

## Original Investigation

# Thirty-Day Prevalence of *DSM-IV* Mental Disorders Among Nondeployed Soldiers in the US Army

## Results From the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS)

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**IMPORTANCE** Although high rates of current mental disorder are known to exist in the US Army, little is known about the proportions of these disorders that had onsets prior to enlistment.

**OBJECTIVE** To estimate the proportions of 30-day *DSM-IV* mental disorders among nondeployed US Army personnel with first onsets prior to enlistment and the extent which role impairments associated with 30-day disorders differ depending on whether the disorders had pre- vs post-enlistment onsets.

**DESIGN, SETTING, AND PARTICIPANTS** A representative sample of 5428 soldiers participating in the Army Study to Assess Risk and Resilience in Servicemembers completed self-administered questionnaires and consented to linkage of questionnaire responses with administrative records.

**MAIN OUTCOMES AND MEASURES** Thirty-day *DSM-IV* internalizing (major depressive, bipolar, generalized anxiety, panic, and posttraumatic stress) and externalizing (attention-deficit/hyperactivity, intermittent explosive, alcohol/drug) disorders were assessed with validated self-report scales. Age at onset was assessed retrospectively. Role impairment was assessed with a modified Sheehan Disability Scale.

**RESULTS** A total of 25.1% of respondents met criteria for any 30-day disorder (15.0% internalizing; 18.4% externalizing) and 11.1% for multiple disorders. A total of 76.6% of cases reported pre-enlistment age at onset of at least one 30-day disorder (49.6% internalizing; 81.7% externalizing). Also, 12.8% of respondents reported severe role impairment. Controlling for sociodemographic and Army career correlates, which were broadly consistent with other studies, 30-day disorders with pre-enlistment ( $\chi^2_{18} = 131.8, P < .001$ ) and post-enlistment ( $\chi^2_7 = 123.8, P < .001$ ) ages at onset both significantly predicted severe role impairment, although pre-enlistment disorders were more consistent powerful predictors (7 of 8 disorders significant; odds ratios, 1.6-11.4) than post-enlistment disorders (5 of 7 disorders significant; odds ratios, 1.5-7.7). Population-attributable risk proportions of severe role impairment were 21.7% for pre-enlistment disorders, 24.3% for post-enlistment disorders, and 43.4% for all disorders.

**CONCLUSIONS AND RELEVANCE** Interventions to limit accession or increase resilience of new soldiers with pre-enlistment mental disorders might reduce prevalence and impairments of mental disorders in the US Army.

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**M**ental disorders are leading causes of US military morbidity.<sup>1</sup> Indeed, health care visits and days out of role owing to mental disorders in the US military are exceeded only by those owing to injuries.<sup>2</sup> This is partly because selection and retention criteria lead to low rates of chronic physical disorders, but military service also has unique stressors that can increase mental disorders.<sup>3-6</sup> Annual hospital bed days owing to mental disorders in the US military doubled<sup>7</sup> between 2006 and 2010. The military suicide rate also increased substantially during this period.<sup>8</sup> Although these trends are widely believed to be linked to the protracted conflicts in Afghanistan and Iraq,<sup>3,9</sup> it is not clear how many of these cases represented recurrences of pre-enlistment disorders. This question is important given recent discussions of optimal recruitment-retention strategies for an all-volunteer Army during times of war.<sup>10,11</sup> We know from general population epidemiological studies that most lifetime mental disorders have childhood-adolescence onsets<sup>12-14</sup> that are initially too mild to cause rejection from military service, even if they predict more severe subsequent episodes.<sup>15</sup> We are unaware of previous research that has examined the question of pre-enlistment history of mental disorders. Such data are presented here from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS; [www.armystarrs.org](http://www.armystarrs.org)), a large multicomponent epidemiological-neurobiological study of Army suicide.<sup>16</sup>

## Methods

### The Sample

Data came from the April to December 2011 Army STARRS All-Army Study (AAS), a de-identified cross-sectional survey of active duty soldiers exclusive of those in Basic Combat Training or deployed to a combat theater. Quarterly AAS replicates consisted of stratified (by Army Command location) probability samples of units or subunits selected with probabilities proportional to authorized unit strength excluding units of fewer than 30 soldiers (less than 2% of Army personnel). All personnel in selected units were ordered to attend an informed consent presentation explaining study purposes, confidentiality, and voluntary participation before requesting written informed consent for a group self-administered questionnaire to link their administrative records to questionnaire responses and to participate in future data collections. Identifying information (eg, name and social security number) was collected from consenting respondents and kept in a separate secure file. These recruitment, consent, and data protection procedures were approved by the Human Subjects Committees of the Uniformed Services University of the Health Sciences for the Henry M. Jackson Foundation (the primary grantee), the Institute for Social Research at the University of Michigan (the organization collecting the data), and all other collaborating organizations.

A total of 327 group sessions were held in April to December 2011. Sessions were held with platoons (typically 30-60 soldiers), companies (typically 80-225 soldiers), or other subunits of battalions (typically 300-1300 soldiers, but divided into

smaller groups for group administration). The median number of attendees was 18 (range, 1-169; interquartile range [ie, 25th-75th percentiles], 4-46). Small sessions were mostly held in medical or military police units to deal with their special 24-hour operation schedules. Large sessions were confined to installations with large auditoriums and a short time window for unit data collection. All interview sessions were scheduled for 90 minutes.

