*Research Article*

# APPROXIMATING A DSM-5 DIAGNOSIS OF PTSD USING DSM-IV CRITERIA

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**Background:** *Diagnostic criteria for DSM-5 posttraumatic stress disorder (PTSD) are in many ways similar to DSM-IV criteria, raising the possibility that it might be possible to closely approximate DSM-5 diagnoses using DSM-IV symptoms. If so, the resulting transformation rules could be used to pool research data based on the two criteria sets.* **Methods:** *The pre–post deployment study (PPDS) of the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS) administered a blended 30-day DSM-IV and DSM-5 PTSD symptom assessment based on the civilian PTSD Checklist for DSM-IV (PCL-C) and the PTSD Checklist for DSM-5 (PCL-5). This assessment was completed by 9,193 soldiers from three US Army Brigade Combat Teams approximately 3 months after returning from Afghanistan. PCL-C items were used to operationalize conservative and broad approximations of DSM-5 PTSD diagnoses. The operating characteristics of these approximations were examined compared to diagnoses based on actual DSM-5 criteria.* **Results:** *The estimated 30-day prevalence of DSM-5 PTSD based on conservative (4.3%) and broad (4.7%) approximations of DSM-5 criteria using DSM-IV symptom assessments were similar to estimates based on actual DSM-5 criteria (4.6%). Both approximations had excellent sensitivity (92.6–95.5%), specificity (99.6–99.9%), total classification accuracy (99.4–99.6%), and area under the receiver operating characteristic curve (0.96–0.98).* **Conclusions:** *DSM-IV symptoms can be used to approximate DSM-5 diagnoses of PTSD among recently deployed soldiers, making it possible to recode symptom-level data from earlier DSM-IV studies to draw inferences about DSM-5 PTSD. However, replication is needed in broader trauma-exposed samples to evaluate the external validity of this finding. Depression and Anxiety 32:493–501, 2015.* 

**Key words:** *PTSD/posttraumatic stress disorder; assessment/diagnosis; anxiety/anxiety disorders; measurement/psychometrics; trauma*

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# INTRODUCTION

Posttraumatic stress disorder (PTSD) is a common[1] and seriously impairing[2] disorder that has undergone substantial changes in diagnostic criteria across DSM editions. In DSM-5,[3] several criterion-level changes from DSM-IV[4] broadened the definition of PTSD, whereas others narrowed the definition. Initial prevalence studies using DSM-5 draft criteria led to the belief that the net result of these changes was to increase PTSD prevalence,[5,6] but most subsequent studies of the final criteria found slightly lower prevalence of DSM-5 than DSM-IV PTSD when assessed using either self-report scales[7–9] or structured clinical interviews,[10,11] although this evidence is not entirely consist.[12] Studies agree, though, that substantial overlap exists in PTSD case based on DSM-IV and DSM-5 criteria,[8,12] raising the possibility that diagnoses of DSM-5 PTSD might be approximated closely using DSM-IV criteria. This is an issue of considerable importance for purposes of preserving the value of previous research studies that were based on DSM-IV criteria, as evidence that DSM-5 diagnoses could be closely approximated using DSM-IV criteria would allow the results of these previously completed studies to be recoded and used to draw inferences about DSM-5 PTSD.

The present report investigates this issue using data from the Army Study to Assess Risk and Resilience in Servicemembers (Army STARRS).[13,14] We capitalize on the fact that one Army STARRS survey assessed PTSD in three Brigade Combat Teams of soldiers shortly after they returned from deployment to Afghanistan using an expanded self-report scale that included DSM-IV as well as all DSM-5 symptoms of PTSD. This allowed us to make individual-level comparisons between approximated DSM-5 diagnoses based on DSM-IV symptoms and true DSM-5 diagnoses based on the actual DSM-5 criteria. The close correspondence of DSM-IV and DSM-5 prevalence estimates in previous studies and the fact that the new symptoms in DSM-5 appear to be much less common than those retained from DSM-IV[7–12] led us to hypothesize that DSM-5 diagnoses of PTSD could be closely approximated using DSM-IV symptoms.

