

## SPECIAL COMMUNICATION

# Consensus Recommendations for Common Data Elements for Operational Stress Research and Surveillance: Report of a Federal Interagency Working Group

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**ABSTRACT.** Nash WP, Vasterling J, Ewing-Cobbs L, Horn S, Gaskin T, Golden J, Riley WT, Bowles SV, Favret J, Lester P, Koffman R, Farnsworth LC, Baker DG. Consensus recommendations for common data elements for operational stress research and surveillance: report of a federal interagency working group. *Arch Phys Med Rehabil* 2010;91:1673-83.

Empirical studies and surveillance projects increasingly assess and address potentially adverse psychological health outcomes from the stress of military operations, but no standards yet exist for common concept definitions, variable categories, and measures. This article reports the consensus recommendations of the federal interagency Operational Stress Working Group for common data elements to be used in future operational stress research and surveillance with the goal of improving comparability across studies. Operational stress encompasses more than just combat; it occurs everywhere service members and their families live and work. Posttraumatic stress is not the only adverse mental or behavioral health outcome of importance. The Operational Stress Working Group contends that a primary goal of operational stress research and surveillance is to promote prevention of adverse mental and behavioral outcomes, especially by recognizing the preclinical and subclinical states of distress and dysfunction that portend a risk for failure of role performance or future mental disorders. Recommendations for data elements are divided into 3 tiers: core, supplemental, and emerging, including variable domains and specific measures for assessing operational stressor exposures, stress outcomes, moderating factors, and mediating processes. Attention is drawn to the emerging construct of stress injury as a generic term for subclinical operational stress, and to emerging data elements addressing biological, psychological, and spiritual mediators of risk. Methodologies are needed

for identifying preclinical and subclinical states of distress or dysfunction that are markers of risk for failure of role performance and future clinical mental disorders, so that targeted prevention interventions can be developed and evaluated.

**Key Words:** Combat disorders; Military personnel; Preventive psychiatry; Rehabilitation; Research design; Stress; psychological.

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**S**INCE THE BEGINNING of the wars in Afghanistan and Iraq, federal agencies such as the Department of Defense, Department of Veterans Affairs, and National Institute of Mental Health have sponsored increasing numbers of research studies and surveillance programs to assess and address adverse psychological outcomes from the stress of military operations. Many of these studies and programs have been unprecedented in their aims and methodologies. Even those that have repeated or extended previous work have sometimes used very different constructs, variables, and measures. Given the immaturity of operational stress science, consensus guidelines for common data elements for federally funded research studies and surveillance programs might facilitate comparisons and the drawing of meaningful conclusions across projects.

The OSWG was one of several working groups chartered in January 2009 by the federal interagency Common Data Elements Workshop, described earlier in the article by Thurmond et al<sup>1</sup> (published in this issue). The OSWG was charged with developing consensus recommendations for constructs, variable domains, and specific measures to be used in future operational stress research and surveillance. This article reports those recommendations.

## METHODS

### Working Group Composition and Process

Participants in the OSWG were recruited from the Department of Defense and its service branches, the Department of Veterans Affairs, the National Institute of Mental Health, the Uniformed Services University of the Health Sciences, and a number of civilian academic institutions. OSWG members

#### List of Abbreviations

DRRI	Deployment Risk and Resilience Inventory
IOM	Institute of Medicine
OEF	Operation Enduring Freedom
OIF	Operation Iraqi Freedom
OSWG	Operational Stress Working Group
PTSD	posttraumatic stress disorder

From the Defense Centers of Excellence for Psychological Health and Traumatic Brain Injury, Arlington, Veterans Administration (Nash, Horn, Golden); Center of Excellence for Stress and Mental Health, Veterans Administration San Diego Healthcare System and University of California, San Diego, CA (Nash, Baker); VA Boston Healthcare System and National Center for PTSD, Boston, MA (Vasterling); Dan L. Duncan Neurodevelopmental Clinic, Children's Learning Institute and University of Texas, Houston, TX (Ewing-Cobbs); Combat and Operational Stress Control, Headquarters, Marine Corps, Quantico, VA (Gaskin); National Institute of Mental Health, Bethesda, MD (Riley); Uniformed Services University of the Health Sciences, Bethesda, MD (Bowles); Headquarters, U.S. Air Force, Washington, DC (Favret); UCLA Semel Institute for Neuroscience and Human Behavior, Los Angeles, CA (Lester); and U.S. Navy Bureau of Medicine and Surgery, Washington, DC (Koffman); San Jose State University, San Jose, CA (Farnsworth).

