

Continuing Controversy Over the Psychological Risks of Vietnam for U.S. Veterans

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In 1988, the National Vietnam Veterans Readjustment Study (NVVRS) reported 30.9% lifetime and 15.2% current rates of posttraumatic stress disorder (PTSD), and a strong dose/response relationship with retrospective reports of combat exposure. Skeptics argued that recall bias and other flaws inflated the results. Using a new record-based exposure measure and diagnoses in an NVVRS subsample, the authors addressed this controversy in a recent issue of Science (B. P. Dohrenwend et al., 2006). They found little evidence of falsification, an even stronger dose/response relationship and, when fully adjusted for impairment and evidence of exposure, 18.7% onset and 9.1% current rates of war-related PTSD. The fact that these rates are lower than the original NVVRS rates has stimulated continuing controversy that has tended to obscure the more important implications of the study's results.

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In 1988, the congressionally mandated National Vietnam Veterans Readjustment Study (NVVRS) reported rates of 30.9% lifetime posttraumatic stress disorder (PTSD) and 15.2% current PTSD in a representative sample of veterans from all branches of military service (Kulka et al., 1988). The same year, the Centers for Disease Control (CDC; 1988), which conducted the only other nationwide study, reported a lifetime rate of only 14.7% in a sample of Army enlisted men who served in Vietnam. Moreover, the CDC rate of current PTSD was 2.2% (present in the month prior to interview), a rate far lower than the 15.2% rate of current PTSD (present in the 6 months prior to interview) reported in the NVVRS. The interviews in both studies were conducted 11–12 years after the end of the war.

Evident flaws in the CDC measure explained why the CDC rates were so low. For example, the CDC used only about half of the items (Thompson, Gottesman, & Zalewski, 2006) from a newly developed module from the Diagnostic Interview Schedule (DIS; Robins, Helzer, Croughan, & Ratcliff, 1981) to diagnose lifetime and current PTSD on the basis of responses to closed questions asked by lay interviewers. Moreover, this version of the DIS-PTSD module has been found to diagnose much lower rates of PTSD in the general population than the other diagnostic instrument that is most widely used by lay interviewers (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995). Against this background, it is not surprising that the abbreviated CDC adaptation of the DIS-PTSD module was found in the NVVRS to miss the large majority of veterans (78%) who were diagnosed by experienced clinicians as having current PTSD (Kulka et al., 1988, Appendix E). These results suggested that PTSD is underdiagnosed in both military and civilian samples when this version of DIS-PTSD is used; attention turned to the question of why the NVVRS rates were so high.

SKEPTICISM ABOUT THE NVVRS RESULTS

As Wessely and Jones (2004) have suggested, this question is as complicated as it is important. They summed up their views and the views of other skeptics this way:

This [the NVVRS] was a landmark study, of immense political importance, and played a major role in the rehabilitation of the Vietnam veteran in the eyes of society, but one not immune to criticism – not the least because of the ‘remarkable’ prevalence of psychiatric disorder reported. Perhaps the most important methodological drawback comes from the way in which combat exposure was assessed. First of all, it was based . . . on ‘retrospective self reports of events and circumstances that occurred approximately 10 to 20 years prior to data collection.’

We know now that retrospective reports of war experience are coloured by current circumstances and the political and social climate that follows the war. . . . it is highly likely that there has been a gradual ‘inflation’ of traumatic memories to fit with the changing views of the Vietnam War. (pp. 99–100)

Grounds for Skepticism

Grounds for this kind of skepticism have been found by many critics of the NVVRS. For example, as measured by rates of combat stress breakdowns (CSB), killed in action (KIA), or wounded in action (WIA), Vietnam has been described as a low intensity war for U.S. forces (Jones & Wessely, 2001). Because CSB, KIA, and WIA rates have consistently predicted the development of adverse psychiatric outcomes (see Jones & Wessely, 2001, for a review; Solomon & Mukulincer, 2006; and a remarkable record-based study of Civil War veterans by Pizarro, Silver, & Prause, 2006), the psychiatric casualty rates in Vietnam were expected to be low (see Wessely, 2005a, for a review). The rates reported in the NVVRS were not consistent with this expectation.

Diagnoses of PTSD require the presence of antecedent traumatic events, defined at the time of the NVVRS as events that are markedly distressing and outside the range of usual human experience—especially events that threaten the life or physical integrity of the individual or someone close to him or her; the definition also includes witnessing death or serious injury to others (American Psychiatric

Association [APA], 1987). Critics have argued that the NVVRS 30.9% lifetime rate of PTSD is twice as high as the proportion of veterans (15%) who served in combat roles (Burkett & Whitley, 1998; Marlow, 2000; McNally, 2003; Satel, 2004; Shephard, 2001; Wessely, 2005b). This seeming anomaly has prompted questions about the accuracy of the retrospective reports of PTSD symptoms and war-zone stressors that qualify as traumatic. The critics have pointed to indirect evidence for a host of possible sources of distortion: For example, anecdotes about fraudulent claims of military prowess in Vietnam by some individuals in the public eye (Burkett & Whitley, 1998); possible falsification of war-zone experiences by Vietnam veterans seeking compensation for psychiatric disability (Frueh et al., 2005), and evidence of recall biases in reports of combat experiences (e.g., Koenen, Stellman, Stellman, Dohrenwend, & Sommer, 2007; Roemer, Litz, Orsillo, Ehich, & Friedman, 1998; Southwick, Morgan, Nickolau, & Charney, 1997). Critics have called for verification of veterans' retrospective reports using military personnel "201" files (Marlowe, 2000; McNally, 2003; Satel, 2004). Some have suggested that the integrity of the PTSD database may be at stake (e.g., Frueh et al., 2005; McNally, 2003).