The 5428 AAS respondents considered here represent all Regular Army soldiers in the April to December 2011 AAS who completed the questionnaire and provided written consent for administrative data linkage. Activated Army Reserve and National Guard respondents were excluded owing to small numbers. Although all unit members were ordered to report to informed consent sessions, 23.5% were absent owing to conflicting duty assignments. Most attendees in 2011 (96.0%) consented to the survey, 98.0% of consenters completed the survey, and 69.2% of completers provided record linkage. Most incomplete surveys were owing to logistical complications (eg, units either arriving late or having to leave the 90-minute sessions early), although some respondents needed more than the allotted time to complete the survey. The survey completion-successful linkage cooperation rate was 65.1% ( $0.96 \times 0.98 \times 0.692$ ) and the response rate was 49.8% ( $(1 - 0.235) \times 0.651$ ) based on the American Association of Public Opinion Research COOP1 and RR1 calculation methods.<sup>17</sup> Although we were prohibited from attempting refusal conversion or obtaining individual-level administrative data for refusers, de-identified administrative data were provided for the entire Army and for survey respondents who agreed to linkage, allowing 2 weights to be created to adjust for nonresponse bias. Weight 1 adjusted for discrepancies in survey responses between survey completers with and without record linkage. Weight 2 adjusted for discrepancies between multivariate administrative record profiles of weighted (weight 1) survey completers with record linkage and the target population. Doubly weighted (weight 1  $\times$  weight 2) data were used in analyses. A more detailed description of AAS weighting is presented elsewhere.<sup>18</sup>

### Measures

#### Data Collection Mode

Some data collection staff members were stationed throughout the field period at the largest 6 domestic Army installations (Forts Bliss and Hood in Texas, Bragg in North Carolina, Campbell in Kentucky, Carson in Colorado, and JB Lewis-McChord in Washington; together accounting for 63.5% of the AAS sample). Other staff traveled to smaller installations. Questionnaires were computer-administered using laptop computers at the 6 largest installations, while paper and pencil administration was used at other facilities. A discussion of considerations in this dual-mode approach to data collection is presented elsewhere.<sup>19</sup>

#### Diagnostic Assessment

Respondents self-administered the Composite International Diagnostic Interview Screening Scale (CIDI-SC)<sup>20</sup> and the Posttraumatic Stress Disorder (PTSD) Checklist (PCL)<sup>21</sup> to assess

30-day DSM-IV mental disorders. We distinguished between internalizing and externalizing disorders based on empirical evidence for the importance of this distinction.<sup>22</sup> Internalizing disorders included major depressive disorder (MDD), bipolar I and II or subthreshold bipolar disorder, generalized anxiety disorder (GAD), panic disorder (PD), and PTSD. Externalizing disorders included attention-deficit/hyperactivity disorder (ADHD), intermittent explosive disorder (IED), and substance use disorder (SUD; alcohol or drug abuse or dependence). The SUD assessment included both illicit drugs and misused prescription drugs (the latter was defined as use either without a doctor's prescription; more than prescribed; or to get high, buzzed, or numbed out) based on evidence that prescription drug misuse is considerably more common than illicit drug use in the Army.<sup>23</sup> All disorders were assessed without DSM-IV diagnostic hierarchy or organic exclusion rules. Respondents who reported a disorder were asked at what age they first experienced the disorder. Comparison of these age at onset (AAO) reports with respondent age at enlistment was used to distinguish disorders with pre- vs post-enlistment onsets. An AAS clinical reappraisal study found good individual-level concordance (area under the receiver operating characteristic curve of 0.69-0.79 across diagnoses)<sup>24</sup> between diagnoses based on the CIDI-SC or PCL and independent clinical diagnoses based on blinded administration of the Structured Clinical Interview for DSM-IV.<sup>25</sup> The clinical reappraisal study also found that CIDI-SC and PCL prevalence estimates were unbiased relative to the Structured Clinical Interview for DSM-IV prevalence estimates ( $\chi^2_1 = 0.0-0.6$ ,  $P = .89$  to  $.43$ ).<sup>24</sup>

#### Health-Related Role Impairment

The severity of health-related role impairment was assessed with a revised version of the Sheehan Disability Scale<sup>26</sup> asking respondents the extent to which problems with physical health, mental health, or alcohol-drug use interfered with their functioning in the past 30 days in each of 4 role domains using a 0 to 10 visual analogue scale labeled as no interference (0), mild (1-3), moderate (4-6), severe (7-9), and very severe (10) interference. The 4 domains were home management, quality of work on duty, social life, and close personal relationships. Severe self-reported role impairment was defined as a 7 to 10 rating in 1 or more domains.

