IMPORTANCE  The long-term course of readjustment problems in military personnel has not been evaluated in a nationally representative sample. The National Vietnam Veterans Longitudinal Study (NVVLS) is a congressionally mandated assessment of Vietnam veterans who underwent previous assessment in the National Vietnam Veterans Readjustment Study (NVVRS).

OBJECTIVE  To determine the prevalence, course, and comorbidities of war-zone posttraumatic stress disorder (PTSD) across a 25-year interval.

DESIGN, SETTING, AND PARTICIPANTS  The NVVLS survey consisted of a self-report health questionnaire (n = 1409), a computer-assisted telephone survey health interview (n = 1279), and a telephone clinical interview (n = 400) in a representative national sample of veterans who served in the Vietnam theater of operations (theater veterans) from July 3, 2012, through May 17, 2013. Of 2348 NVVRS participants, 1920 were alive at the outset of the NVVLS, and 81 died during recruitment; 1450 of the remaining 1839 (78.8%) participated in at least 1 NVVLS study phase. Data analysis was performed from May 18, 2013, through January 9, 2015, with further analyses continued through April 13, 2015.

MAIN OUTCOMES AND MEASURES  Study instruments included the Mississippi Scale for Combat-Related PTSD, PTSD Checklist for DSM-IV supplemented with PTSD Checklist for DSM-5 items (PCL-5+), Clinician-Administered PTSD Scale for DSM-5 (CAPS-5), and Structured Clinical Interview for DSM-IV, Nonpatient Version.

RESULTS  Among male theater veterans, we estimated a prevalence (95% CI) of 4.5% (1.7%-7.3%) based on CAPS-5 criteria for a current PTSD diagnosis; 10.8% (6.5%-15.1%) based on CAPS-5 full plus subthreshold PTSD; and 11.2% (8.3%-14.2%) based on PCL-5+ criteria for current war-zone PTSD. Among female veterans, estimates were 6.1% (1.8%-10.3%), 8.7% (3.8%-13.6%), and 6.6% (3.5%-9.6%), respectively. The PCL-5+ prevalence (95% CI) of current non-war-zone PTSD was 4.6% (2.6%-6.6%) in male and 5.1% (2.3%-8.0%) in female theater veterans. Comorbid major depression occurred in 36.7% (95% CI, 26.2%-47.2%) of veterans with current war-zone PTSD. With regard to the course of PTSD, 16.0% of theater veterans reported an increase and 7.6% reported a decrease of greater than 20 points in Mississippi Scale for Combat-Related PTSD symptoms. The prevalence (95% CI) of current PCL-5+-derived PTSD in study respondents was 1.2% (0.0%-3.0%) for male and 3.9% (0.0%-8.1%) for female Vietnam veterans.

CONCLUSIONS AND RELEVANCE  Approximately 271 000 Vietnam theater veterans have current full PTSD plus subthreshold war-zone PTSD, one-third of whom have current major depressive disorder, 40 or more years after the war. These findings underscore the need for mental health services for many decades for veterans with PTSD symptoms.
Military personnel deployed to war zones are exposed to a broad array of traumatic events and are at risk for posttraumatic stress disorder (PTSD) and other readjustment problems. Posttraumatic stress disorder can be debilitating, especially when complicated by comorbid depression and substance use.

After the inclusion of PTSD in the DSM-III in 1980, many studies of the mental health of Vietnam veterans were conducted, including a longitudinal study reporting a gradual decline in PTSD rates and a twin study reporting a diminished effect of exposure levels on PTSD symptoms during a 10-year follow-up. In contrast, a 20-year longitudinal study of World War II veterans reported intensification of stress symptoms, which raised concerns for aging Vietnam veterans. The present study builds on the congressionally mandated National Vietnam Veterans Readjustment Study (NVVRS), implemented from 1984 through 1988 (10 years after the war ended) as the only national probability survey of all Vietnam veterans. The NVVRS reported that 15.2% of men and 8.5% of women who served in the war had current PTSD and that nearly 30% of the male and female veterans met lifetime criteria for PTSD. Findings from these earlier studies advanced our understanding of PTSD, but because most of the studies were cross-sectional or not representative of all who served, they were not designed to generate unbiased population estimates of the course of PTSD.