These questions about the NVVRS have become more urgent in the context of the possible relevance of what has been learned about the psychological risks of Vietnam to the risks now being undergone by U.S. forces fighting in Iraq and Afghanistan (e.g., Hoge, Auchterlonie, & Milliken, 2006; Shane, 2004). In the course of our ongoing research with the NVVRS data set, we discovered a treasure trove of historical material and data from military records that were not available at the time the NVVRS was conducted. We also had been working with tape-recorded data from detailed diagnostic examinations of a subsample of the NVVRS veterans. We realized that we had, or could obtain, data that might resolve this controversy.

We published our findings about the psychological risks of Vietnam for U.S. veterans last summer in *Science* (Dohrenwend et al., 2006). At the time, our report was accompanied by a commentary by McNally (2006), and both our report and McNally's comments about it gave rise to many interviews with reporters about our work

and its implications (e.g., Carey, 2006; Weiss, 2006). Still more recently, there have been four letters in *Science* about our study and McNally's comment (Buckley, 2007; Frueh, 2007; Kilpatrick, 2007; Vermetten, Bremner, Skelton, & Spiegel, 2007; and responses from us (Dohrenwend et al., 2007) and from McNally (2007). A symposium on the continuing controversy was held at the November 2006 meeting of the International Society of Traumatic Stress Studies (ISTSS), and is the point of departure for this section of the *Journal of Traumatic Stress*. Our purpose here is to describe our procedures and results, sometimes in more detail than was possible in our report for *Science* or in the ISTSS symposium, as the research bears not only on the controversy up to the time of our publication in *Science*, but also as our results relate to the more recent discussions and commentary.

THE NVVRS FULL SAMPLE OF VIETNAM VETERANS AND THE DIAGNOSED SUBSAMPLE

The NVVRS was an extraordinary undertaking, and it is still the only fully representative sample of U.S. veterans of the Vietnam War in existence. To appreciate what was involved in achieving this sample, you will need reminders of some important features of the war in Vietnam.

Officially, the Vietnam War began with the Bay of Tonkin resolution by the U.S. Congress in August 1964. This resolution authorized President Johnson to use massive U.S. force on behalf of South Vietnam. The war ended with the surrender of the South Vietnamese to the North Vietnamese in May 1975. During this 11-year period, an estimated 3.14 million men from the United States served in the Vietnam Theater of operations, which included Vietnam, U.S. ships in surrounding waters, and U.S. bases in neighboring countries such as Thailand. These men are referred to as Theater veterans to distinguish them from veterans who served at the same time, but in places other than the Vietnam Theater. We will refer to the latter as Era veterans who were also sampled as a comparison group for purposes of the NVVRS.

The NVVRS sample of male Theater veterans consisted of 1,200 men. It was drawn on a full probability basis from veteran records extracted from personnel files (201 files). This sampling procedure provided a far more representative target group than any household sample could possibly have done because it involved locating the veterans drawn into the sample whether they were in households, or in other places, such as hospitals, prisons, or homeless shelters. A much smaller subsample consisting of 260 male Theater veterans was selected for more intensive psychiatric study than could be accomplished with members of the full sample, given the time and funds available. These 260 were drawn from veterans in the 1,200-member sample who resided in 28 standard metropolitan regions (SMRs) that had convenient clinical facilities in which psychiatric examinations could be conducted. These urban settings included the 15 largest SMRs in the United States. As with the full Theater sample, the completion rate for the subsample was well over 80%. Unlike most of the men in the full Theater sample, these subsample veterans received clinical diagnostic examinations conducted by experienced doctoral-level clinicians. With appropriate sampling weights, the results can be generalized to the population of male Theater veterans or the population from the 28 SMRs (Kulka et al., 1988, Appendix B and Appendix D). The relevant full sample and subsample weights are used in all analyses reported here. Because the use of weighted data artificially reduces estimated standard errors, inferential statistics are calculated using SUDAAN, a statistical package that employs Taylor-series estimation to compute standard errors (Shah, Barnwell, & Bieler, 1997).

Table 1 shows that the diagnosed subsample is very similar in demographic and military background characteristics to the NVVRS sample of male Theater veterans as a whole. Of major importance for our purposes is the fact that the rate of PTSD estimated from the subsample is at least as high as the rate estimated from the full Theater sample. We know this because of results obtained with the NVVRS measure of current PTSD that was used in both the 1,200-member sample and in the subsample. In the subsample of veterans from the 28 SMRs, this measure estimated a 15.4% rate of current PTSD compared with

15.2% in the full sample. This finding is important because it suggests that the subsample is psychiatrically equivalent to the full sample of male Theater veterans.

VIETNAM: A "WAR AMONGST THE PEOPLE"

As we noted at the outset, the Vietnam War has been described as a low intensity war as measured by casualty rates (Jones & Wessely, 2001). However, a quantitative distinction of this kind may not be the most relevant way to compare the Vietnam War with more traditional wars. The Vietnam War was a qualitatively different kind of war than previous wars such as World War I and World War II. It involved what Smith (2006) refers to as a paradigm shift from industrial wars between states that involved armies with roughly comparable forces on fields of battle, to a "war amongst the people" (Smith, 2006, p. 5). In this latter type of war, a "war without fronts" (Thayer, 1985), not all combatants are armies, and it is often difficult to distinguish between the enemy and friendly civilians. Exposures to war-zone stressors may be more difficult to locate and define in this type of war among the people.