#### Sociodemographic and Army Career Variables

Sociodemographic variables considered here included respondent sex, race/ethnicity, and marital status. Army career variables included rank, age at enlistment, number of deployments to a combat theater, and current Army Command assignment (the major organizational subdivisions within the Army). Race and ethnicity were assessed in 2 questions, the first asking respondents whether they were Spanish, Hispanic, or Latino (yes or no) and the second asking respondents to record their race by checking all applicable categories of white, black or African American, American Indian or Native American, Asian (eg, Chinese, Filipino, or Indian), and Native Hawaiian or other Pacific Islander and/or providing an open-ended response to an other race category. Responses were collapsed into the summary categories of non-Hispanic black,

non-Hispanic white, Hispanic, and others. Race and ethnicity were assessed as part of an effort to create a comprehensive sociodemographic profile of soldiers. Distributions of sociodemographic and career variables in the weighted AAS sample are quite comparable with those in the target population (Table 1).

#### Analysis Methods

Thirty-day prevalence of disorders with pre- and post-enlistment AAO were compared with estimates from a subsample of the National Comorbidity Survey Replication (NCS-R),<sup>27</sup> a US national household survey that assessed DSM-IV disorders with the full CIDI,<sup>20</sup> calibrated to be sociodemographically comparable with the AAS using methods described elsewhere.<sup>28</sup> Predicted age at enlistment was imputed at the individual level to NCS-R respondents using the SAS PROC MI procedure,<sup>29</sup> which implemented Rubin's multiple imputation method<sup>30</sup> using all variables available in both the NCS-R and Army administrative data set to make imputations. Logistic regression analysis was used to examine associations of sociodemographic and Army career variables with disorders and of disorders with self-reported severe role impairment. Coefficients were exponentiated to generate odds ratios (ORs) and 95% CIs. Simulation methods described elsewhere<sup>31</sup> were used to calculate population-attributable risk proportions (PARPs) of severe role impairment owing to 30-day DSM-IV disorders with pre- vs post-enlistment AAOs. The PARP describes the proportion of observed severe impairment associated with the predictors.<sup>32</sup> As the AAS data are both clustered and weighted, the design-based Taylor series linearization method was used to estimate standard errors. The significance of predictor sets was evaluated using design-based Wald  $\chi^2$  tests. Statistical significance was evaluated using .05-level 2-sided tests.

## Results

### Prevalence of 30-Day DSM-IV Disorders

Estimated 30-day prevalence was 15.0% for any internalizing disorder, 18.4% for any externalizing disorder, and 25.1% for any disorder (Table 2). The most prevalent disorders were IED (11.2%), PTSD (8.6%), and ADHD (7.0%), with other disorders much less common (3.3%-5.7%). All AAS prevalence estimates were higher than in the calibrated NCS-R civilian sample (5.3% any internalizing, 7.3% any externalizing, and 11.6% any disorder).

Nearly half (49.6%) of AAS respondents with 30-day internalizing disorders had first onsets of at least 1 disorder prior to enlistment. Disorder-specific proportions of pre-enlistment onset are significantly lower in the AAS than calibrated NCS-R for each internalizing disorder other than PTSD ( $\chi^2_1 = 7.3-10.9$ ,  $P = .005$  to  $.017$ ). Panic disorder and PTSD are the only 2 internalizing disorders where 30-day prevalence with pre-enlistment onset differs significantly between the AAS and NCS-R. Prevalence was higher in both cases in the AAS than NCS-R (PD: 1.0% vs 0.4%,  $\chi^2_1 = 4.4$ ,  $P = .04$ ; PTSD: 2.6% vs 0.1,  $\chi^2_1 = 68.2$ ,  $P < .001$ ).

**Table 1. Distributions of Sociodemographic and Army Career Variables in Quarters 2 Through 4 of the 2011 Army STARRS All-Army Survey Analysis Sample and the Target Population of All Comparable US Army Personnel<sup>a</sup>**

Characteristic	Sample, % (SE)		Population, %
	Unweighted	Weighted	
<b>Sex</b>			
Men	89.7 (0.9) <sup>b</sup>	85.9 (0.8)	85.8
Women	10.3 (0.9) <sup>b</sup>	14.1 (0.8)	14.2
<b>Race/ethnicity</b>			
Non-Hispanic white	66.7 (0.9) <sup>b</sup>	62.5 (1.2)	61.4
Non-Hispanic black	15.8 (0.7) <sup>b</sup>	19.5 (1.1)	20.5
Hispanic	11.1 (0.5)	11.0 (0.5)	11.1
Other	6.4 (0.3)	7.1 (0.5)	6.9
<b>Marital status</b>			
Married	61.6 (0.8)	59.2 (1.3)	61.5
Previously married	4.8 (0.3) <sup>b</sup>	6.6 (0.5)	6.4
Never married	33.5 (0.7)	34.3 (1.2)	32.0
<b>Age at enlistment, y</b>			
17-18	26.3 (0.8)	24.0 (0.9) <sup>c</sup>	21.8
19-20	29.1 (0.5) <sup>b</sup>	26.5 (1.1)	26.9
21-23	23.9 (0.5)	24.9 (0.8) <sup>c</sup>	27.4
≥24	20.8 (0.7) <sup>b</sup>	24.7 (1.1)	24.0
<b>Rank</b>			
Lower-ranking enlisted, E1-E4	56.9 (1.2) <sup>b</sup>	43.7 (1.6)	43.8
Higher-ranking enlisted, E5-E9	32.4 (0.8) <sup>b</sup>	37.9 (1.0)	38.0
Officer, W1-5/O1-9	10.7 (1.0) <sup>b</sup>	18.4 (1.8)	18.2
<b>No. of deployments</b>			
0	32.1 (2.1)	31.3 (1.8)	31.7
1	34.8 (1.7)	31.9 (1.7)	31.6
2	19.0 (0.6) <sup>b</sup>	21.1 (0.7)	20.6
≥3	14.2 (0.7)	15.7 (1.2)	16.1
<b>Command</b>			
Forces Command	79.2 (1.5) <sup>b</sup>	53.5 (3.6)	50.3
Area Service Component Commands <sup>d</sup>	4.5 (0.8) <sup>b</sup>	16.1 (4.1)	15.5
Special Operations Command	4.6 (0.6)	6.0 (1.0)	5.2
Medical Command	5.6 (0.3) <sup>b</sup>	8.2 (0.8)	7.0
Training and Doctrine Command	3.8 (0.2) <sup>b</sup>	6.9 (0.5) <sup>c</sup>	10.1
All other commands <sup>e</sup>	2.4 (1.0) <sup>b</sup>	9.3 (2.7)	11.9
Total No.	5428	5428	440 369