# METHODS AND MATERIALS

## SAMPLE

Data came from the Army STARRS pre–post deployment study (PPDS). The PPDS is a four-wave panel survey of three Army Brigade Combat Teams assessed shortly before deployment to Afghanistan in Quarter 1 2012 (baseline [T0]) and three times after returning from deployment (within 1 month of return [T1], 2 months after T1 [T2], and 6 months after T2 [T3]). The assessments included completion of a self-administered questionnaire (SAQ) at each time point. At T0-2, all personnel in each selected PPDS unit reported to a 30-min group informed consent session that explained study purposes, procedures, confidentiality, and voluntary participation before requesting written informed consent. The SAQ was only administered after obtaining consent. The SAQ was administered on a laptop computer in group administration format. Consent was confidential despite the group format, as respondents recorded consent privately on their laptops and could go through the instrument either without entering responses or entering only noninformative responses. 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. Additional details on the PPDS design, sample, and consent procedures have been reported elsewhere.[13,15] The 9,193 PPDS respondents considered here represent all consenting soldiers who completed the SAQ at T2. We focus on T2 because the T2 SAQ included assessments of both DSM-IV and DSM-5 PTSD symptoms. Of the 9,613 soldiers present for duty at T2, virtually all attended the SAQ session (98.3%, $n = 9{,}453$) and the vast majority completed the full SAQ (95.6%, $n = 9{,}193$). As a result of this very high response rate, no nonresponse adjustment weight was used in analyzing the data.

## MEASURES

The criterion-level changes in DSM-5 included a mix of broadening and narrowing of DSM-IV criteria. The definition of PTSD was *broadened* by deleting DSM-IV Criterion A2 (subjective reactions of intense fear, helplessness, or horror to the trauma) and adding one new symptom of hyperarousal (DSM-5 Criterion E) to the five already in DSM-IV while still requiring two hyperarousal symptoms. The definition of PTSD was *narrowed*, in comparison, by restricting the DSM-IV Criterion A1 definition to exclude nonviolent indirect exposure (DSM-5 Criteria A1–A4; an important change in that it was found in one study to account for roughly half of all instances where a person meeting DSM-IV criteria failed to meet DSM-5 criteria[8]) and splitting DSM-IV Criterion C (which required three of seven avoidance/emotional numbing symptoms) into two separate criteria in one of which (DSM-5 Criterion C) at least one of the two DSM-IV symptoms of avoidance is required (a requirement that did not exist in DSM-IV). The new DSM-5 Criterion D (negative alteration in cognitions/mood), which was created from the remaining DSM-IV Criterion C symptoms, finally, changed the definition of PTSD in a way that might either broaden or narrow the number of qualifying cases depending on symptom distributions in that the new criterion requires two of seven symptoms that include three of the original five in DSM-IV Criterion C, a slightly modified version of one of the others in DSM-IV Criterion C, and three new symptoms. This would lead to a reduction in DSM-5 prevalence compared to DSM-IV prevalence among people who had both of the two symptoms of avoidance, only 1 other retained DSM-IV Criterion C avoidance/emotional numbing symptom, and none of the new DSM-5 Criterion D symptoms, as such people would meet DSM-IV Criterion C, but not DSM-5 Criteria C and D. But the requirements of DSM-5 Criterion D would lead to an increase in DSM-5 prevalence compared to DSM-IV among people who had at least one symptom of avoidance, exactly one of the other DSM-IV Criterion C symptoms, but at least two of the three new DSM-5 Criterion D symptoms, as such people meet DSM-5 Criteria C and D, but not DSM-IV Criterion C. As a result, whether PTSD prevalence increases or decreases in DSM-5 compared to DSM-IV and the degree of overlap among case definitions will both depend on the relative distributions of the symptoms involved in these various changes.

The T2 PPDS began the assessment of the above criteria with separate checklists for traumatic events that occurred in the line of duty and those that did not occur in the line of duty. The events in these checklists were developed to operationalize DSM-IV Criterion A1 rather than DSM-5 Criteria A1–A4. As noted above, the latter are narrower

than DSM-IV Criterion A1 because of the exclusion of *nonviolent* indirect exposure. This narrowing is perhaps less relevant in the current sample than it might be in other samples, however, in that the vast majority of T2 PPDS respondents reported experiencing direct combat (i.e., violent) trauma in their most recent deployment.

Thirty-day DSM-IV Criteria B–D and DSM-5 Criteria B–E symptoms of PTSD were assessed in the T2 PPDS by using a blended version of the civilian PTSD Checklist for DSM-IV (PCL-C) [16] and the PTSD Checklist for DSM-5 (PCL-5).[17] The PCL-C, which asks about PTSD symptoms due to *stressful experiences*, was used instead of the military version, which asks about symptoms specific to *military experiences*, because of our interest in PTSD due to either military or nonmilitary traumas. The PCL-C has been the most widely used and validated self-report measure of PTSD over the past two decades.[18,19] The PCL-C was also found to be a valid measure of DSM-IV PTSD in an independent Army STARRS clinical reappraisal study[20] that compared diagnoses based on the PCL-C with independent blinded diagnoses based on the Structured Clinical Interviews for DSM-IV.[21]

The PCL-C includes 17 questions to operationalize the 17 DSM-IV Criteria B–D symptoms of PTSD. The PCL-5 includes 20 questions to operationalize the 20 DSM-5 Criteria B–E symptoms of PTSD. A 5-point response scale is used in both versions in which respondents rate the extent to which each symptom has been bothersome in the past 30 days (*not at all*, *a little bit*, *moderately*, *quite a bit*, and *extremely*). PCL-5 modifications correspond directly to differences between DSM-IV and DSM-5 criteria (Table 1).