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were selected for their expertise in operational stress research, military psychological health promotion, research and surveillance in various operational stress target populations, and the many conceptual domains that inform operational stress as a broad construct. The OSWG convened repeatedly over the course of more than a year to review literature, develop and refine concepts, and draft recommendations for standard definitions, variables, metrics, instruments, and outcomes for use in future operational stress research and surveillance.

As one of the psychological health working groups chartered by the Common Data Elements Workshop, the OSWG was charged with focusing especially on developing key case definitions for operational stress surveillance and research, and identifying specific *core*, *supplemental*, and *emerging* data elements that could be used across future studies to promote consistency. The charter for the OSWG left open to it the task of defining where, for the sake of data element recommendations, the boundaries of the broad and ill-defined operational stress construct should be drawn. Potentially, operational stress could include any and all psychological health impacts of military operations, of any type and in any location, on service members and their families. One of the challenges faced by the OSWG, therefore, was to narrow its focus sufficiently to provide useful recommendations without artificially limiting the scope of data elements considered relevant to the growing science of operational stress.

### Guiding Conceptual Framework

Current military operations in Iraq and Afghanistan present unprecedented challenges to service members and their families. During deployments, service members may be repeatedly exposed to intense stressor events involving threats to life, the loss of close comrades or leaders, or actions or failures to act that violate deeply held moral beliefs.<sup>2,3</sup> Besides specific high-intensity events, service members may be subjected to a multitude of lower-intensity stressors whose relentless accumulation over time may pose an even greater challenge to their adaptive capacities.<sup>4-6</sup> The biological and psychological impact on service members of stressors of all kinds may be intensified and complicated by simultaneous physical injuries to their bodies, or blast injuries to their brains.<sup>7,8</sup> Spouses, children, and extended close family members of those deployed may also be exposed, directly or vicariously, to both high-intensity and cumulative operational stressors.<sup>9</sup>

Stressor exposures lie on one side of the operational stress equation. On the other side lie the spectrum of operational stress *outcomes* that are reflected in all domains of experience and functioning, including the physical, psychological, social, and spiritual. The most well-studied mental health outcome of high-intensity operational stressor exposure is PTSD (see Kaloupek et al,<sup>10</sup> published in this issue), but recent epidemiologic studies of service members and veterans serving in OIF and OEF have shown significantly increased risks for depression, anxiety, and substance use disorders as well.<sup>11-15</sup> Operational stress has also been associated with physical health problems such as new-onset hypertension<sup>16</sup> and early-onset cardiovascular disease,<sup>17</sup> and a multitude of behavioral problems, including failures of role performance in operational settings or at home, excessive or inappropriate aggression or violence, homicide, and suicide.<sup>18-21</sup> Mental or traumatic brain disorders may moderate such adverse behavioral outcomes in service members and veterans, but in multiple studies, combat stressor exposures appeared to confer risk independently.<sup>20,21</sup> Other adverse operational stress outcomes of interest include the distress and alterations in functioning that may follow the loss of cherished persons or objects, such as in complicated

grief,<sup>22</sup> or the witnessing or perpetration of violations of moral codes.<sup>3,20,21</sup> These have been little studied in military populations. Finally, great interest has arisen in the spectrum of positive operational stress outcomes, such as posttraumatic growth,<sup>23</sup> that may be very common among military personnel and family members.

A multitude of risk and resilience factors operate at various points in trajectories of stress exposures, adaptation, distress, and dysfunction. Studies have identified both *mediators* and *moderators* of stress adaptation, injury, and disease operating at the level of genomics, neurotransmitter systems, neuroendocrine and immunologic systems, development, personality, emotion, cognition, social relationships, belief systems, and spirituality.<sup>24</sup> Generalizing existing research findings about risk and resilience factors to an understanding of operational stress processes in service members is challenging because most studies have targeted nonmilitary populations, collected data in cross-section rather than longitudinally, and examined variables in only one or a few domains rather than looking for interactions between exposure and risk factors across domains. Much work remains to be done in the crucial area of risk and resilience factors for military operational stress.

