 ($72)	$13,950 ($879)	**$3974 ($1543)**	**$2974 ($1438)**	0.452	0.130
Total outpatient	$17,874 ($637)	$25,531 ($809)	**$7756 ($1243)**	**$1832 ($975)**	$16,064 ($95)	$23,663 ($1267)	**$7799 ($1929)**	**$4282 ($1651)**	0.962	0.001
Inpatient services										
Psychiatric	$1025 ($128)	$2850 ($493)	**$1796 ($456)**	**$1796 ($456)**	$1880 ($53)	$4832 ($1008)	**$2900 ($1072)**	**$2900 ($1072)**	0.014	0.014
Substance use	$125 ($29)	$198 ($80)	$64 ($82)	$64 ($82)	$324 ($15)	$385 ($192)	$75 ($212)	$75 ($212)	0.898	0.898
Medical	$1253 ($224)	$2409 ($884)	**$1084 ($647)**	**$1084 ($647)**	$2019 ($89)	$2688 ($752)	$578 ($1128)	$578 ($1128)	0.315	0.315
overall	$20,278 ($718)	$30,987 ($1450)	**$10,734 ($1932)**	**$4803 ($1583)**	$20,287 ($170)	$31,568 ($2214)	**$11,484 ($3311)**	**$8001 ($2957)**	0.614	0.014

Models are adjusted for age, education (high school, posthigh school), marital status (married, never married, divorced/other), race/ethnicity (white, black, Hispanic, other, unknown), rank (enlisted, officer, warrant), component (Active Duty, Reserve, Guard), and branch of service (Army, Navy/Coast Guard, Marines, Air Force).

Bold indicates statistical significance, $P<0.01$.

MST indicates military sexual trauma.

CONCLUSIONS

Results from this study demonstrate significant and consistent differences in health care utilization and costs between Veterans with a positive relative to negative MST screen, including both mental and physical health-related treatment. Even after accounting for MST-related care, those with a positive MST screen have significantly higher utilization and costs. Although the overall incremental effect of a positive MST screen is similar between men and women, treatment is more often designated as MST-related among women.

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