Dean (1997) has been cited (e.g., in McNally, 2003) as the source of the figure of 15% in combat. As we read the historical literature about the war, the 15% probably includes the 10.5% of Army forces who were infantrymen (Clodfelter, 1995, p. 238) and their combat counterparts in the Marines, Navy, and Air Force. However, the 15% clearly does not include an additional 14% who were regularly exposed to combat hazards while serving in support roles, such as combat engineers and artillery personnel (Clodfelter, 1995, p. 238). Our estimate from data in the 201 files of the NVVRS Theater veterans is that 23.1% served in high combat exposure military occupational specialties (MOSs), such as infantrymen, medics, combat engineers, cannon crewmen, and cannon-fire direction specialists (Dohrenwend et al., 2004).

Estimates of the percentage exposed to combat dangers increase, however, when Vietnam is recognized as a war without fronts rather than a conventional war (Thayer, 1985). For U.S. forces, 30.4% of combat engagements

Table 1. Demographic and Military Background Characteristics of Full NVVRS Sample of Male Vietnam Theater Veterans and in the Diagnosed Subsample of Those Veterans

Background characteristic	Full sample %	Subsample %
Age at entry to Vietnam		
Under 20	24.9	27.7
20	22.1	20.5
21	14.7	13.4
22–24	18.9	19.1
25 and up	19.4	19.3
Total	100.0 (<i>n</i> = 1,180)	100.0 (<i>n</i> = 256)
Race or ethnic group		
White	81.3	77.2
Black	11.2	13.2
Hispanic	5.4	6.5
Other	2.1	3.1
Total	100.0 (<i>n</i> = 1,200)	100.0 (<i>n</i> = 259)
Educational attainment at follow-up		
Less than high school grad	6.4	8.1
High school grad	34.3	26.3
Some college	42.6	44.0
College grad	7.2	10.5
Grad/Prof Work	9.5	11.1
Total	100.0 (<i>n</i> = 1,200)	100.0 (<i>n</i> = 259)
Marital status at follow-up		
Married	75.3	79.5
Separated	3.9	3.9
Divorced	13.5	9.2
Widowed	0.5	0.0
Never married	6.7	7.3
Total	99.9 (<i>n</i> = 1,200)	99.9 (<i>n</i> = 259)
Grade at discharge		
Enlisted: E1–E4	51.3	46.8
E5–E6	33.2	38.7
E7–E9	8.6	8.3
Officer	6.9	6.2
Total	100.0 (<i>n</i> = 1,200)	100.0 (<i>n</i> = 259)
Branch of service		
Army	52.9	56.2
Air Force	16.0	15.4
Navy	21.1	19.9
Marines	9.8	8.3
Coast Guard	0.1	—
Total	99.9 (<i>n</i> = 1,197)	99.8 (<i>n</i> = 258)
Record-based measure of probable severity of exposure to war-zone stress (MHM; described below)		
Low	19.8	25.1
Moderate	68.4	64.0
High	8.5	7.6

Continued

Table 1. Continued

Background characteristic	Full sample %	Subsample %
Very high	3.2	3.4
Total	99.9 (<i>n</i> = 1,200)	100.1 (<i>n</i> = 259)
Current PTSD according to the NVVRS algorithm (described below)		
Yes	15.2	15.4
No	84.8	84.6
Total	100.0 (<i>n</i> = 1,200)	100.0 (<i>n</i> = 259)

Note. Percentages are weighted to the populations from which the samples were drawn. Totals not equal to 100.0 are due to rounding error. Sample *ns* are in parentheses. NVVRS = National Vietnam Veterans Readjustment Study; MHM = military/historical measure; PTSD = posttraumatic stress disorder.

were “organized enemy attacks against U.S. static defense perimeter[s]” (Pentagon Papers, 1971, pp. 461–462). The U.S. bases were regularly at risk of such standoff attacks by mortars, rockets, and recoilless rifles; from 1967–1972, North Vietnamese and Vietcong troops launched an average of about 14,000 standoff attacks per year (Thayer, 1985, pp. 46–47). Against this background, Kolko (1985) estimated that, in all, 50% of soldiers were considered combat forces (p. 361). Baskir and Strauss (1978) conclude that about 1.6 million of the 2.15 million men they estimate were assigned to tours in Vietnam itself served in combat (p. 53). The latter estimate is close to Kolko’s when we add supporting troops on ships and land bases in Thailand and elsewhere (e.g., Guam), increasing the denominator to about 3.14 million. Nor were forces who did not serve in combat free of risk in this type of war. As Karnow (1991) put it, “While infantrymen obviously faced greater risks, headquarters typists were also vulnerable” (p. 479).

OUR APPROACH TO THE CONTROVERSY

To capture something of this complexity, we used military records and historical accounts to develop measures of probable severity of exposure to war-zone stressors. The record-based military/historical measures (MHMs) provide prospective estimates of exposure that are independent of the veterans’ retrospective reports. We also relied on the best psychiatric data available, the clinical diagnoses in the

subsample of NVVRS veterans to measure PTSD. In addition, we used impairment of functioning and severity of disorder ratings by the clinicians to distinguish impairing from milder PTSD.

Finally, the MMPI was available on all subsample veterans, so it was possible to construct MMPI validity scales for these respondents (Gough, 1947, 1950, 1957; Greene, 1988; Weiner, 1948). We used these scales as well as the data extracted by the NVVRS from military personnel files (201 files) for sampling purposes and other military records to check on the credibility of the veterans’ reports of exposure to war-zone stressors and symptoms of PTSD.