Figure 1 depicts a conceptual model of operational stress developed by the OSWG that includes the 3 key components of stressor exposures, risk and resilience factors, and stress outcomes, both positive and negative. Omitted from this 2-dimensional model, just for the sake of clarity, is the important dimension of time as it relates to trajectories and development; it is to be understood that operational stress is a forever-unfolding process rather than a static state. The model of figure 1 highlights the *fundamental conceptual recommendation offered by the OSWG that future research and surveillance in operational stress make a clear distinction between stressor exposures, mediators or moderators, and subsequent stress states or outcomes*. As a simple example, the currently used diagnostic criteria for PTSD draw attention to 3 conceptually distinct elements of the disorder: (1) a life event involving actual or threatened death or serious injury to oneself or others

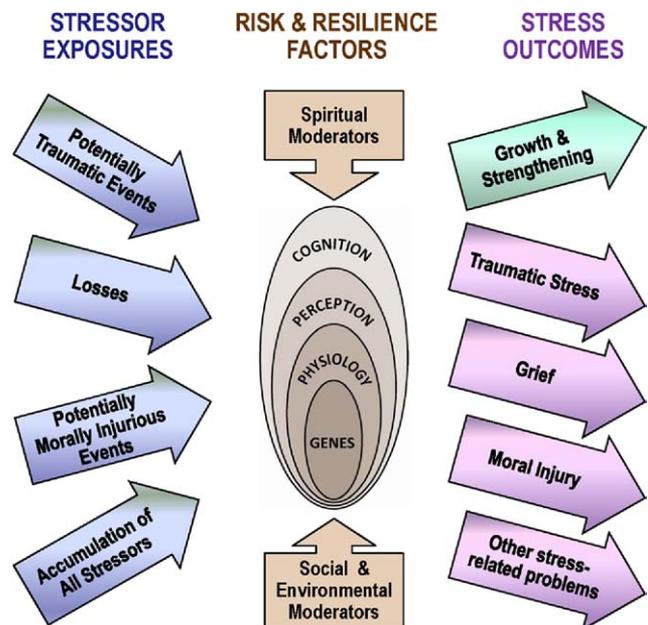


Fig 1. Operational stress model.

(A1 criterion); (2) an immediate response to that event involving intense fear, helplessness, or horror (A2 criterion); and (3) subsequent symptoms of distress or dysfunction (B, C, and D criteria).<sup>25</sup> For other adverse stress outcomes for which the research base is not as rich, and for which diagnostic criteria are not as well developed, the existing literature does not always keep conceptually distinct stressor exposures, mediators or moderators, and subsequent distress or dysfunction. A maladaptive stress response can, itself, function as an additional stressor for the person who experiences it, but for analyses of stress processes to be most useful, stressors and stress outcomes must be discriminated in research models. Similarly, the existing operational stress literature does not always clearly discriminate between stressor exposures and other mediating or moderating risk factors. Research models may analyze the relative contributions to risk, resilience, or recovery made by stressor exposures of various types compared with other moderators and mediators, and one class of stressor may be considered a moderator of stress responses to another class of stressor (eg, family conflicts at home may be analyzed as a risk factor for the development of PTSD after exposure to life-threat in theater). However, the most useful models for advancement of operational stress science may be those that offer means to reduce the risk for a particular adverse outcome given a particular stressor exposure that is common in military service.

On the left side of figure 1 are listed 4 broad categories of stress exposures. The first 3 are events of potentially high impact that are common in operational military environments: (1) potentially traumatic events involving experiences of life-threat; (2) losses of cherished people, things, or aspects of oneself; and (3) potentially morally injurious events. The fourth category of stress exposure is not a single event but the accumulation of stressors of all types that may not be toxic when experienced one at a time, but which collectively have the capacity to deplete resources and damage coping mechanisms over time. These concepts are more fully defined below.

The OSWG elected to define the domain of operational stress on the exposure side as broadly as possible to avoid unnecessarily limiting the scope of future research and surveillance. Hence, *operational stressors* are conceived to encompass *all* challenges related to military service for *both* service members and their families, whether in training or while deployed, in the United States or overseas, at home or in the field. To define the boundaries of operational stress on the outcome side, the OSWG considered what the overarching *aim* of operational stress research and surveillance might be. In other words, why should we even invest in studies of operational stress? What is the point? The OSWG found a clear answer to this question in the 2007 report of the Defense Health Board Task Force on Mental Health:

Involvement in combat imposes a psychological burden that affects all combatants, not only those vulnerable to emotional disorders or those who sustain physical wounds. Combat is a life-changing experience, imposing long-lasting emotional challenges for combatants. It is increasingly clear that efforts to enhance combatants' resilience and recovery in response to the emotional sequelae of combat must be undertaken by all members of the military community. Psychological health involves not only the detection and remediation of illness but also the provision of effective preventive strategies. Strategies to prevent other common problems, such as dental disease or orthopedic injuries, are well developed.