We herein describe findings from the National Vietnam Veterans Longitudinal Study (NVVLS), the first follow-up of the NVVRS, a large probability sample of Vietnam veterans who underwent evaluation more than 25 years ago. A primary objective of the NVVLS was to produce unbiased population estimates of the prevalence, course, and comorbidities of warzone PTSD by reassessing 2348 veterans who participated in the NVVRS. The NVVLS was also designed to provide unbiased estimates of PTSD prevalence in veterans due to non-warzone military and civilian trauma in the Vietnam theater (serving in the war zone) and era (serving in the military during the years of the Vietnam War outside the war zone). The NVVLS thus fills a critical gap in our understanding of how military service 40 or more years earlier affects adjustment in later life.

Methods

Study Design and Implementation

The NVVRS sample was a stratified, national probability sample drawn from military records of the more than 8 million men and women who served while the war was being fought. The veteran sample had the following 2 components: (1) veterans who served in the Vietnam theater of operations (theater veterans), and (2) a comparison group who were in the US military during the war but did not serve in the war (era veterans). We oversampled black and Hispanic men, women, and veterans who were wounded in the war.

The eligible theater veteran sample included 1959 theater veterans, of whom 1632 participated and 327 did not (83.3% unweighted response rate); the eligible era veteran sample included 939 veterans, of whom 716 participated and 223 did not (76.3% unweighted response rate). In all, 2348 veterans participated, and those 2348 veterans constitute the sample for the first follow-up of NVVRS participants (the NVVLS).

The NVVLS included the following 3 sequential components: a phase 1 one-hour self-report health questionnaire; a phase 2 one-hour computer-assisted telephone survey health interview for all participants; and, for a stratified random subsample of theater veterans, a phase 3 three-hour clinical diagnostic telephone interview. The subsample of 767 theater veterans was selected for phase 3 by combining 346 living theater veterans who were eligible to participate in the NVVLS clinical examination and a probability sample of living theater veterans who were not eligible for the NVVLS clinical interview owing to geographic constraints (n = 421). The clinical subsample was used to validate survey measures and to estimate prevalence for PTSD and comorbidities. The protocol was approved by the institutional review boards at Abt Associates and New York University. A written consent form was mailed to participants, and informed consent for phase 1 was indicated by return of the completed survey/questionnaire by mail. Informed consent for phase 2 was indicated verbally (by the participant agreeing to be interviewed over the telephone). Informed consent for phase 3 was also provided orally; a telephone consent script was administered, and verbal consent was obtained before starting the interview. Participant data were deidentified.

A mortality assessment indicated that 428 of 2348 NVVRS participants died before the NVVLS recruitment. Data collection began July 3, 2012, and ended May 17, 2013. An incentive payment of $75 was provided after completion of each phase, raised to $100 during the last 4 months of data collection. Follow-up procedures included a personalized introduction letter, 5 postcards, a telephone follow-up, and selective use of field representatives.

We mailed advance letters to all 1920 participants initially identified as living from the original 2348 NVVRS participants (Figure). An additional 81 NVVRS participants were determined to have died in the interval between the advance mailing and the launching of phase 1. Among 1839 veterans living at the time of the NVVLS, 1450 (78.8%) participated in at least 1 phase; 1238 (67.3%) completed phases 1 and 2, 171 (9.3%) completed phase 1 only, and 41 (2.2%) completed phase 2 only. Among the 767 veterans initially selected for phase 3 (before the phase 2 interviews took place), 40 were found to be deceased during recruitment. Participation in phase 3 was contingent on serving in theater and completing phase 2, with 498 of 767 completing phase 2 (64.9%) and 400 of 498 participating in clinical interviews conducted by psychologists (80.3%). Among those completing phase 2, the primary reasons for nonparticipation in phase 3 were lack of recontact (n = 46) and refusal (n = 35).