DESCRIPTIONS OF MAIN MEASURES AND RESULTS OBTAINED WITH EACH

Central to our approach are two sets of measures: first, measures of probable severity of exposure to war-zone stressors that we constructed with military records and historical accounts; second, measures of the onset and course of war-related PTSD that we developed from information obtained in the NVVRS clinical examinations conducted by experienced clinicians with subsample veterans. We shall describe both sets of measures and some results obtained with each in more detail than in any one of our previous publications and in more detail than other measures to which they will be related, but which we

Table 2. Relation of Company Rates of Killed in Action (KIA) During Veteran's Tour to Previous Composite Military/Historical Measure (MHM) of Probable Severity of Exposure to War-Zone Stressors in Male Theater Sample as a Whole

Previous composite MHM	Company rates of KIA				Total %
	None %	One %	2-9 %	10 or more %	
Low combat exposure ($n = 151$)	71.4	9.8	16.0	2.9	100.0
Moderate combat exposure ($n = 641$)	53.5	14.3	24.9	7.3	100.0
High combat exposure ($n = 212$)	17.3	15.4	37.2	30.1	100.0
Total ($n = 1,004$)	52.4	13.5	24.7	9.4	100.0

Note. Percentages are based on data weighted to reflect the complex sampling design; sample ns are in parentheses. The number of KIA in the companies of 196 of the veterans could not be ascertained. These veterans were assigned to low, medium, or high probable severity of exposure based on the other three MHMs. From "The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods," by B. P. Dohrenwend, J. B. Turner, N. A. Turse, B. G. Adams, K. C. Koenen, and R. Marshall, 2006, *Science*, 313, 979-982. Copyright 2006 by the American Association for the Advancement of Science. Adapted from Table 1 in Supplementary Online Material (SOM).

have not constructed ourselves. More detailed information about the latter, such as the NVVRS algorithm for current PTSD based on symptom scales and the NVVRS measure of war-zone stress based on retrospective reports by the veterans, can be found in references that we cite in the text.

Probable Severity of Exposure to War-Zone Stressors Based on Historical Accounts and Military Records

Our military/historical measure (MHM) of probable severity of exposure consists of four components: (a) the veteran's MOS, ranging from infantryman (high exposure) to clerk (low exposure); (b) the monthly casualty rate (KIA) during the veteran's service in Vietnam, ranging from a high of 4.2/1,000 in February 1968 during the Tet offensive, to a low of 0.11/1,000, in November 1971 just before the end of U.S. fighting; (c) the casualty rate (KIA) in the veteran's larger military unit (e.g., Division, typically consisting of about 20,000 men) ranging from a high of 78.3/1,000 in the 1st Marines to a low of 0.6/1,000 in the Engineer Command; and (d) the casualty rate (KIA) in the veteran's company (usually consisting of about 200 men) or other smaller unit during his Vietnam service. This ranged from no KIA for 52.4% of veterans to 10 or more KIA for 9.4% of veterans.

The first three measures were combined into a composite measure of low, moderate, and high probable severity of exposure by procedures described in detail elsewhere (Dohrenwend et al., 2004). The fourth measure that we constructed later on the basis of more recently available archival data (Coffelt, Arnold, & Argabright, 2002) was used to validate the first three, as shown in Table 2.

On the basis of the results given in Table 2, it was also possible to refine the previous composite measure into a four-category variable that can be summarized as follows. Veterans in the high and very high categories (11.7%) typically had high exposure MOSs, were in large military units with high KIA rates, and served at times of high U.S. KIA rates; men in the very high category (3.2%) were further distinguished by having been in small units (e.g., companies) that suffered 10 or more KIAs during the veteran's service. By contrast, veterans in the low exposure category (19.8%) typically had low exposure MOSs, served in large units with low KIA rates, served at times of low KIA rates, and were in small units with no KIAs during the veteran's service. The remaining veterans in the moderate exposure category (68.4%) differed from those in the low exposure category mainly in that most served in Vietnam when KIA rates were moderate or high rather than low.

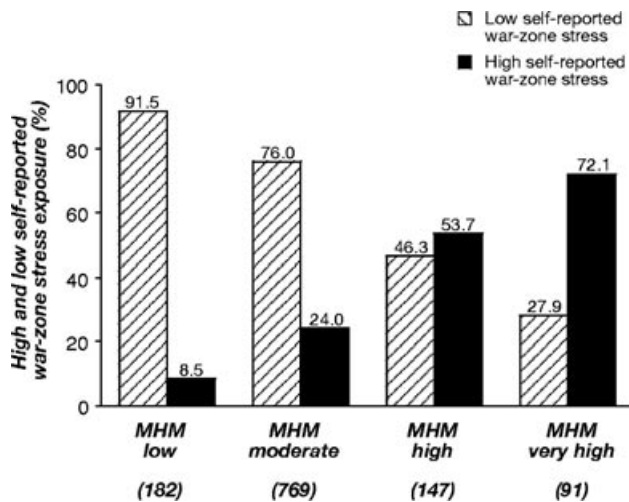


Figure 1. Percentages of veterans with self-reported high and self-reported low war-zone stress exposure by military/historical measure (MHM) of probable severity of exposure to war-zone stressors (full sample $n = 1,189$, excluding 11 veterans with missing data on self-reported war-zone exposure). Percentages are based on data weighted to reflect complex sampling design; sample n s are in parentheses. From “The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods,” by B. P. Dohrenwend, J. B. Turner, N. A. Turse, B. G. Adams, K. C. Koenen, and R. Marshall, 2006, *Science*, 313, 979–982. Copyright 2006 by the American Association for the Advancement of Science. Adapted with minor correction of percents in the first two columns from Figure 1.

Figure 1 shows the relationship between our record-based MHM exposure and the NVVRS measure of war-zone stress based on retrospective reports by the veterans (see Kulka et al., 1988, Appendix C). The relationship is very strong. For example, only 8.5% of the veterans who had low MHM exposure reported high war-zone stress compared with 72.1% of the veterans in the very high MHM exposure category.