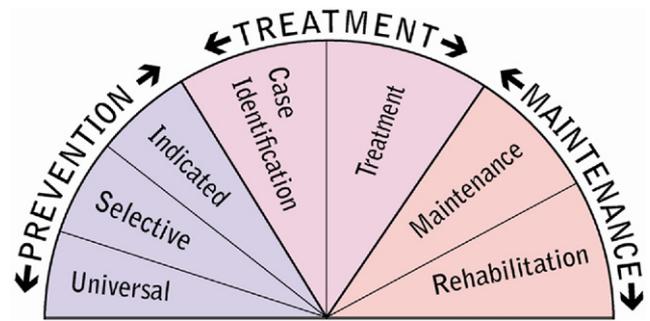


Fig 2. Mental health intervention spectrum. (Adapted from the 1994 IOM report on the prevention of mental disorders.<sup>25</sup>)

A similar capacity must be developed to prevent psychological dysfunction and enhance resilience to stress.<sup>26(p5)</sup>

Hence, one overarching goal of operational stress research and surveillance must be to help *prevent* long-term distress and disability, and to promote growth and strength instead. Compared with strategies that exist for preventing most physical disorders—such as dental disease, as mentioned—existing strategies for preventing mental disorders that may arise from exposure to combat and other operational stressors are relatively poorly informed by evidence or conceptual models consistent with that evidence.

A framework for defining the scope of stress outcomes most directly relevant for promoting military mental health prevention follows from an examination of the relationship and boundaries between mental health prevention and clinical mental health treatment, as was undertaken in 1994 by the IOM Committee on Prevention of Mental Disorders.<sup>27</sup> As depicted in figure 2, the IOM committee placed prevention interventions at one end of a continuum along with treatment and rehabilitation interventions. It recommended reserving the term “prevention” for interventions that occurred before the onset of a full clinical disorder. In other words, prevention interventions focus on *preclinical* states, whether symptomatic or not. The IOM committee further recommended that prevention interventions be subdivided, as in figure 2, into 3 levels: *universal*, *selective*, and *indicated*. In the committee’s nomenclature, universal prevention interventions are those applied to entire populations or population groups, such as preexposure education, for example. Selective prevention interventions are those that target subgroups believed to be at increased risk for illness, such as that resulting from a recent stressor exposure, but who are not known to be symptomatic. Indicated prevention interventions, on the other hand, specifically target those persons who are identified as experiencing subclinical or preclinical symptoms such as distress or alterations in functioning, but who do not fully meet criteria for a clinical mental disorder. The IOM prevention nomenclature differs from the alternate scheme of primary, secondary, and tertiary prevention, but it has the advantage of discriminating better between *selective* interventions offered to at-risk persons regardless of symptom status, such as psychological debriefing for a group recently exposed to a potentially traumatic event, and *indicated* interventions offered only to persons identified as significantly symptomatic and, therefore, at increased risk. A recent review of theoretic constructs and empirical data informing efforts to prevent PTSD concluded that the most promising prevention interventions were those that were indicated based on identified symptom burden, rather than merely selective based on stressor exposure regardless of symptoms.<sup>28</sup>

The IOM committee recommendations suggest that operational stress science should promote more effective prevention interventions by defining the early subclinical states that confer the greatest risk for either failure of role performance or future mental disorders, and identifying the moderators and mediators that can best be manipulated to reduce that risk. A significant obstacle to applying this standard to operational stress research and surveillance is the lack, in our present state of knowledge, of well-defined and validated categories, dimensions, and instruments to identify preclinical operational stress cases. Thus, because discussion of measures of both subthreshold states (eg, posttraumatic stress symptoms, depression symptoms) and mental disorder diagnoses (eg, PTSD, mood disorders, substance use disorders) is beyond the scope of the article, this article will emphasize measures of preclinical or subthreshold outcomes. The IOM recommendations, taken together with the report of the Defense Health Board Mental Health Task Force, suggest the following aims of operational stress research and surveillance, in the service of which concepts should be developed and metrics defined:

- To promote identification of at-risk populations based on stressor exposures as well as other preexisting or concurrent factors, so that *selective* interventions can appropriately be offered to them
- To promote identification of persons with *preclinical* symptoms, for whom *indicated* prevention interventions might most usefully be offered
- To define "cases" of preclinical operational stress based on sound conceptual reasoning and empirical support
- To identify biological, psychological, and behavioral markers of cases of preclinical operational stress
- To better understand the natural history of operational stress outcome trajectories, ranging from preclinical distress or dysfunction in the immediate aftermath of a high-intensity event to entrenched clinical mental disorders months or years later
- To better understand the risk and resilience factors that mediate between stress exposures and outcomes at every point in individual stress trajectories over time
- To evaluate outcomes of conceptually sound *indicated* biopsychosocial-spiritual interventions for preclinical operational stress based on uniformly applied case definitions

## RESULTS

### Constructs

Appendix 1 contains the conceptual constructs recommended by the OSWG for use in future operational stress research and surveillance. Most of the concepts and definitions listed are well represented in the literature in at least a similar form.

One notable exception is the concept of *moral injury*, which is defined here as changes in biological, psychological, social, or spiritual functioning resulting from witnessing or perpetrating acts or failures to act that transgress deeply held, communally shared moral beliefs and expectations. Potentially morally injurious events are analogously defined as acts or failures to act that have the potential to damage trust in one's own or others' ability to behave morally. This definition was distilled from recent scientific, philosophic, and other literature describing the consequences for persons and social groups of betrayals of moral expectations, whether experienced as the perpetrator or victim.<sup>3,29-32</sup> Although damage to fundamental beliefs has, in the past, been conceived to be a component of traumatic stress rather than an aspect of a unique stress outcome,<sup>33</sup>

evidence is accruing that moral injuries may be distinguished from traumatic stress states by the types of events that cause them, the forms of distress and dysfunction they typically produce, and their responses to treatment.<sup>3,34</sup>

Two other constructs whose definitions are surprisingly not well established in the literature are *loss*, as a stressor event, and *grief*, as the constellation of possible changes in biological, psychological, social, or spiritual functioning resulting from an experience of loss. As with moral injury, there is accruing evidence that grief, as a subclinical but significant stress state, can be discriminated from traumatic stress along a number of dimensions.<sup>22,35</sup> Because an important goal of operational stress research and surveillance is to promote prevention through identifying and mitigating the risk associated with preclinical or subclinical states of distress or dysfunction, future studies should target losses and potentially morally injurious events, as stressors, and grief and moral injury, as stress outcomes, even though they are not currently defined as mental disorders.

A final category of important operational stress constructs is a generic term for preclinical operational stress outcome states. Such states might encompass not only trauma, grief, and moral injury as often overlapping responses to discrete events, but also the spectrum of responses to the accumulation of operational stress from all causes over time. The Army term, *combat operational stress reaction*,<sup>36</sup> has a long history and is supported by a body of research, particularly in the Israeli military.<sup>37</sup> Combat operational stress reaction, as currently defined, includes the entire spectrum of clinical and preclinical stress states, regardless of severity or chronicity, as long as they are experienced in the midst of a military operational mission rather than before or after it. In contrast, *stress injury*, the term in use by the Navy and Marine Corps, is conceived to represent a state of disruption to the integrity to a person's brain, mind, or spirit, causing distress or dysfunction that is significant though not sufficiently chronic or disabling to meet criteria for a clinical mental disorder (stress illness), regardless of where it is experienced.<sup>38,39</sup> In keeping with the scope of this article, we have chosen to emphasize measures most directly relevant to the constructs encompassed by the term stress injury.

### Core Data Elements

Appendix 2 contains the core data elements recommended for inclusion in future operational stress research and surveillance. In keeping with Thurmond et al,<sup>1</sup> the core data elements listed in these appendices are considered minimum variable domains and measures recommended for broad use across future operational stress research and surveillance. Unlike the common data element recommendations offered by other working groups in this multiagency effort, the OSWG did not limit *core* measures to only those whose psychometric properties had already been well studied and validated in operational stress research of service members and veterans serving in OIF or OEF. If that standard were applied to operational stress research and surveillance, almost all recommended measures would have to be considered emerging, at least until their literature bases had been further developed.