Fifteen DSM-IV Criterion B–D symptoms are either unchanged or only modestly changed in DSM-5. The PCL-C measures of these symptoms were used to approximate DSM-5 criteria. Nine of the 15 measures were virtually unchanged in PCL-5 (DSM-5 Criteria B2, B4, D1, D5, D6, and E3–E6) and six others only changed slightly (DSM-5 B1, B3, B5, C1, C2, and E1). We used the PCL-C wording for the latter six questions. Another PCL-C question that was double-barreled in that it asked about both numbing and inability to have loving feelings (*feeling emotionally numb or being unable to have loving feelings for those close to you*) was narrowed in PLC-5 to operationalize DSM-5 Criterion D7 (*trouble experiencing positive feelings [e.g., being unable to feel happiness or have loving feelings for people close to you]*). Our blended version of the two instruments included a separate question for this modified criterion about numbing (*feeling emotionally numb*) in addition to the new PCL-5 question that operationalized DSM-5 Criterion D7. Although only the PCL-5 question was used to operationalize DSM-5 Criterion D7, we combined responses to the two questions into a single symptom-level score to approximate the original PCL-C question (assigning the higher response to the two questions) to define DSM-IV Criterion C6, noting that this operationalization broadens the second part of the original characterization in DSM-IV. It is possible that this broader operationalization caused us to misclassify some observations as true cases of DSM-IV PTSD in addition to slightly inflating the estimated accuracy of our DSM-5 approximations (i.e., among soldiers who endorsed this item solely because of *trouble experiencing positive feelings*, a clause that is only found in DSM-5/PCL-5).

DSM-5 substantially changed DSM-IV Criterion C7 that required a "sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)" to require "persistent and exaggerated negative beliefs or expectations about oneself, others, or the world (e.g., 'I am bad,' 'No one can be trusted,' 'The world is completely dangerous,' 'My whole nervous system is permanently ruined' [DSM-5 Criterion D2])." We included in our blended assessment both the original PCL-C question to operationalize DSM-IV Criterion C7 and the new PCL-5 question to operationalize DSM-5 Criterion D2. Given this substantive revision, we did not attempt to approximate DSM-5 Criterion D2 using the PCL-C question for DSM-IV Criterion C7.

Finally, three PCL-5 questions were added to the T2 PPDS assessment to operationalize the new DSM-5 criteria D3, D4, and E2. In addition, as neither version of the PCL assesses the DSM-IV Criterion F/DSM-5 Criterion G requirement of clinically significant distress or impairment, our blended version of the instrument included two additional questions about the extent to which PTSD symptoms caused distress and impairment in the past 30 days.

We considered soldiers reporting at least one lifetime traumatic event as fulfilling DSM-IV/DSM-5 Criterion A. Although we did not separately assess DSM-IV versus DSM-5 Criterion A, combat exposure qualifies for either definition. Consistent with other studies that used the PCL to diagnose PTSD,[7,22,23] all other symptoms were coded as present if reported as having been either *Moderately*, *Quite a bit*, or *Extremely* bothersome on the 5-point PCL response scale. DSM-IV PTSD was operationalized using the 17 PCL-C items to assess DSM-IV Criteria B–D, whereas DSM-5 PTSD Criteria B–E were defined using the 15 PCL-IV items that are identical to or very minor rewordings in the PCL-5 plus the five additional PCL-5 items that were broadened (one item), substantively changed (one item), or unique to DSM-5 (three items). Both definitions also required endorsement of one of two of the items created to assess DSM-IV Criterion F/DSM-5 Criterion G (distress/impairment).

## ANALYSIS METHODS

In total, 16 DSM-IV PTSD symptoms were substantively unchanged in DSM-5. As mentioned in the introduction, however, DSM-IV Criterion C (avoidance/emotional numbing) was split in DSM-5 into Criteria C (avoidance) and D (negative alternations in cognitions and mood). We thus aimed to approximate DSM-5 PTSD by operationalizing the new DSM-5 criteria using only the 16 corresponding DSM-IV/PCL-C symptoms. Although the DSM-IV/PCL-C items provided full coverage of all seven DSM-5 Criteria B–C symptoms, we could only operationalize four of seven DSM-5 Criteria D symptoms and five of six DSM-5 Criteria E symptoms. We consequently focused on the subsample of T2 PPDS respondents who met DSM-5 Criteria B and C and created in this subsample a 30-category variable made up of the five-by-six cross-classification between the count of PCL-C symptoms endorsed for DSM-5 Criterion D (0-4 PCL-C symptoms out of the seven symptoms in DSM-5) and DSM-5 Criterion E (0-5 PCL-C symptoms out of the six symptoms in DSM-5). This 30-cell variable was then cross-classified with the Yes–No DSM-5 diagnosis of PTSD based on the PCL-5 to examine the extent to which DSM-IV symptoms can be used to approximate DSM-5 diagnoses of PTSD.