Abbreviations: E, enlisted rank; O1-9, commissioned officer rank 1-9; STARRS, Study to Assess Risk and Resilience in Servicemembers; W1-5, warrant officer rank 1-5.

<sup>a</sup> The population data were obtained from the Defense Manpower Data Center Master Personnel and Contingency Tracking System (CTS) for all Regular Army active-duty soldiers exclusive of those in Basic Combat Training or in theater. Results are based on monthly CTS snapshots for the 8-month period between May 2011 and December 2011. The Army STARRS All-Army Survey analysis sample included 5428 participants, and the target population of comparable US Army personnel included 440 369. The estimate of population size is averaged over the 9 months used to generate the population data.

<sup>b</sup> Significant difference between unweighted and weighted prevalence estimates at the .05 level.

<sup>c</sup> Significant difference between weighted prevalence estimate and population prevalence at the .05 level.

<sup>d</sup> Area Commands include Africa (USARAF), Central (USARCENT), North (USARNORTH), South (USARSO), Europe (USAREUR), and Pacific (USARPAC).

<sup>e</sup> Including Materials Command, all other Service Component Commands, and all other Direct Reporting Units. See <http://www.army.mil/info/organization/> for a more detailed description of the US Army Command structure.

The situation was different for externalizing disorders, where 81.7% of AAS respondents with 30-day prevalence had first onsets of at least 1 such disorder prior to enlistment. None of the disorder-specific proportions with pre-enlistment onset differed significantly in the AAS vs calibrated NCS-R. This means the higher AAS than NCS-R 30-day prevalence estimates of externalizing disorders were owing equally to cases with pre- and post-enlistment onsets.

### Sociodemographic and Army Career Predictors of 30-Day Disorder Prevalence

Multivariate logistic regression equations predicted each 30-day disorder, any internalizing disorder, any externalizing disorder, and any disorder. Only summary results are presented here (Table 3). Detailed results are available on request.

#### Sex

Women soldiers had significantly elevated odds of any internalizing disorder (1.5) and several individual disorders (MDD, GAD, and PTSD; 1.6-2.6).

#### Race/Ethnicity

Although race and ethnicity are significantly associated overall with any disorder ( $\chi^2_3 = 9.4, P = .02$ ), the only individually significant coefficient was one modestly lower OR among non-Hispanic black than non-Hispanic white individuals (0.7) for IED.

#### Marital Status

Although the association of marital status with any disorder is nonsignificant, never-married soldiers had significantly

**Table 2. Estimated 30-Day Prevalence of DSM-IV Internalizing and Externalizing Disorders in Quarters 2 Through 4 of the 2011 Army STARRS AAS and Separately in a Calibrated NCS-R<sup>a</sup>**