The NVVRS Algorithm for Current PTSD in the Full Male Theater Sample

The NVVRS algorithm for current PTSD consists of a calibration of self-report symptom scales, mainly against

the Structured Clinical Interview for DSM-III-R (SUD; Spitzer, Williams, & Gibbon, 1988) diagnoses in the subsample, to approximate a clinical diagnosis of current PTSD (Kulka et al., 1988, Appendix D). This measure is the basis for the published NVVRS current prevalence rate of 15.2%. Note that the NVVRS algorithm focuses only on current prevalence. The often-quoted 30.9% lifetime rate was extrapolated from the results of the SCID diagnoses in the subsample which showed a roughly 2:1 ratio between lifetime and current PTSD.

To investigate questions about the possible falsification of symptom reporting, we reasoned that if some NVVRS veterans exaggerated their PTSD symptoms by outright lying or more subtle retrospective distortions (Young, 2004), these veterans should be overrepresented among veterans who reported experiencing high war-zone stress despite the fact that record-based MHMs indicated probable low or moderate severity of exposure. Although interview and questionnaire methods for detecting dissembling are far from ideal (e.g., Rosen, 2004), data were available for subsample veterans from which we were able to construct three Minnesota Multiphasic Personality Inventory (MMPI) “fake bad” and “dissembling” validity scales (Gough, 1947, 1950, 1957; Greene, 1988; Weiner, 1948). Mean scores on each scale and percentages above the usual cut-offs on all three scales were not elevated in the discordant exposure groups.

The one indication of possible exaggeration emerged in our analysis of current PTSD measured by the NVVRS algorithm in the full Theater sample ($n = 1,200$). By this measure, the rate of current PTSD among veterans reporting high war-zone stress was 46.9% in the context of low MHM exposure (sample $n = 22$) compared with 26.7% in the context of high MHM exposure (sample $n = 96$) and 37.4% in the context of very high MHM exposure (sample $n = 73$). However, these differences are not statistically significant with the small sample size in the most discordant exposure group. Importantly, they do not replicate with SCID diagnoses in the subsample.

The possibility of receiving disability compensation might motivate falsification of symptoms and exposure reports (e.g., Frueh et al., 2005). In our previous analysis

of this question, we mistakenly reported that an estimated 9.3% of the Theater veterans said that they sought or received compensation for psychiatric disability (Dohrenwend et al., 2006). This incorrect figure is nearer the undifferentiated record-based figure of 11.0% of Theater veterans who received compensation for physical disability and/or psychiatric disability. Seeking or receiving compensation for psychiatric disability was reported by only 2.7% of the male Theater veterans in general and 5.7% of the subsample veterans who were diagnosed with current war-related PTSD. Of importance for our purposes, there was no elevation of compensation-seeking among veterans discordant on the exposure measures; for example, as we correctly reported previously, only 3.0% of the veterans who reported high exposure in the context of low MHM exposure sought compensation compared with 15.6% who were high on both exposure measures (Dohrenwend et al., 2006).

The SCID Diagnoses of War-Related PTSD in the Subsample

The SCID (Spitzer, Williams, & Gibbon, 1988) was used in examinations by experienced doctoral-level clinicians, who were not Veteran's Affairs (VA) employees, with members of the subsample. Examinations were tape-recorded, permitting careful reliability checks (Weiss et al., 1992). Importantly, the clinicians obtained information that made it possible for us to distinguish war-related PTSD from PTSD with first onsets that were related to events that occurred prior to or after service in Vietnam.

The diagnostic examiners recorded the times of occurrence of traumatic events and onsets of symptoms (Schlenger, 1987). From this information, we estimated that 1.3% of the veterans had first onsets of PTSD prior to Vietnam service, and 0.1% had first onsets that could be attributed to a post-Vietnam traumatic event in the absence of prior Vietnam-related PTSD. There are too few subsample veterans (4 veterans) with pre-Vietnam first onsets to analyze as a separate group. With these removed, the rate of war-related first onsets of PTSD is 22.5%

($SE = 3.4\%$) and the rate of still current war-related onsets 12.2% ($SE = 2.3\%$).

Recall that the full-sample NVVRS PTSD measure used self-report symptom scales to provide an economical approximation of a diagnosis of current PTSD, whether or not PTSD was war-related. However, if one (a) takes the NVVRS rate of 2.5% current PTSD for Era veterans who did not serve in Vietnam (Kulka et al., 1990) as an estimate of noncombat-related current PTSD, (b) doubles it as per the 2:1 ratio of lifetime to current PTSD originally reported by the NVVRS (Kulka et al., 1988; 1990), and (c) subtracts the resulting rates from these original NVVRS 30.9% lifetime and 15.2% current PTSD rates—the result is 25.9% lifetime and 12.7% current war-related PTSD. These figures are very close to the lifetime onsets of war-related PTSD (22.5%) and war-related current PTSD (12.2%) estimated on the basis of the subsample diagnostic information and reported above. This correspondence is what you would expect if the self-report symptom scales were successfully calibrated against the SCID diagnoses (Dohrenwend et al., 2007).

To get an idea of the types of criterion traumatic events involved in the SCID diagnoses of war-related PTSD in the subsample, we extracted descriptions of the events from the tape-recorded clinical interviews and responses to open-ended questions in the survey interviews from all subsample veterans, and we rated these accounts blind to diagnostic outcomes. At least one personally life-threatening event was reported by 86.6% of the 90 Theater veterans in the subsample with war-related onsets. The remaining veterans reported other traumatic events, most usually witnessing the deaths or serious injuries of other U.S. military personnel or of Vietnamese prisoners or civilians.

Veterans' 201 files do not systematically record information about specific war-zone experiences (U.S. National Archives and Record Administration, 2006). However, these files routinely contain, or make it possible to access from historical accounts, other valuable indicators of the likelihood of having experienced traumatic stressors. These indicators include having had a high exposure MOS; having received a Purple Heart for being wounded, a combat medal or Combat Infantryman Badge; having served in

a company with one or more KIA during the veteran's tour; having been attached to a high casualty division; and having been in Vietnam during the nationwide Tet offensive. More than one of these indicators was present for all 30 subsample veterans in our high or very high MHM exposure groups. One or more of these indicators was also present in the 201 files of 47 of the 60 subsample veterans diagnosed with war-related PTSD in the low and moderate MHM exposure groups.