Two coding schemes were developed from this cross-classification. The first was a *conservative* approximation of DSM-5 criteria that required DSM-5 Criteria A–C and G in addition to two or more of the four DSM-5 Criterion D symptoms included in the PCL-C plus two or more of five of the six DSM-5 Criterion E symptoms included in the PCL-C. A two-by-two table was created that cross-classified this conservative approximation with actual DSM-5 diagnoses based on the PCL-5. The operating characteristics of this conservative approximation (i.e., sensitivity, specificity, positive and negative predictive value, total classification accuracy, Cohen's $\kappa$, and area under the ROC curve [AUC]) were then calculated and compared to actual DSM-5 diagnoses based on the PCL-5. The second *broader* coding scheme was then created to determine if allowing the inclusion of a small number of false positives would reduce the number of false negatives in the conservative approximation and increase total classification accuracy. Once a coding rule to achieve that aim was developed (see the below subsection on *Defining a broad approximation of DSM-5 PTSD)*, a two-by-two table was created that cross-classified this broad approximation with DSM-5/PCL-5 PTSD and the same operating characteristics were calculated as for the conservative approximation.

**TABLE 1. Comparison of DSM-5 criteria B–E to DSM-IV Criteria B–D**

| DSM-5 PTSD Criteria B–E (symptoms required) | DSM-IV PTSD Criteria B–D (symptoms required) |
|---|---|
| B. Reexperiencing (one of five) | B. Reexperiencing (one of five) |
| B1. Recurrent, involuntary, and intrusive distressing memories of the traumatic event(s) | B1. Recurrent and intrusive distressing recollections of the event, including images, thoughts, or perceptions |
| B2. Recurrent distressing dreams in which the content and/or affect of the dream are related to the traumatic event(s) | B2. Recurrent distressing dreams of the event |
| B3. Dissociative reactions (e.g., flashbacks) in which the individual feels or acts as if the traumatic event(s) were recurring. (Such reactions may occur on a continuum, with the most extreme expression being a complete loss of awareness of present surroundings) | B3. Acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative flashback episodes, including those that occur on awakening or when intoxicated) |
| B4. Intense or prolonged psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event(s) | B4. Intense psychological distress at exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event |
| B5. Marked physiological reactions to internal or external cues that symbolize or resemble an aspect of the traumatic event(s) | B5. Physiological reactivity on exposure to internal or external cues that symbolize or resemble an aspect of the traumatic event |
| C. Avoidance (one of two) | C. Avoidance and numbing (three of seven) |
| C1. Avoidance of or efforts to avoid distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s) | C1. Efforts to avoid thoughts, feelings, or conversations associated with the trauma |
| C2. Avoidance of or efforts to avoid external reminders (people, places, conversations, activities, objects, situations) that arouse distressing memories, thoughts, or feelings about or closely associated with the traumatic event(s) | C2. Efforts to avoid activities, places, or people that arouse recollections of the trauma |
| D. Negative alterations in cognition and mood (two of seven) | |
| D1. Inability to remember an important aspect of the traumatic event(s) (typically due to dissociative amnesia and not to other factors, such as head injury, alcohol, or drugs) | C3. Inability to recall an important aspect of the trauma |
| *D2. Persistent and exaggerated negative beliefs or expectations about oneself, others, or the world (e.g., "I am bad," "No one can be trusted," "The world is completely dangerous," "My whole nervous system is permanently ruined")*[a] | *DSM-5 symptom is a substantive revision of DSM-IV: C7. Sense of a foreshortened future (e.g., does not expect to have a career, marriage, children, or a normal life span)*[a] |
| *D3. Persistent, distorted cognitions about the cause or consequences of the traumatic event(s) that lead the individual to blame himself/herself or others*[a] | *No equivalent DSM-IV symptom*[a] |
| *D4. Persistent negative emotional state (e.g., fear, horror, anger, guilt, or shame)*[a] | *No equivalent DSM-IV symptom*[a] |
| D5. Markedly diminished interest or participation in significant activities | C4. Markedly diminished interest or participation in significant activities |
| D6. Feelings of detachment or estrangement from others | C5. Feeling of detachment or estrangement from others |
| *D7. Persistent inability to experience positive emotions (e.g., inability to experience happiness, satisfaction, or loving feelings)*[a] | *DSM-5 symptom is a rewording of DSM-IV: C6. Restricted range of affect (e.g., unable to have loving feelings)*[b] |
| E. Hyperarousal (two of six) | D. Hyperarousal (two of five) |
| E1. Irritable behavior and angry outbursts (with little or no provocation) typically expressed as verbal or physical aggression toward people or objects | D2. Irritability or outbursts of anger |
| *E2. Reckless or self-destructive behavior*[a] | *No equivalent DSM-IV symptom*[a] |
| E3. Hypervigilance | D4. Hypervigilance |
| E4. Exaggerated startle response | D5. Exaggerated startle response |
| E5. Problems with concentration | D3. Difficulty concentrating |
| E6. Sleep disturbance (e.g., difficulty falling or staying asleep or restless sleep) | D1. Difficulty falling or staying asleep |