Variable	% (SE)							
	30-Day Prevalence		Proportion of 30-Day Cases With Pre-enlistment AAO		Prevalence of 30-Day Disorders With Pre-enlistment AAO		No. of 30-Day Cases <sup>b</sup>	
	AAS	NCS-R	AAS	NCS-R	AAS	NCS-R	AAS	NCS-R
<b>Internalizing disorders</b>								
MDD	4.8 (0.4) <sup>c</sup>	0.9 (0.5)	36.1 (3.3) <sup>c</sup>	77.3 (14.0)	1.7 (0.2)	0.7 (0.5)	295	24
BPD	3.3 (0.4)	1.7 (1.0)	47.9 (2.5) <sup>c</sup>	84.0 (13.0)	1.6 (0.3)	1.4 (1.0)	213	14
GAD	5.7 (0.4) <sup>c</sup>	2.0 (1.5)	34.3 (2.7) <sup>c</sup>	81.3 (16.0)	2.0 (0.2)	1.6 (1.5)	351	16
PD	3.8 (0.3) <sup>c</sup>	0.5 (0.2)	27.9 (3.4) <sup>c</sup>	78.1 (15.0)	1.0 (0.2) <sup>c</sup>	0.4 (0.2)	219	15
PTSD	8.6 (0.7) <sup>c</sup>	0.6 (0.2)	29.5 (1.7)	20.4 (11.8)	2.6 (0.3) <sup>c</sup>	0.1 (0.0)	498	19
Any internalizing disorder	15.0 (0.7) <sup>c</sup>	5.3 (2.0)	49.6 (2.0) <sup>c</sup>	82.0 (8.1)	7.4 (0.5)	4.4 (1.9)	901	84
<b>Externalizing disorders</b>								
ADHD	7.0 (0.6)	3.3 (1.6)	100.0 (0.0)	100.0 (0.0)	7.0 (0.6) <sup>c</sup>	3.3 (1.6)	381	40
IED	11.2 (0.7) <sup>c</sup>	1.7 (0.6)	73.4 (2.4)	80.2 (16.5)	8.2 (0.4) <sup>c</sup>	1.4 (0.5)	753	30
SUD	4.8 (0.4)	2.5 (1.1)	37.5 (2.5)	63.0 (22.3)	1.8 (0.2)	1.6 (0.7)	284	24
Any externalizing disorder	18.4 (0.8) <sup>c</sup>	7.3 (1.9)	81.7 (1.4)	84.3 (6.6)	15.0 (0.6)	6.2 (1.8)	1128	92
<b>Total internalizing and externalizing disorders</b>								
Any of the above disorders	25.1 (0.8) <sup>c</sup>	11.6 (2.5)	76.6 (1.5) <sup>c</sup>	91.2 (4.2)	19.2 (0.6) <sup>c</sup>	10.6 (2.6)	1521	167
<b>No. of disorders</b>								
1	14.0 (0.8) <sup>c</sup>	10.4 (2.4)	69.5 (2.5) <sup>c</sup>	90.4 (4.7)	9.7 (0.6)	9.4 (2.5)	838	130
2	4.4 (0.4) <sup>c</sup>	1.0 (0.6)	78.7 (2.7) <sup>c</sup>	98.7 (1.4)	3.5 (0.3) <sup>c</sup>	1.0 (0.6)	292	27
≥3	6.7 (0.7) <sup>c</sup>	0.2 (0.1)	90.1 (2.0) <sup>c</sup>	98.8 (1.5)	6.0 (0.6) <sup>c</sup>	0.2 (0.1)	391	10

Abbreviations: AAO, age at onset; AAS, All-Army Survey; ADHD, attention-deficit/hyperactivity disorder; BPD, bipolar disorder; GAD, generalized anxiety disorder; IED, intermittent explosive disorder; MDD, major depressive disorder; NCS-R, National Comorbidity Survey Replication; PD, panic disorder; PTSD, posttraumatic stress disorder; STARRS, Study to Assess Risk and Resilience in Servicemembers; SUD, substance use disorder.

<sup>a</sup> Proportions of 30-day cases with pre-accession AAO in the 2 samples and proportions of the total samples with the conjunction of 30-day prevalence

and pre-enlistment AAO.

<sup>b</sup> The numbers of cases do not equal the products of prevalence times total sample size owing to the fact that prevalence estimates are based on weighted data and the numbers of cases reported are unweighted.

<sup>c</sup> Significant difference between AAS (n = 5428) and NCS-R (n = 1785) at the .05 level, 2-sided test.

lower odds than married soldiers of any externalizing (0.7) disorder owing to significantly lower odds of ADHD and IED (0.5-0.6).

**Age at Enlistment**

Age at enlistment was significantly associated with any internalizing disorder ( $\chi^2 = 26.8, P < .001$ ), but not any externalizing disorder ( $\chi^2 = 3.1, P = .21$ ); low odds of MDD, PD, and PTSD (0.4-0.6); and with intermediate age at enlistment (ages 19-23 years).

**Rank**

Rank significantly predicted all disorders, with ORs for lower-rank enlisted soldiers significantly elevated vs officers for each aggregate (2.3-3.5), each internalizing disorder other than MDD (2.2-12.0), and each externalizing disorder (2.7-2.8). In addition, odds for virtually all internalizing disorders other than MDD (2.9-6.5) and all externalizing disorders (2.4-3.0) were significantly higher for higher-rank enlisted soldiers than officers.

**Deployment History**

Two-thirds of AAS respondents had a history of deployment (31.9% had 1 deployment, 21.1% had 2, and 15.7% had 3 or more).

The number of deployments had a consistently positive monotonic relationship with virtually all disorders and significantly so with 5 (MDD, bipolar disorder, GAD, PTSD, and IED), with ORs in the range of 1.1 to 1.5 for 1, 1.2 to 3.0 for 2, and 1.7 to 3.8 for 3 or more deployments.

**Army Command**

Current Army Command assignment was significantly associated with any internalizing disorder and several individual disorders owing to elevated odds in the Training and Doctrine Command (GAD and PTSD, 1.3-2.2) and decreased odds in the Special Operations Command (PD and PTSD, 0.3-0.5) compared with the Forces Command.