### Supplemental Data Elements

Appendix 3 lists supplemental data elements recommended for ad hoc inclusion in future operational stress research and surveillance. Variables and measures included as supplemental data elements fall into 3 broad categories: additional deployment history information; additional stressors not included in the list of core data elements, both deployment related and nonoperational;

and risk and resilience factors that may act as mediators, moderators, or both, in the psychological, social, or behavioral domains.

### Emerging Data Elements

Appendix 4 lists emerging data elements that are of interest because of their potential to fill significant current gaps in operational stress science.

## DISCUSSION

### Core Data Elements

The following specific core variables and measures deserve explanation. Military-specific demographic information may be crucial to understanding not only the stressors to which service members may be routinely exposed, but also the cultural ecologies within which they are mastered. Rank can be conveniently divided into 5 natural groupings: junior enlisted (E1–E3), noncommissioned officer (E4–E9), warrant officer (W1–W5), junior commissioned officer (O1–O4), and senior commissioned officer (O5–O9). Although the precise boundaries of these rank groups can be debated, the roles and responsibilities of individual members of all military service branches can be well defined by their membership in 1 of these 5 groups. Likewise, individual roles, responsibilities, stressor exposures, and cultural expectations can be predicted, to some extent, by military occupational specialty, especially for enlisted service members. Each specialty group in each service branch is defined not only by its specialized roles and tasks in military operations of various kinds, but also by its unique and enduring cultural ethos, complete with identifications, values, and language.

Military settings for data collection may be crucial determinants not only of the current stress states experienced by study participants, but also of their willingness and ability to participate in a self-report study. Introspective mindsets, necessary for accurately responding to psychological surveys or interviews, may be discouraged by military leaders and actively avoided by service members while in the midst of a combat deployment, because maintaining a consistently external attentional focus may be crucial for their adaptation, effectiveness, and even survival.<sup>6</sup> During postdeployment recovery periods, on the other hand, service members may be more willing to take stock of the very same perceptions, thoughts, and feelings they excluded from awareness during deployment.

All of the operational stressor exposure variables listed as core data elements can be conveniently and reliably measured using several scales from the DRRI,<sup>41</sup> which was developed on samples of 1991 Gulf War veterans with the goal of broad applicability to contemporary deployments. The DRRI is a modular inventory in which researchers may select those individual modules most relevant to their aims. We consider the following DRRI constructs and modules to be *core measures of operational stressor exposures*: Combat Experiences, Post-Battle Experiences, Deployment Concerns, Deployment Environment, Life and Family Concerns, Pre-Deployment Life Events, and Post-Deployment Life Events. Other valid measures of combat experiences exist, but in the context of asymmetric counterinsurgency military operations common to current war-zone deployments, and of the strain of high and sustained operational tempos on all segments of military forces, we believe the entire spectrum of possible operational stressors should be assessed in every study, not only *during* deployments but *before* and *afterward* as well. Predeployment and postdeployment life events may be analyzed as risk factors for adverse outcomes from during-deployment stress, but they

could just as profitably be considered additive to combat and noncombat stressors as contributors to total stress load. Most of the DRRI scales, in their original forms, have undergone preliminary validation for use in a population of recent OIF veterans.<sup>42</sup> To allow for sufficient variance of exposure severity in OEF/OIF populations, we recommend modifying the Combat Experiences scale to use a 5-point Likert response format (1, never; 2, a few times over entire deployment; 3, a few times each month; 4, a few times each week; and 5, daily or almost daily) instead of a dichotomous (yes/no) response.<sup>42(p394)</sup> However, the psychometric properties of this modification have not been evaluated.

Given the evidence that posttraumatic stress is not the only significant mental health consequence of exposure to operational stressors, we recommend including in core data elements dimensional measures of depression, anxiety, and alcohol use, as well as posttraumatic stress symptoms. Because an important challenge for the operational stress field is to develop evidence-based prevention interventions—especially indicated interventions targeting subclinical or preclinical levels of distress or dysfunction—we emphasize the importance of analyzing stress outcomes in multiple domains to ascertain the risk relevance of various subclinical threshold scores on dimensional measures. Identifying co-occurring symptoms across somatic, cognitive, emotional, and behavioral domains in the immediate aftermath of adverse events may also help define *subclinical stress syndromes* deserving of focused surveillance and early intervention.