PTSD, posttraumatic stress disorder; PCL-C, civilian PTSD checklist for DSM-IV; PCL-5, PTSD checklist for DSM-5.

[a]Italicized criteria reflect those that were reworded (D7), substantively revised (D2), or newly added (D3, D4, E2) in DSM-5. In our blended assessment, soldiers were administered only the first part of the double-barreled PCL-C item used to assess DSM-IV C6, but the full PCL-5 item used to assess DSM-5 D7. The full PCL-C item was used to assess DSM-IV C7 and the full PCL-5 items was used to assess DSM-5 D2. PCL-5 items were also used to assess new DSM-5 symptoms D3, D4, and E2. To avoid item redundancy, nonitalicized criteria were assessed only using PCL-C items given the negligible substantive differences in DSM-IV versus DSM-5 criteria.

[b]DSM-IV Criterion C6 was coded as being present if soldiers endorsed our condensed version of the double-barreled PCL-C item for this criterion (*feeling emotionally numb*) or if they endorsed the corresponding PCL-5 item (which captures the second part of the original double-barreled PCL-C item, *trouble experiencing positive feelings [e.g., being unable to feel happiness or have loving feelings for people close to you]*).

**TABLE 2. Prevalence and associations of 30-day PTSD according to different definitions in the PPDS sample[a]**

| | | | In subsamples of respondents with … | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Total sample | | True DSM-IV | | True DSM-5 | | Conservative approximation of DSM-5 | |
| | Percentage | SE | Percentage | SE | Percentage | SE | Percentage | SE |
| True DSM-IV[b] | 5.3 | 0.2 | – | – | 96.7 | 0.9 | 100.0 | 0.0 |
| True DSM-5[c] | 4.6 | 0.2 | 82.9 | 1.7 | – | – | 97.7 | 0.8 |
| Conservative approximation of DSM-5[d] | 4.3 | 0.2 | 81.2 | 1.8 | 92.6 | 1.3 | – | – |
| *n* | 9,193 | | 490 | | 420 | | 398 | |

PTSD, posttraumatic stress disorder; PPDS, pre–post deployment survey; SE, standard error; PCL-C, civilian PTSD checklist for DSM-IV; PCL-5, PTSD checklist for DSM-5.

[a]For the two true and one approximated PTSD diagnoses, Criterion A was considered met if the soldiers reported one or more traumatic experience during the Time 0 and Time 2 assessments of lifetime, during deployment, and postdeployment traumatic events. DSM-IV Criterion F and DSM-5 Criterion G were considered met if the soldier reported significant interference or distress due to their PTSD symptoms.

[b]True DSM-IV PTSD was defined using the 17 PCL-C as: (i) one or more Criterion B (re-experiencing) symptoms, (ii) three or more Criterion C (avoidance/numbing) symptoms, (iii) two or more Criterion D (hyperarousal) symptoms, and (iv) significant interference or distress due to PTSD symptoms (Criterion F).

[c]True DSM-5 PTSD was defined using the 15 PCL-C items and five PCL-5 items as: (i) one or more Criterion B (re-experiencing) symptoms, (ii) one or two Criterion C (avoidance) symptoms, (iii) two or more Criterion D (negative alterations in cognition and mood) symptoms, (iv) two or more Criterion E (hyperarousal) symptoms, and (v) significant interference or distress due to PTSD symptoms (Criterion G).

[d]The conservative approximation of DSM-5 PTSD was defined using DSM-IV symptoms as assessed by the PCL-C as: (i) one or more DSM-IV Criterion B (re-experiencing) symptoms, which are virtually identical to DSM-5 Criterion B symptoms, (ii) one or two of the two DSM-IV Criterion C (avoidance/numbing) symptoms that map onto DSM-5 Criterion C (avoidance) symptoms, (iii) two or more of the four DSM-IV Criterion C (avoidance/numbing) symptoms that map onto DSM-5 Criterion D (negative alterations in cognition and mood) symptoms, and (iv) two or more of the DSM-IV Criterion D symptoms that map onto DSM-5 Criterion E (hyperarousal symptoms).