**Associations of 30-Day Disorders With Self-Reported Severe Role Impairment**

Reported by 12.8% of respondents, severe role impairment was substantially more common among soldiers with (31.4%) than without (6.6%) DSM-IV mental disorders ( $\chi^2 = 79.6, P < .001$ ). Most respondents with self-reported severe role impairment (61.5%) had at least one 30-day DSM-IV disorder. The best-fitting model predicting self-reported severe role impairment distinguishes disorders with pre- vs post-enlistment onsets ( $\chi^2 = 16.0, P = .03$ ), with significant ORs generally higher for



**Table 3. Associations of Sociodemographic and Army Career Variables With 30-Day DSM-IV Disorders in Quarters 2 Through 4 in the 2011 Army STARRS All-Army Survey<sup>a</sup>**

Variable	Odds Ratio (95% CI)		
	Internalizing Disorder	Externalizing Disorder	Total Disorders
<b>Sex</b>			
Men	1.0	1.0	1.0
Women	1.5 (1.1-2.1) <sup>b</sup>	0.9 (0.6-1.4)	1.2 (0.8-1.7)
$\chi^2_1$	7.8 <sup>b</sup>	0.2	0.9
<b>Race/ethnicity</b>			
Non-Hispanic white	1.0	1.0	1.0
Non-Hispanic black	0.8 (0.6-1.2)	0.7 (0.5-0.9) <sup>b</sup>	0.7 (0.6-1.0) <sup>b</sup>
Hispanic	0.9 (0.7-1.2)	0.9 (0.7-1.1)	0.8 (0.7-1.0)
Other	1.0 (0.8-1.4)	1.0 (0.7-1.3)	1.0 (0.8-1.2)
$\chi^2_3$	1.5	8.6	9.4 <sup>b</sup>
<b>Marital status</b>			
Married	1.0	1.0	1.0
Previously married	1.2 (0.7-1.9)	0.7 (0.5-1.1)	0.9 (0.5-1.5)
Never married	0.8 (0.6-1.1)	0.7 (0.6-0.9) <sup>b</sup>	0.8 (0.7-1.0)
$\chi^2_2$	3.2	9.2 <sup>b</sup>	3.8
<b>Age at enlistment, y</b>			
17-18	1.0 (0.7-1.4)	1.3 (0.9-1.9)	1.2 (0.9-1.8)
19-20	0.7 (0.6-0.9) <sup>b</sup>	1.2 (0.9-1.5)	1.0 (0.8-1.2)
21-23	0.6 (0.4-0.8) <sup>b</sup>	1.2 (0.9-1.7)	0.9 (0.7-1.2)
≥24	1.0	1.0	1.0
$\chi^2_3$	26.8 <sup>b</sup>	3.1	8.1 <sup>b</sup>
<b>Rank</b>			
Lower-ranking enlisted, E1-E4	3.5 (2.4-5.2) <sup>b</sup>	2.3 (1.5-3.5) <sup>b</sup>	2.6 (2.1-3.4) <sup>b</sup>
Higher-ranking enlisted, E5-E9	2.9 (2.1-3.9) <sup>b</sup>	2.3 (1.6-3.2) <sup>b</sup>	2.4(1.8-3.2) <sup>b</sup>
Officer, W1-5/O1-9	1.0	1.0	1.0
$\chi^2_2$	52.8 <sup>b</sup>	22.0 <sup>b</sup>	58.5 <sup>b</sup>
$\chi^2_1$	1.7	0.0	0.7
<b>No. of Deployments</b>			
0	1.0	1.0	1.0
1	1.3 (1.0-1.8)	1.1 (0.8-1.5)	1.2 (0.9-1.5)
2	2.1 (1.5-3.0) <sup>b</sup>	1.4 (1.0-1.9) <sup>b</sup>	1.7 (1.3-2.4) <sup>b</sup>
≥3	2.5 (1.8-3.4) <sup>b</sup>	1.5 (1.0-2.1) <sup>b</sup>	1.8 (1.5-2.2)
$\chi^2_3$	40.8 <sup>b</sup>	4.8	32.5 <sup>b</sup>
<b>Command</b>			
Forces Command	1.0	1.0	1.0
Area Service Component Commands <sup>c</sup>	1.1 (0.8-1.5)	0.9 (0.4-1.7)	1.0 (0.7-1.4)
Special Operations Command	0.4 (0.2-0.9) <sup>b</sup>	0.7 (0.4-1.4)	0.6 (0.3-1.1)
Medical Command	1.4 (0.9-2.1)	0.8 (0.5-1.2)	1.1 (0.7-1.5)
Training and Doctrine Command	1.3 (1.0-1.8)	1.3 (1.0-1.6) <sup>b</sup>	1.2 (1.0-1.4)
All other Commands <sup>d</sup>	1.3 (0.9-1.9)	1.2 (0.7-2.1)	1.3 (0.8-2.1)
$\chi^2_5$	14.0 <sup>b</sup>	8.2	6.8

Abbreviation: STARRS, Study to Assess Risk and Resilience in Servicemembers.

<sup>a</sup> Based on a series of multivariate logistic regression equations with all the previously mentioned predictors in the same model. N = 5428.