Measures

The Mississippi Scale for Combat-Related Posttraumatic Stress Disorder (M-PTSD) consists of 35 items representing the following 4 factors: Reexperiencing and Avoidance, Withdrawal and Numbing, Arousal and Emotional Control, and Self-persecution or Survivor Guilt. Psychometrics include strong construct validity, sensitivity of 0.93, specificity of 0.89, and correct classification rate (CCR) of 90%.
We administered the 17-item PTSD Checklist for DSM-5 (PCL-5), a self-report measure of 20 DSM-5 PTSD symptoms. Given the early stage of development of the PCL-5 at the time of study initiation, we administered the full PCL for DSM-IV (designated PCL-4) supplemented with new, PCL-5 items (eAppendix in the Supplement). The PCL-5 was administered by survey interviewers to theater veterans with reference to their most distressing war-zone incident and for assessing non–war-zone military and civilian PTSD in theater and era veterans; scoring was based on DSM-5 diagnostic criteria for PTSD. Because the PCL does not assess PTSD criteria F (symptom duration) and G (functional impairment), 10 items from the Posttraumatic Diagnostic Scale were used to assess symptom duration and functioning. Those cases with positive findings for PTSD endorsed at least 1 intrusion, 1 avoidance, 2 cognition and mood, and 2 arousal and reactivity symptoms, each at ratings of 2 to 4 of a possible 4, for at least 1 month with functional impairment. We designated the derived measure PCL-5+. As described in the eAppendix in the Supplement, we also administered the PCL-4 and created a PCL-4+ measure to assess DSM-IV PTSD diagnosis.

The Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) was administered to theater veterans in phase 3 with reference to the cumulative impact of war-zone trauma. Participants who met CAPS-5 criteria were identified as positive for current and/or lifetime PTSD. Subthreshold PTSD was defined as meeting criteria for cluster B and any 2 of clusters C, D, and E; a duration at least 1 month; emotional distress; and/or functional disturbances. Because NVVRS estimate were based on DSM-III-R criteria, we also applied DSM-III-R decision rules to the CAPS-5. Resource limitations and participant burden precluded administering the CAPS-5 to assess non–war-zone PTSD.

The Structured Clinical Interview for DSM-IV, Nonpatient Version (SCID-NP), is a structured diagnostic clinical interview for DSM-IV. The mood, anxiety, and substance use disorder modules were administered in phase 3.

All SCID-NP and CAPS-5 interviews were audio recorded, and 60 of 400 interviews (15%) were selected randomly and rescored by an independent rater blind to the New York University study team diagnoses. Interrater reliabilities were determined by κ coefficients and were high for CAPS-5 PTSD diagnoses (0.93) and SCID-NP major depressive disorder (1.00).

Statistical Analysis
Data analysis was conducted from May 18, 2013, through January 9, 2015, with further analyses continued through April 13, 2015. Sample design and weighting have been fully described elsewhere. To obtain data representative of all Vietnam veterans living today, prevalence estimates and mean scores were weighted to account for the probability of selection and nonresponse. Standard errors of estimates, 95% CIs, and hypothesis testing accounted for the complex sample design, using the Taylor series. Continuous variables were compared between points using paired t tests. Weighted prevalence estimates were compared across groups using the Rao-Scott χ² test. The M-PTSD and PCL-5+ measures were validated against the CAPS-5 diagnosis using sensitivity, specificity, overall CCR, and, for continuous measures, the area under the receiver operating characteristic curve. Statistical significance was claimed when P < .05, and statistical analyses were performed using SAS (version 9.3, SAS Institute Inc).

Results
Comparison of Respondents and Nonrespondents
Detailed unweighted and weighted comparisons of NVVLS respondents and nonrespondents, including demographics, war-zone exposure, and symptom levels, are presented elsewhere. Unweighted comparisons showed some significant differences, with minority veterans and those with PTSD at the time of the NVVRS less likely to complete phase 1 and/or 2, and male and minority veterans less likely to participate in phase 3. After data were weighted for differences in probability of selection and nonresponse, we found no significant differences between respondents and nonrespondents. Applying the conventional formula for estimating nonresponse bias to the maximum observed differences in weighted comparisons suggested biases of 0.64 to 1.28 percentage points for phase 1 and 0.38 to 0.81 percentage points for phase 2, implying a minimal effect on analyses.