# RESULTS

## COMPARISONS AMONG DSM-IV, DSM-5, AND CONSERVATIVELY APPROXIMATED DSM-5 PTSD

The estimated 30-day prevalence of DSM-IV PTSD based on the PCL-C was 5.3%, whereas estimated prevalence of DSM-5 PTSD based on the PCL-5 was 4.6% (Table 2). The 30-day prevalence of the conservative approximation of DSM-5 PTSD based on the PCL-C was 4.3%. The vast majority (96.7%) of soldiers with DSM-5/PCL-5 PTSD also met criteria for DSM-IV/PCL-C PTSD. A smaller proportion (82.9%) of those with DSM-IV/PCL-C PTSD also met criteria for DSM-5/PCL-5 PTSD. Nearly all soldiers with the conservative PCL-C approximation of DSM-5/PCL-5 PTSD met criteria for DSM-5/PCL-5 PTSD (97.7%), while this definition captured 92.6% of the soldiers who met DSM-5/PCL-5 PTSD criteria.

## DEFINING A BROAD APPROXIMATION OF DSM-5 PTSD

Inspection of the 30-by-2 table cross-classifying the PCL-C approximation of DSM-5 Criteria D–E with DSM-5/PCL-5 diagnoses showed that the majority of the 7.4% (100% minus the 92.6% true-positive percentage in Table 2) of false-negative DSM-5/PCL-5 cases endorsed one or more of the four DSM-5 Criterion D symptoms assessed in the PCL-C as well as at least four of the five DSM-5 Criterion E symptoms assessed in the PCL-C (i.e., 67.7% of the 31 conservative approximation false negatives), whereas this pattern of endorsement was less common among DSM-5/PCL-5 noncases (Table 3). Based on this observation, we defined a broad approximation of DSM-5 PTSD based on the PCL-C as meeting full Criteria A–C and G in addition to one or more of the four DSM-5 Criterion D symptoms assessed in the PCL-C and at least four of the five DSM-5 Criterion E symptoms assessed in the PCL-C.

## COMPARISONS BETWEEN DSM-5 AND BROADLY APPROXIMATED DSM-5 PTSD

The 30-day prevalence estimate of DSM-5 PTSD based on the broad PCL-C coding scheme was 4.7%, slightly higher but close to the estimate based on DSM-5/PCL-5 (i.e., 4.6%; Table 4). This was achieved by increasing sensitivity (the proportion of DSM-5/PCL-5 cases that were correctly classified as cases by the approximation) from 92.6% in the conservative approximation to 95.5%. This was done at the expense of decreasing specificity (the proportion of DSM-5/PCL-5 noncases that were correctly classified by the approximation as non-cases) from 99.9% in the conservative approximation to 99.6%. Given that the number of people in the population who are noncases is much higher than the number who are cases, the small decrease in specificity decreased both total classification accuracy (from 99.6

**TABLE 3. Association between cross-classified counts of DSM-5/PCL-5 Criterion D and E symptoms based on questions available in the PCL-C among soldiers satisfying Criteria A, B, C, and G**

| Approximated number of DSM-5 symptoms | | Number of DSM-5 PTSD cases | |
|---|---|---|---|
| Criterion D | Criterion E | True noncase[a] | True case[b] |
| 0 | 0 | 1 | 0 |
| 0 | 1 | 5 | 0 |
| 0 | 2 | 6 | 1 (FN) |
| 0 | 3 | 9 | 2 (FN) |
| 0 | 4 | 7 | 0 |
| 0 | 5 | 7 | 1 (FN) |
| 1 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 (FN) |
| 1 | 2 | 4 | 1 (FN) |
| 1 | 3 | 6 | 3 (FN) |
| 1 | 4 | 5 | 10 (FN) |
| 1 | 5 | 13 | 11 (FN) |
| 2 | 0 | 0 | 0 |
| 2 | 1 | 1 | 0 |
| 2 | 2 | 1 (FP) | 6 |
| 2 | 3 | 0 | 10 |
| 2 | 4 | 5 (FP) | 12 |
| 2 | 5 | 3 (FP) | 18 |
| 3 | 0 | 0 | 0 |
| 3 | 1 | 2 | 1 (FN) |
| 3 | 2 | 0 | 10 |
| 3 | 3 | 0 | 25 |
| 3 | 4 | 0 | 29 |
| 3 | 5 | 0 | 64 |
| 4 | 0 | 1 | 0 |
| 4 | 1 | 5 | 0 |
| 4 | 2 | 0 | 6 |
| 4 | 3 | 0 | 11 |
| 4 | 4 | 0 | 25 |
| 4 | 5 | 0 | 173 |

PTSD, posttraumatic stress disorder; PCL-C, civilian PTSD checklist for DSM-IV; PCL-5, PTSD checklist for DSM-5; FN, conservative approximation false negatives (31 cases); FP, conservative approximation false positives (nine cases).