<sup>b</sup> Significant at the .05 level, 2-sided test.

<sup>c</sup> The complete set of Area Commands includes Africa (USARAF), Central (USARCENT), North (USARNORTH), South (USARSO), Europe (USAREUR), and Pacific (USARPAC).

<sup>d</sup> Including Materials Command, all other Service Component Commands, and all other Direct Reporting Units. See <http://www.army.mil/info/organization/> for a complete description of the US Army Command structure.

the former than latter (Table 4). Global interactions were significantly subadditive for the number of pre-enlistment ( $\chi^2_2 = 12.6, P = .002$ ) and post-enlistment ( $\chi^2_2 = 6.6, P = .04$ ) onset disorders, meaning that the ORs for comorbid disorders were significantly less than the products of the ORs reported in Table 4 for component disorders.

The PARPs based on the best-fitting model were 21.7% for 30-day disorders with pre-enlistment onsets, 24.3% for 30-day disorders with post-enlistment onsets, and 43.4% for all 30-day disorders. The latter estimate was smaller than the sum of the first 2 estimates because the effects of pre-enlistment disorders were partially mediated through post-enlistment dis-

**Table 4. Associations of 30-Day DSM-IV Disorders Having Pre- and Post-enlistment Ages at Onset With Severe Role Impairment in Quarters 2 Through 4 of the 2011 Army STARRS All-Army Survey<sup>a,b</sup>**

Disorder	Odds Ratio (95% CI)	
	Disorders With Pre-enlistment Onsets	Disorders With Post-enlistment Onsets
Internalizing disorders		
MDD	11.4 (4.7-27.9) <sup>c</sup>	7.7 (2.8-21.1) <sup>c</sup>
BPD	7.0 (2.7-18.1) <sup>c</sup>	3.8 (1.8-7.8) <sup>c</sup>
GAD	5.4 (2.7-10.9) <sup>c</sup>	1.5 (0.8-2.7) <sup>c</sup>
PD	3.2 (1.3-7.9) <sup>c,d</sup>	1.6 (0.9-2.9)
PTSD	1.4 (0.7-2.9)	1.8 (1.3-2.7) <sup>c</sup>
Externalizing disorders		
ADHD	2.3 (1.3-3.9) <sup>c</sup>	
IED	1.6 (1.2-2.1) <sup>c</sup>	1.8 (1.0-3.4)
SUD	2.5 (1.1-5.6) <sup>c</sup>	2.7 (1.6-4.5) <sup>c</sup>
No. of internalizing and externalizing disorders		
2	0.3 (0.2-0.6) <sup>c</sup>	
≥3	0.2 (0.1-0.6) <sup>c</sup>	
$\chi^2_{8/7}$	131.8 <sup>c</sup>	123.8 <sup>c</sup>
$\chi^2_2$	12.6 <sup>c</sup>	

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; BPD, bipolar disorder; GAD, generalized anxiety disorder; IED, intermittent explosive disorder; MDD, major depression; PD, panic disorder; PTSD, posttraumatic stress disorder; STARRS, Study to Assess Risk and Resilience in Servicemembers; SUD, substance use disorder.

<sup>a</sup> N = 5428.

<sup>b</sup> Based on a multivariate logistic regression equation controlling for the sociodemographic and Army career variables in Table 3.

<sup>c</sup> Significant at the .05 level, 2-sided test.

<sup>d</sup> Significantly different from the odds ratio for disorders with post-enlistment onset.

orders. Consistent with this mediation, the PARP for pre-enlistment disorders was 32.9% in a model that did not control post-enlistment disorders vs 21.7% in the model that included these controls.

## Discussion

Exclusions of deployed soldiers and those in basic training limited generalizability. The low response rate limited external validity despite the lack of evidence of substantial sample bias.<sup>18</sup> In addition, respondents might have underreported mental disorders,<sup>33</sup> although methodological studies show this bias is reduced by using the confidential self-administration procedures used here.<sup>34,35</sup>

Within the context of these limitations, AAS 30-day DSM-IV disorders appeared to be more prevalent than among sociodemographically matched civilians owing largely to post-enlistment internalizing disorders and both pre- and post-enlistment externalizing disorders. The high pre-enlistment externalizing disorders presumably reflected selection processes in the current all-volunteer Army, although the higher prevalence of disorders in the AAS than civilian sample has to be interpreted with caution despite efforts to calibrate the

NCS-R owing to incomplete understanding of selection factors into Army service. Inconsistent results have been reported in previous studies attempting to compare civilian and military prevalence estimates using less rigorous calibration methods.<sup>36,37</sup> It is also noteworthy that mental disorders predict early attrition<sup>38</sup> and might influence promotion and deployment,<sup>39</sup> leading to uncertainties in interpreting associations of those variables with disorders.