Two of the record-based indicators, service during the Tet offensive and attachment to a high casualty division, arguably represent less likelihood of severe exposure than do the others. Ten of these 47 subsample veterans had only these indicators. We examined descriptions of their war-zone experiences to see if they reported less severe events, such as witnessing rather than personally experiencing life-threatening events. As in the onset group as a whole, the large majority, 86.7% described experiencing personal life threats.

To investigate the validity of the reports of the remaining 13 of the 60 veterans with onsets of PTSD, but none of the record-based indicators of probable exposure, we compared their narratives of traumatic events with information from military histories (e.g., Fox, 1979; Sigler, 1992) and from newspaper accounts of events in Vietnam published contemporaneously in *The New York Times* and *The Los Angeles Times*. These independent sources confirmed the narratives of traumatic events of five veterans: Attacks on air bases reported by three veterans were reported in detail in a military history of Air Force actions (Fox, 1979); a harrowing rescue of U.S. personnel in a downed aircraft described by one veteran who served in a submarine was corroborated in a newspaper account, as was a typhoon that occurred during a series of attacks on another veteran's base. This left only eight subsample veterans whose accounts were not confirmed by any of our independent checks. Record information was contradictory for only two of these eight veterans: one reported several combat medals, with no supporting evidence in his 201 file; the other's account of his exploits seemed out of proportion, and the diagnosing clinician noted that he may have been somewhat delusional.

Impairment of Functioning

When the NVVRS was conducted, the diagnosis of PTSD according to the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-III-R; APA, 1987)* did not include impairment of functioning. By contrast, the more recent *DSM-IV (APA, 1994)* requires evidence of clinically significant distress or disability in social, occupational, or other important areas of functioning. Skeptics speculated that the PTSD measured in the NVVRS might indicate relatively mild psychological distress rather than true disorder.

Although only a few of the comparisons are statistically significant, the direction of the differences in Table 3 is consistent: War-related PTSD tends to be related to more unemployment following service in Vietnam, less ability to maintain a stable marriage, lower socioeconomic (SES) attainment, and less likelihood of achieving a college education among those who were not college graduates prior to service in Vietnam. Fortunately, moreover, the subsample SCID diagnoses included ratings of severity and impairment on the Global Assessment of Functioning Scale (GAF; Spitzer, Williams, & Gibbon, 1987) with which to further address this question.

The GAF ranged from 9 (*good functioning in all areas*) to 1 (*persistent danger of severely hurting self or others*), with anchoring examples of poor functioning or distress symptoms at each level. The ratings were made for functioning at the time of the SCID examination. Table 4 shows that 85% of the subsample veterans with current war-related PTSD had more than slight impairment at the time of the examination 11 to 12 years after the war. By contrast, veterans with past war-related PTSD closely resembled the veterans with no war-related PTSD—with the large majority in both groups showing good functioning or no more than slight impairment at the time of the examination.

The GAF ratings were made only for current functioning; that is, for functioning at the time of the diagnostic interview many years after the war. In addition, however, the clinicians rated the severity of PTSD when it was at its worst, as well as at the time of the diagnosis. As Table 5

Table 3. Post-Vietnam Marital Status, Educational Attainment, Socioeconomic Status (SES) and Unemployment in Subsample Veterans With No War-Related Posttraumatic Stress Disorder (PTSD), Past War-Related PTSD, and Current War-Related PTSD

Post-Vietnam service attainments	War-Related PTSD		
	None	Past	Current
Married, never separated or divorced	67.7%	28.3%***	34.6%***
Total <i>n</i>	(163)	(30)	(60)
Completed college for those with no Pre-Vietnam degree	16.1%	11.5%	7.3%
Total <i>n</i>	(145)	(29)	(58)
SES	43.5	38.5	37.8
Total <i>n</i>	(162)	(30)	(59)
Periods of unemployment of one month or more divided by number of years from leaving Vietnam to follow-up	.055	.067	.194*
Total <i>n</i>	(148)	(27)	(51)

Note. Percentages are weighted to the population from which the sample was drawn. Sample *ns* are in parentheses.

*Differs significantly from "None" at $p \leq .10$. **Differs significantly from "None" at $p \leq .05$. ***Differs significantly from "None" at $p \leq .01$.

Table 4. Estimated Impairment on the GAF Scale in the 260-Member Subsample of Veterans Diagnosed by Experienced Clinicians Using SCID as Having No Lifetime War-Related First Onsets of PTSD (Past or Current), Past War-Related First Onsets of PTSD, and War-Related First Onsets of PTSD That Were Current^a

Functioning	War-related first onsets of PTSD		
	None (<i>n</i> = 158)%	Past (<i>n</i> = 30)%	Current (<i>n</i> = 59)%
09 Good in all areas	46.6	43.6	0.0
08 No more than slight impairment	29.9	24.0	15.1
07 Some difficulty in social, occupational, or school functioning	18.3	23.9	40.5
06 Moderate difficulty	2.7	8.2	15.6
05 Any serious impairment	1.7	0.3	21.1
04 Major serious impairment in several areas	0.1	0.0	7.0
03 Inability to function	0.0	0.0	0.0
02 Some danger to self or others	0.0	0.0	0.0
01 Persistent danger to self or others	0.0	0.0	0.4

Note. Sample *ns* are in parentheses and percentages are based on data weighted to reflect the complex sampling design. Omitted from the analysis are four veterans with prewar onsets, two missing onset information, one missing sampling weight, and six veterans missing impairment scores. GAF = Global Assessment of Functioning; SCID = The Structured Clinical Interview for DSM-III-R; PTSD = posttraumatic stress disorder.