[a]The sum of the column equals 82, the total number of soldiers who met DSM-5 PTSD Criteria A, B, C, and G but not D and/or E.

[b]The sum of the column equals 420, the total number of true cases of DSM-5 PTSD.

to 99.4%) and $\kappa$ (from 0.95 to 0.93) and increased AUC (from 0.96 to 0.98).

## THE TRADE-OFF BETWEEN REDUCTION IN TOTAL CLASSIFICATION ACCURACY AND INCREASE IN AUC

The symptom count distributions of DSM-5/PCL-5 Criteria D and E were compared between cases either detected or not detected by the two PCL-C approximations (Table 5). The Criterion D symptom count distributions were significantly different for detected and undetected cases based on both the conservative ($\chi^2_3 = 106.0$, $P < .001$) and broad ($\chi^2_3 = 61.0$, $P < .001$)

**TABLE 4. Operating characteristics of conservative and broad approximations of DSM-5 PTSD using DSM-IV criteria**

| | Aggregate concordance | | | | | Individual-level concordance | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | True prevalence | | Estimated prevalence | | McNemar | Positive operating characteristics | | | | Negative operating characteristics | | | | | | |
| | Percentage | SE | Percentage | SE | $\chi^2_1$ | Sens | SE | PPV | SE | Spec | SE | NPV | SE | TCA | SE | $\kappa$ | SE | AUC |
| Conservative approximation (vs. true DSM-5) | 4.6 | 0.2 | 4.3 | 0.2 | 12.1[a] | 92.6 | 1.3 | 97.7 | 0.8 | 99.9 | 0.0 | 99.6 | 0.1 | 99.6 | 0.1 | 0.95 | 0.0 | 0.96 |
| Broad approximation (vs. true DSM-5) | 4.6 | 0.2 | 4.7 | 0.2 | 4.7[a] | 95.5 | 1.0 | 92.0 | 1.3 | 99.6 | 0.1 | 99.8 | 0.1 | 99.4 | 0.1 | 0.93 | 0.0 | 0.98 |

PTSD, posttraumatic stress disorder; SE, standard error; Sens, sensitivity; PPV, positive predicted value; Spec, specificity; NPV, negative predicted value; TCA, total classification accuracy; $\kappa$, Cohen's $\kappa$; AUC, area under the curve.

[a]Significant at the .05 level, two-sided test.

**TABLE 5. Distributions of DSM-5 PTSD Criterion D and E symptoms among true cases of DSM-5 PTSD depending on whether or not they were detected by the DSM-IV approximations**

| | Conservative approximation | | | | Broad approximation | | | |
|---|---|---|---|---|---|---|---|---|
| | Detected | | Not detected | | Detected | | Not detected | |
| | Percentage | SE | Percentage | SE | Percentage | SE | Percentage | SE |
| I. Criterion D[b] | | | | | | | | |
| 2 | 6.2 | 1.2 | 58.1 | 9.0 | 7.7 | 1.3 | 57.9 | 11.6 |
| 3 | 7.5 | 1.3 | 22.6 | 7.6 | 8.0 | 1.4 | 21.1 | 9.6 |
| 4 | 12.9 | 1.7 | 16.1 | 6.7 | 13.0 | 1.7 | 15.8 | 8.6 |
| 5[b] | 16.5 | 1.9 | 0.0 | 0.0 | 16.0 | 1.8 | 0.0 | 0.0 |
| 6[b] | 17.7 | 1.9 | 3.2 | 3.2 | 17.2 | 1.9 | 5.3 | 5.3 |
| 7[b] | 39.3 | 2.5 | 0.0 | 0.0 | 38.2 | 2.4 | 0.0 | 0.0 |
| Total | 100.0 | – | 100.0 | – | 100.0 | – | 100.0 | – |
| $\chi^2_3$ | 106.0[a] | | | | 61.0[a] | | | |
| II. Criterion E | | | | | | | | |
| 2 | 5.1 | 1.1 | 12.9 | 6.1 | 5.0 | 1.1 | 21.1 | 9.6 |
| 3 | 9.8 | 1.5 | 12.9 | 6.1 | 9.5 | 1.5 | 21.1 | 9.6 |
| 4 | 13.9 | 1.8 | 29.0 | 8.3 | 14.5 | 1.8 | 26.3 | 10.4 |
| 5 | 28.3 | 2.3 | 29.0 | 8.3 | 28.7 | 2.3 | 21.1 | 9.6 |
| 6 | 42.9 | 2.5 | 16.1 | 6.7 | 42.4 | 2.5 | 10.5 | 7.2 |
| Total | 100.0 | – | 100.0 | – | 100.0 | – | 100.0 | – |
| $\chi^2_4$ | 12.7[a] | | | | 17.2[a] | | | |
| *n* | 389 | | 31 | | 401 | | 19 | |

PTSD, posttraumatic stress disorder.