Validation of Self-report Measures
The PCL-5+ showed high concordance with the CAPS-5 diagnosis (sensitivity, 0.86; specificity, 0.93; CCR, 93%). After using the recommended cutoff score of no greater than 38, the PCL-5+ total score also showed high concordance with the CAPS-5 diagnosis (area under the curve, 0.967; sensitivity, 0.83; specific-
The CAPS-5 criteria were selected as the primary measure of PTSD diagnosis. As shown in Table 1, among male theater veterans alive at the time of the NVVLS, the CAPS-5 estimate (95% CI) for current war-zone PTSD derived from the phase 3 clinical sample was 4.5% (1.7%-7.3%); the CAPS-5 lifetime prevalence, 17.0% (11.9%-22.2%). The CAPS-5 estimate (95% CI) for current full plus subthreshold war-zone PTSD was 10.8% (6.5%-15.1%), compared with a lifetime full plus subthreshold prevalence of 26.2% (19.9%-32.4%). Applying the DSM-III-R scoring rules to the CAPS-5 diagnosis yielded a current PTSD prevalence of 6.3% (2.0%-9.7%), 40% greater than the DSM-5 estimate of 4.5%. Among female veterans, the CAPS-5 estimate (95% CI) for current war-zone PTSD was 6.1% (1.8%-10.3%), and 8.7% (3.8%-13.6%) met CAPS-5 current full plus subthreshold criteria.

### Prevalence of Current War-Zone, Non-War-Zone, and Any PTSD Based on PCL-5+ Estimates

In Table 2 we present estimates of current war-zone PTSD based on PCL-5+ score for DSM-5 weighted to the population of theater veterans living at the time of the NVVLS. Among male theater veterans, the prevalence (95% CI) of current war-zone PTSD was 11.2% (8.3%-14.2%); of full plus subthreshold PTSD, 14.5% (11.3%-17.8%). Among female theater veterans, prevalence (95% CI) of current war-zone-related PTSD was 6.6% (3.5%-9.6%); of full plus partial PTSD, 9.1% (5.6%-12.6%).

The prevalence (95% CI) of non–war-zone PTSD (non-war-zone military, including accidents during training plus civilian trauma, including child abuse) in male theater veterans was 4.6% (2.6%-6.6%); of full plus subthreshold non–war-zone PTSD, 6.5% (4.1%-8.8%). The prevalence of current non–war-zone PTSD for female veterans was 5.1% (2.3%-7.9%); of full plus partial non–war-zone PTSD, 7.8% (4.4%-11.3%). Among male Vietnam era veterans, the prevalence (95% CI) of non–war-zone PTSD was 1.2% (0.0%-3.0%); of full plus subthreshold PTSD, 6.9% (0.4%-13.4%). Among female era veterans, the prevalence (95% CI) of non–war-zone PTSD was 3.9% (0.0%-8.1%); of full plus subthreshold PTSD, 10.2% (2.0%-18.5%). The prevalence (95% CI) of any current PTSD (war-zone + non-war-zone military + civilian) in male theater veterans was 12.2% (9.2%-15.3%) and in female theater veterans was 8.5% (5.1%-12.0%). Among era veterans, the prevalence (95% CI) of any PTSD (non-war-zone military + civilian) was 1.2% (0.0%-3.0%) for male and 3.9% (0.0%-8.1%) for female veterans.