^aA chi-square test shows that the overall difference in the percentages of male veterans with more than slight impairment is statistically significant at the 0.01 level. Individual tests show that the percentage impaired in veterans with current war-related PTSD is significantly greater at the 0.01 level than the percentage impaired in veterans with past PTSD and the percentage impaired in veterans with no PTSD. From "The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods," by B. P. Dohrenwend, J. B. Turner, N. A. Turse, B. G. Adams, K. C. Koenen, and R. Marshall, 2006, *Science*, 313, 979–982. Copyright 2006 by the American Association for the Advancement of Science. Adapted from Table 1.

Table 5. Mean Current Impairment (GAF) Ratings according to Ratings of Severity of Current PTSD in National Vietnam Veterans Readjustment Study Subsample Veterans Who had Onsets of Past or Current War-Related PTSD

Ratings of current severity of PTSD symptoms	Mean current GAF rating ^a	SD
In complete remission: previously met criteria but has no symptoms in past 6 months	8.57	0.50
In partial remission: previously met criteria currently has some significant symptoms but does not meet criteria	7.93	1.04
Severity of still current PTSD		
Mild	6.86	1.18
Moderate	6.30	1.09
Severe	5.67	1.14

Note. Sample $n = 89$; means and standard deviations are based on weighted data. GAF = Global Assessment of Functioning; SCID = The Structured Clinical Interview for DSM-III-R; PTSD = posttraumatic stress disorder.

^aSee Table 4 for summary description of GAF ratings.

shows, the rating of the severity of current PTSD is strongly related to the GAF rating of current impairment.

These severity ratings suggest that the results in Table 4 underestimate impairment when the disorder was at its worst. For example, 36.1% of veterans with current war-related PTSD (current group) were rated mild, 43.1% moderate, and 20.8% severe at the time of diagnosis. When this still-present PTSD was at its worst, 3.7% of veterans were rated mild, 31.8% moderate, and 66.5% severe.

Of those with past war-related PTSD (past group), only 7.2% were rated mild when the disorder was at its worst; 73.6% were rated moderate, and 19.2% severe. This suggests that the past group had disorders that were at least as severe at their peak as the disorders in the group with current PTSD at the time of diagnosis (current group). It follows that, like the current group (see Table 4), at least 85% in the past group had significantly impairing PTSD.

All of these measures of impairment focused on veterans who were still alive at the time of the NVVRS follow-up 11 to 12 years after the war. An important study by Hearst, Newman, and Hulley (1986) of the impact of military service during a period of the Vietnam War on postwar service mortality suggests that focus on the living may underestimate psychiatric impairment in the Vietnam cohort as a whole. Capitalizing on an approximation of a randomized

experiment created by the military draft lottery of 1970 to 1972, these investigators were able to show with data from California and Pennsylvania that rates of premature mortality from suicide and motor vehicle accidents were elevated in men who served in the military compared with their counterparts who did not.

MAIN RESULTS FOR THE CONTROVERSY

Differing Rates of PTSD With Different Criteria for the Disorder

Three of the above analyses have implications for assessing the rate of PTSD in U.S. male veterans of the war in Vietnam. In our previous report, we presented rates modified by results of each of the three analyses; that is, we required that the first onsets of PTSD be war-related; that there be independent, record-based evidence for the plausibility of antecedent exposure to criterion stressors; and that the PTSD be associated with more than slight impairment of functioning.

We saw earlier that the figures of 22.5% lifetime and 12.2% current war-related PTSD, repeated in the top row of Table 6, are somewhat lower than the original NVVRS rates of lifetime and current PTSD (30.9% and 15.2%, respectively) that do not focus only on war-related PTSD.

Table 6. Percentages of Lifetime First Onsets and Current First Onsets of War-Related PTSD in the 260-Member SCID-Diagnosed Subsample of Veterans With and Without Adjustments for the Requirements of Impairment and/or Independent Documentation of Traumatic Exposure

Adjustments	Lifetime ($n = 90$)%	Current ($n = 60$)%
Unadjusted	22.5	12.2
Adjusted for impairment of functioning	21.0	10.4
Adjusted for documentation of exposure	20.3	11.1
Adjusted for both impairment and documentation	18.7	9.1

Note. Percentages are weighted to the population from which the sample was drawn. Omitted from the analysis are four veterans with pre-war onsets, two missing onset information, and one missing a sampling weight. PTSD = Posttraumatic stress disorder; SCID = The Structured Clinical Interview for DSM-III-R. From "The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods," by B. P. Dohrenwend, J. B. Turner, N. A. Turse, B. G. Adams, K. C. Koenen, and R. Marshall, 2006, *Science*, 313, 979–982. Copyright 2006 by the American Association for the Advancement of Science. Adapted from Table 2.