[a]Significant at the .05 level, two-sided test.

[b]A single collapsed category was created for five to seven Criterion D symptoms because no soldiers in the not detected subgroup endorsed exactly five or exactly seven Criterion D symptoms. A three degrees of freedom $\chi^2$ test was then used to test for significant differences in the distribution of Criterion D symptoms among those detected and not detected by the approximations.

approximations, with 71.4–73.5% of detected cases endorsing five or more Criterion D symptoms compared to 3.2–5.3% of not detected cases. A similar pattern was found for Criterion E, with the symptom count distributions significantly different for detected and undetected cases based on both the conservative ($\chi^2_4 = 12.7, P = .01$) and broad ($\chi^2_4 = 17.2$, $P = .002$) approximations, with 42.4–42.9 of detected cases endorsing all six Criterion E symptoms compared to 10.5–16.1% of not detected cases.

## DISCUSSION

Three study limitations are noteworthy. First, the diagnoses are based on self-report scales rather than clinical interviews. Second, the sample is based on a narrow segment of the population: US Army soldiers in Brigade Combat Teams recently returning from deployment in Afghanistan, during which time the vast majority of respondents were exposed to traumatic combat-related experiences. Third, our blended combination of the PCL-C and PCL-5 scales introduced more similarity between the two than exists in the originals. This harmonization was carried out to avoid redundancy in question wording, but might have led to an overestimation of the similarity of case definitions of DSM-IV and DSM-5 PTSD. Based on these limitations, replication of our study is needed in broader samples using clinical interviews that operationalize both DSM-IV and DSM-5 criteria to determine the external validity of the results reported here.

Within the context of these limitations, the study results are useful in two ways. First, the finding of substantial overlap between diagnoses based on DSM-IV and DSM-5 criteria and the finding of slightly higher prevalence of DSM-IV/PCL-4 PTSD (5.3%) than DSM-5/PCL-5 PTSD (4.6%) are consistent with most, although not all,[12] smaller studies of the final published DSM-5 criteria among active duty soldiers,[7] veterans,[9,10] and civilians.[8,9,11] Although the exclusion of DSM-IV Criterion A2 and the addition of a new qualifying symptom in DSM-5 Criterion E broaden the DSM-5 definition of PTSD relative to the DSM-IV definition, the lower prevalence of DSM-5 than DSM-IV PTSD in previous studies was due to the tightening of Criterion A1 (i.e., nonviolent indirect events no longer qualifying) in conjunction with the new requirement of experiencing at least one avoidance symptom (DSM-5 Criterion C) along with the fact that the new symptoms of DSM-5 Criterion D (negative alterations in cognition and mood) are relatively uncommon. Although the changes to Criterion A1 were not relevant to the current sample of combat-exposed soldiers, inspection of the symptom-level cross-classification showed that the lower prevalence of DSM-5 than DSM-IV PTSD found here was caused by the exclusion of DSM-IV cases from DSM-5 due to new requirement of experiencing at least one avoidance

symptom and to the rarity of the new DSM-5 Criterion D symptoms.

Second, we showed that DSM-IV criteria can be used to closely approximate DSM-5 criteria in the context of the measures and sample considered. These approximations provide a principled basis for recoding DSM-IV diagnoses in previously collected research samples to generate estimates of DSM-5 PTSD. The transformation rules suggested by our approximation should be considered only provisional because of the narrowness of the sample and the possibility that results might have been influenced by the particular measures we used. There is good reason to expect that similar results will be found in other samples using other measures due to the fact that the new DSM-5 PTSD symptoms are among the least frequently endorsed of the DSM-5 Criteria D and E symptoms both in our study and in previous studies.[9, 12] This is especially true of DSM-5 symptoms D2 (negative expectations about self/others/world), D3 (distorted blame of self or others), and E2 (reckless or self-destructive behavior). As a result, only a small number of cases—and cases that for the most part only meet minimum DSM-5 criteria—are likely to be missed by applying the scoring rules we developed here for DSM-5 approximations based on DSM-IV symptoms.

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