### Course of PTSD Symptoms Across Time

We compared M-PTSD scores for 961 male and female theater veterans who participated in the NVVRS and NVVLS. Theater veterans had higher mean (95% CI) scores at the time of the NVVLS (73.52 [71.39-75.64]) than at the time of the NVVRS (69.72 [68.03-71.4]). Although statistically significant (t = 4.04; P < .001), this difference represents a modest increase in PTSD symptoms. In contrast, among the 409 era veterans who participated in both study waves, mean (95% CI) M-PTSD scores were low and stable across time (NVVLS, 63.95 [60.74-67.16]; NVVRS, 65.31 [61.86-68.76]) (t = −0.97; P = .33). For era veterans, self-reports of PTSD symptoms during 25 years are low and stable, whereas, for theater veterans, mean levels are higher and increasing.
Although we found modest PTSD symptom increases for theater veterans as a whole group, mean scores may mask heterogeneity. To determine course, we used a criterion of a change of greater than 20 points on the M-PTSD, which is a substantive clinical change, and found that 16.0% of theaterveterans had experienced deterioration at the second administration, whereas only 7.6% showed improvement.

### Prevalence of Current Depression and Alcohol and Other Drug Abuse by PTSD Status in Theater Veterans

As presented in Table 3, among male and female theater veterans with current war-zone PTSD as determined by the CAPS-5 diagnosis, 36.7% (95% CI, 6.2%-67.2%) met SCID-NP DSM-IV criteria for current comorbid major depressive disorder. Among subthreshold PTSD cases, 30.9% (95% CI, 5.7%-56.2%) met criteria for current major depressive disorder. By contrast, only 0.7% (95% CI, 0.0%-1.4%) of veterans without full or subthreshold PTSD met criteria for major depressive disorder. Among theater veterans meeting CAPS-5 criteria for current war-zone PTSD, 2.2% (95% CI, 0.0%-5.6%) met criteria for current alcohol abuse, whereas 0.7% (95% CI, 0.0%-2.2%) of those with subthreshold PTSD and 3.2% (0.0%-6.6%) of those without PTSD met criteria for current alcohol abuse. Rates of co-morbid current other drug abuse in theater veterans during the NVVLS are presented in Table 3, indicating rates of 1.9% (95% CI, 0.0%-5.9%) among current war-zone PTSD cases, 2.0% (95% CI, 0.0%-5.1%) among subthreshold cases, and 0.6% (95% CI, 0.0%-1.6%) among those without PTSD.

### Discussion

Among all theater veterans, we estimate a current prevalence (95% CI) of war-zone PTSD based on CAPS-5 criteria of 4.3% (1.7%-7.3%) and 10.8% (6.5%-13.1%) for current full plus subthreshold PTSD 40 years after the war ended. By comparison, the NVVRS estimated a prevalence of DSM-III-R war-zone PTSD of 15.2% in theater veterans 10 years after the war ended. In
the NVVLS, using the PCL-5+, we estimated that the prevalence of current PTSD combining all causes (war-zone, non−war-zone military, and civilian) is 12.2% in male and 8.5% in female theater veterans. Methodologic factors may contribute to these differences. In the NVVLS, we estimated rates separately for current war-zone and non−war-zone PTSD, whereas in the NVVRS, a single estimate was derived. Use of the PCL-5+ and CAPS-5 represent advances compared with diagnostic measures in the NVVRS. The DSM-5 decision rules yield lower estimates than the DSM-III-R.28 In the NVVLS, applying DSM-III-R scoring rules to the CAPS-5 yields a current PTSD prevalence of 6.3% (95% CI, 2.0%-9.7%), which is 40% higher than the DSM-5 estimate. Finally, conducting clinical interviews by telephone rather than in person, as we did in the NVVRS, allowed for more representative sampling, overcoming geographic restrictions imposed by travel to regional centers.