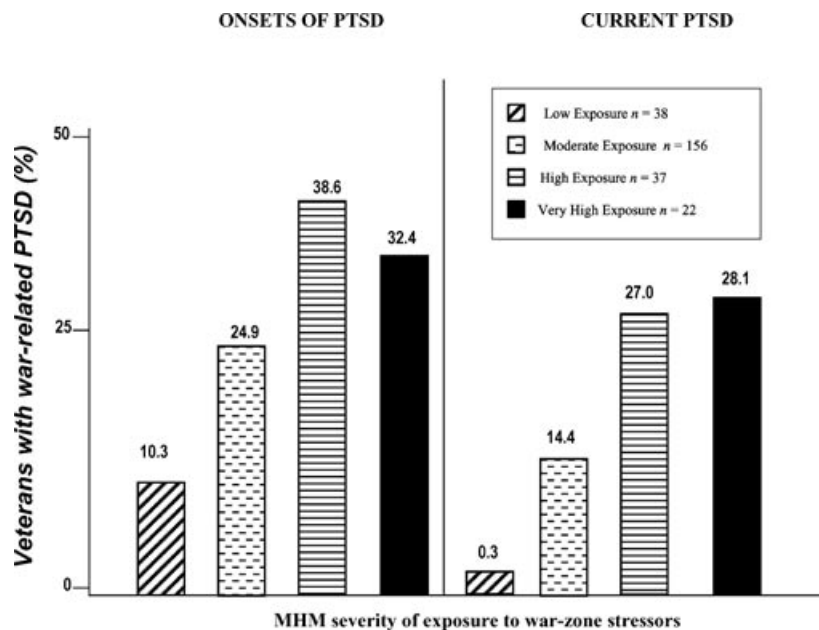


Figure 2. Weighted percentages of veterans with war-related first onsets of posttraumatic stress disorder (PTSD) and war-related first onsets of PTSD that were current at the time of the study by record-based military/historical measure (MHM) of severity of exposure to war-zone stressors (subsample $n = 253$, omitting 4 veterans with prewar onset, 2 missing onset information, and 1 missing sampling weight). From "The Psychological Risks of Vietnam for U.S. Veterans: A Revisit with New Data and Methods," by B. P. Dohrenwend, J. B. Turner, N. A. Turse, B. G. Adams, K. C. Koenen, and R. Marshall, 2006, *Science*, 313, 979–982. Copyright 2006 by the American Association for the Advancement of Science. Adapted from Figure 2.

Table 6 shows that the rates are reduced still further if we remove veterans with no more than slight impairment of functioning and veterans without independent confirmation of the plausibility of traumatic exposure.

Dose-Response Relationship

The NVVRS reported a strong dose-response relationship between retrospective reports of exposure and rates of

current PTSD measured by the NVVRS algorithm. When this positive relationship between increasing severity of exposure and increasing rates of PTSD is called into question on the grounds that recall biases may have inflated the relationship, the basic validity of the construct of war-related PTSD is being challenged. It is for this reason that our prospective measure of probable severity of exposure, a measure that is completely independent of the veterans' recall of their experiences, is of such importance in testing whether a believable dose/response relationship exists.

We showed earlier in Figure 1 that the relationship between our record-based measure of exposure and the NVVRS measure of war-zone stress based on the veterans' retrospective reports is very strong. The relationship is not, however, perfect and does not directly address the question. The results in Figure 2 do directly address the question. Figure 2 shows that there is a very strong dose/response relationship between the record-based MHM exposure and clinically diagnosed PTSD, the two best measures that we have available for the purpose. The relationship is especially strong for current PTSD, with less than 1% of the low-exposed receiving this diagnosis, compared to 28.1% in the very high exposure category. Omission of the veterans with unconfirmed traumatic exposure and/or those with no more than slight impairment had little effect on the results shown in Figure 2. With these veterans removed, current war-related PTSD in the very high exposure group was reduced to 23.4% and in the low exposure group, it was reduced to zero. These results compare favorably with the previous dose/response findings using the algorithm for current PTSD and the NVVRS self-report war-zone stress measure.

CONCLUSIONS

Skeptics have pointed to the fully adjusted rates of 18.7% lifetime war-related onsets and 9.1% war-related current PTSD in arguing that our results show that the original NVVRS rates of 30.9% lifetime and 15.2% current were grossly inflated. In his commentary in *Science*, McNally (2006) nominated the 40% reduction in the NVVRS, 30.9% lifetime and 15.2% current PTSD rates as our most

newsworthy finding, and Buckley (2007) concluded in his Letter to the Editor about our study that we had confirmed his view and the view of other skeptics that the previous NVVRS rates were unreasonably high. The press has echoed this highly selective emphasis on a lower rate in the headlines for their otherwise exemplary accounts of our research. In point of fact, however, we found little evidence of dissembling or more subtle forms of exaggeration by the NVVRS veterans. The discrepancies between the original NVVRS rates and the rates we estimated are attributable to differences in the definition of disorder rather than to inflationary measurement error in the original rates (Dohrenwend et al., 2007).

It seems necessary to point out, therefore, that these fully adjusted rates refer to PTSD that has been associated with significant impairment of functioning. These conservative rates of almost 1 in 5 lifetime first onsets of impairing war-related PTSD, with almost 1 in 10 present many years after the war, are substantial and indicate a severe psychological toll on those who served in Vietnam. The toll increases if we factor in premature deaths from suicide and motor vehicle accidents after military service (Hearst, Newman, & Hulley, 1986).

The nature of the psychological toll is especially evident in the strong dose/response relationship between severity of exposure to war-zone stressors and PTSD. The dose in this relationship is measured by record-based indicators of probable severity of exposure that are clearly antecedent to, and independent of, the veterans' recall of their experiences, and the syndrome of symptoms representing the PTSD response is measured by state of the art diagnoses by experienced clinicians. The resulting association is about as near as we can come to demonstrating a causal relationship in cross-sectional, observational research of this kind. We believe that this dose/response relationship is our most important finding.

Also important, but less firm, are the results showing that the trajectory for most veterans who developed war-related PTSD that causes substantial impairment seems to be toward amelioration or complete remission in the 10–11 year period after the end of the war. This trend toward recovery over time cannot be explained entirely

by treatment administered by mental health professionals because less than half the veterans with past war-related PTSD (44.9%) received such treatment. However, this inference about improvement is based on retrospective data. There is a strong need to check and extend this evidence of recovery with a longitudinal follow-up of the NVVRS sample. Such a follow-up would help fill a major gap in our knowledge about the course of war-related PTSD.

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