To our knowledge, although no previous US Army epidemiological survey estimated the prevalence of the same disorders as the AAS, the 25.1% overall 30-day AAS prevalence estimate was close to the 19.5% estimate for a similar set of disorders in the Millennium Cohort Study.<sup>40</sup> It is more difficult to compare disorder-specific AAS prevalence estimates with previous surveys owing to variation in samples and measures, but useful comparisons can be gleaned from 3 recent state-of-the-art reviews on military MDD,<sup>41</sup> PTSD,<sup>42</sup> and SUD.<sup>43</sup> The MDD review found a relatively stable prevalence estimate across 25 US Army surveys, with median prevalence (4.4%) similar to the 4.8% AAS estimate.<sup>41</sup> In comparison, the PTSD review found wide variation in prevalence estimates (2.2%-17.3%) across surveys of Operation Enduring Freedom/Operation Iraqi Freedom/Operation New Dawn servicemembers.<sup>42</sup> The 8.6% AAS PTSD prevalence estimate was at the median of this range, presumably reflecting the AAS inclusion of never-deployed soldiers (who had low PTSD prevalence) and noncoverage of the National Guard and Army Reserve (found in other surveys to have high PTSD prevalence). Finally, the SUD review focused on heavy substance use rather than abuser dependence.<sup>44</sup> Nor did most previous military surveys study bipolar disorder, GAD, PD, ADHD, or IED, despite 2 of these disorders (ADHD and IED) being among the most common disorders considered here.

That most AAS 30-day DSM-IV disorders had pre-enlistment onsets should not be surprising given early mental disorder AAO in the general population.<sup>13,14</sup> That most 30-day internalizing disorders with pre-enlistment onsets had comparable prevalence with calibrated civilian estimates suggests that the high AAS 30-day prevalence of internalizing disorders was largely owing to elevated onset risk after enlistment. The situation is different for externalizing disorders, although where pre-enlistment onset in the AAS is much higher than in the civilian sample, suggesting that early-onset externalizing disorders are associated with joining and/or remaining in the Army. Implications of these findings for recruitment are unclear because the Army already screens for emotional problems in pre-enlistment health examinations. However, knowledge that new recruits have high externalizing disorder rates (even if denied in recruitment interviews) might be useful to the Army in developing targeted outreach-intervention programs for new soldiers such as interventions for ADHD<sup>45,46</sup> and for problems with anger management.<sup>47,48</sup>

Results from the AAS regarding sociodemographic and Army career predictors are mostly consistent with previous studies in finding higher rates of internalizing disorders among women than men,<sup>49,50</sup> somewhat lower rates of IED among non-Hispanic black than white individuals,<sup>40,51,52</sup> weak associations with age at enlistment,<sup>53,54</sup> strong inverse associa-

tions of prevalence with rank,<sup>40,44</sup> and positive associations of prevalence with number of deployments.<sup>55,56</sup> However, 3 of these associations warrant brief comment.

First, sex differences in AAS prevalence estimates, consistent with other military surveys,<sup>44</sup> were smaller than in civilian surveys,<sup>49,57-59</sup> possibly reflecting differential selection of women into Army service, narrowing of sex differences in military roles,<sup>60</sup> or sex differences in psychological reactions to military stressors.<sup>61,62</sup> These possibilities deserve further study in light of the increasing role of women in the military.

Second, the finding that never-married soldiers had somewhat lower prevalence than married soldiers<sup>63</sup> and absence of higher prevalence among previously married than married soldiers<sup>64,65</sup> were inconsistent with general-population studies. This might be owing to unique stressors faced by military marriages (frequent moves, deployments, and rules and regulations).<sup>66</sup> Further analysis is needed to investigate this possibility and to determine whether, as with civilians, effects of marriage might differ by sex<sup>67</sup> and be related as much to quality duration as to marriage per se.<sup>68</sup>

Third, although the low disorder prevalence in Special Operations Command was broadly consistent with evidence of hyperresilience to stress among Special Operations soldiers,<sup>69,70</sup> the ethic of stoicism in Special Operations culture<sup>71</sup> might have led Special Operations survey respondents to underreport emotional problems.<sup>55</sup> In comparison, we are unaware of previous research that documented elevated mental disorder prevalence in Training and Doctrine Command.

Finally, the finding that 30-day DSM-IV disorders were strong predictors of self-reported severe role impairments was broadly consistent with evidence that mental disorders are highly impairing.<sup>72,73</sup> The 43.4% PARP is considerably higher than in civilian surveys, although presumably reflecting Army recruitment-retention practices that reduce impairing physical disorders. That PARP is higher for pre-enlistment than post-enlistment mental disorders is consistent with evidence that early AAO is associated with increased mental disorder severity.<sup>74,75</sup>

## Conclusions

Although we know of no previous studies of pre- vs post-enlistment disorders, evidence exists for associations of childhood stresses<sup>76</sup> and mental disorders<sup>77,78</sup> with poor soldier functioning, lending indirect support to the results reported here. It would be possible to expand future recruitment screening efforts to include self-reports about these pre-enlistment risk factors, but the inability to obtain objective confirmation of these self-reports could undercut the value of such efforts. Another possibility would be to build outreach and treatment programs for new soldiers based on these research findings aimed at attracting soldiers with known pre-enlistment risk factors for targeted interventions, with pre-enlistment mental disorders included in this set of risk factors.

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**Additional Information:** A complete list of Army STARRS publications can be found at <http://www.ARMYSTARRS.org>.

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