Consistent with our findings, Koenen and colleagues11 reported a gradual decline in PTSD prevalence, with 10% of Vietnam veterans having PTSD 14 years after the war. In contrast, an Israeli study29 reported an increase in PTSD prevalence 20 years after the 1973 Yom Kippur War. Additional factors may account for changes in prevalence, including mortality between assessments and recovery from PTSD. Criteria for PTSD have changed from DSM-III-R to DSM-5, raising the diagnostic bar and requiring significant symptom-related distress and/or dysfunction and the addition of symptoms focused on negative alterations in cognitions and mood.30

When we compared the CAPS-5 and PCL-5+ PTSD estimates, we found substantially lower prevalence based on the CAPS-5 diagnosis, consistent with a study of domestic violence survivors showing that clinician diagnoses yield lower estimates than self-report measures.31 Participants may perceive symptoms differently with guidance from clinicians. For example, participants self-reporting flashbacks may not differentiate vivid recollections from true dissociative states in which they actually believe they are in combat. Participants may also feel less social stigma self-reporting distress. Furthermore, self-reports may be more influenced by general distress compared with clinical interviews, which more precisely delineate symptoms. The CAPS-5 protocol also includes a number of new probes to determine the clinical salience of symptoms, which may better differentiate milder from more severe symptoms. This change may explain the close agreement between the PCL-5+ estimate of current war-zone PTSD (11.2%) and the CAPS-5 estimate of current plus subthreshold PTSD (10.8%). These findings suggest that the CAPS-5 criteria may provide a conservative estimate of the lower bound, reflecting higher specificity and lower sensitivity than the PCL-5+ and M-PTSD.

The substantial prevalence of current subthreshold PTSD represents an important public health concern, given that subthreshold PTSD is associated with levels of dysfunction similar to those in PTSD.34−35 Our finding that prevalences of clinician diagnoses of comorbid major depression were similar in full and subthreshold groups underscores this concern. With respect to course, 16.0% of theater veterans reported an increase of greater than 20 points and 7.6% reported a decrease of greater than 20 points in M-PTSD symptoms. Our findings of increasing symptoms among 16.0% are consistent with the findings of Schnurr and colleagues,36 who reported severe chronicity and delayed-onset patterns in a diverse sample of Vietnam veterans. Because we were able to assess the cohort only twice during the past 25 years, a remitting and relapsing trajectory may have been undetected.37

Four decades or longer after their war-zone service, Vietnam theater veterans with current PTSD continue to experience high levels of comorbid depression, consistent with earlier findings.36,39 The prevalence of comorbid alcohol and other drug abuse is low in PTSD and subthreshold PTSD.

The NVVLS design is best categorized as descriptive epidemiology, allowing for quasi-experimental comparisons but not causal inference. The lengthy interval between data collection points precludes a refined analysis of remitting and relapsing symptom patterns. Although participation levels were remarkably high given the long interval without contact, nearly 20% of the participants in the NVVRS cohort had died and others declined to be interviewed, reducing the follow-up sample sizes and precision of estimates. Other limitations included the wide 95% CIs for some estimates and the lack of biomarkers, medical records, and other unbiased sources.

Conclusions

We estimate that the prevalence (95% CI) of current war-zone-related PTSD is 4.5% (1.7%-7.2%); of current plus subthreshold war-zone PTSD, 10.8% (6.5%-15.1%); and of lifetime war-zone PTSD, 17.0% (11.9%-22.2%). The prevalence of current PTSD from any cause is estimated as 12.2% for male and 8.5% for female theater veterans. In our study sample, 26.2% of theater veterans alive today met CAPS-5 criteria for lifetime war-zone-related PTSD or subthreshold PTSD. Most of the theater veterans had low PTSD symptoms at both time points. An increase of greater than 20 points in M-PTSD symptoms was reported by 16.0% of theater veterans, and a decrease of greater than 20 points was reported by 7.6%. An important minority of Vietnam veterans are symptomatic after 4 decades, with more than twice as many deteriorating as improving. Policy implications include the need for greater access to evidence-based mental health services; the importance of integrating mental health treatment into primary care in light of the nearly 20% mortality; attention to the stresses of aging, including retirement,35 chronic illness, declining social support, and cognitive changes that create difficulties with the management of unwanted memories34; and anticipating challenges that lie ahead for Iraq and Afghanistan veterans.
Posttraumatic Stress Disorder 40 Years After the Vietnam War

Original Investigation Research

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REFERENCES


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