### Supplemental Data Elements

Deployment history information may be assessed using ad hoc questionnaires specific for the study population, with the goal of identifying the number of previous operational deployments for each participant, and the number of months during the past 36 months that were spent deployed. These may be useful indices of cumulative stress load that are not captured by questionnaires targeting exposures to specific life events.

The DRRI includes 2 modules that index deployment-related stressors that are not addressed by previously recommended core data elements: the Relationships Within Unit scale, which indexes potential sources of social stress within military units, including sexual harassment; and the Exposure to Nuclear, Biological, Chemical Agents scale, which indexes perceived exposure to chemical, biological, radiologic, nuclear, or high-yield explosives weapons. The former module may be frequently relevant in operational stress studies because it measures common sources of social conflict and potential noncombat trauma, whereas the latter may be used more infrequently given the rarity of chemical, biological, radiological, nuclear, or high-yield explosives threats in current operational environments. A third type of deployment-related stressor that may be important to include as an independent variable in operational stress studies is a measure of personal illness or injury while deployed, such as being wounded in action or injured through other nonhostile means. Both physical and traumatic brain injuries can be powerful moderators of adaptation to operational stress, both during and after deployment. In most cases, ad hoc questionnaires will be developed to query participants about their experiences of personal injury or illness, or exposure to events likely to produce such injury, such as nearby explosive blasts. Alternatively, military medical and personnel records may be very useful for obtaining objective information about injuries and illnesses.

Two categories of nonoperational stressors that have been shown in multiple studies to reliably enhance risk for adverse operational stress outcomes such as PTSD are past life

exposures to potentially traumatic events or traumatic losses, and the cumulative stress burden resulting from the recent loss or current threatened loss of needed biological, psychological, social, or spiritual resources. For recommendations regarding measures of lifetime exposure to potentially traumatic events, the reader is referred to the report of the PTSD Working Group (see Kaloupek et al<sup>10</sup>). To assess current life stressors other than those arising directly from military operational deployment challenges or other traumas or losses, we recommend the Conservation of Resources Evaluation,<sup>46</sup> a broad measure of psychosocial resource availability and loss that has been validated in a variety of trauma-exposed populations.<sup>68</sup>

An important category of potential mediators of negative outcomes from trauma, traumatic loss, and other acute stressors is the spectrum of possible states of perievent distress or dissociation. The most widely used and validated measures of potential peritraumatic mediator states are the Peritraumatic Distress Inventory,<sup>47</sup> a self-report measure of physiologic arousal and emotional distress captured in the A2 criterion for PTSD,<sup>25</sup> and the Peritraumatic Dissociative Experiences Questionnaire,<sup>48</sup> a self-report measure of perievent cognitive dissociation. A third self-report measure of perievent loss of integrative capacity that has been less widely used in recent years, but that uniquely captures peritraumatic somatoform dissociation such as was common in wars of the 19th and 20th centuries,<sup>69</sup> is the Somatoform Dissociation Questionnaire.<sup>49</sup>

The remainder of appendix 3 lists recommended measures for the most widely studied physical, psychological, social, and behavioral risk and resilience factors. In the important domain of social support within military units, 2 measures are recommended: the DRRI Unit Support scale<sup>41</sup> and the Vertical and Horizontal Cohesion Scale, developed by researchers at the Walter Reed Army Institute of Research.<sup>54</sup> Both measures are recommended because each assesses a different aspect of unit social cohesion: the DRRI Unit Support scale addresses unit relationships only during a recent deployment, whereas the Vertical and Horizontal Cohesion Scale indexes relationships within units more broadly, during any phase of a deployment cycle. In the realm of family social supports, we recommend the McMaster Family Assessment Device, General Function scale<sup>55</sup> over other available instruments, because it not only has excellent psychometric properties, but is based on a theoretic model of family functioning that has found good support in the literature.<sup>70</sup> Given the strength of the link between sleep deprivation and both decrements in performance and increased morbidity in many domains, we strongly recommend assessing sleep quality as a risk factor using the self-report Pittsburgh Sleep Quality Index,<sup>57</sup> a measure with well-developed literature support. Health-related quality of life may best be assessed using the Veterans RAND 36-Item Health Survey,<sup>58</sup> developed specifically for use with veterans from the widely used Medical Outcomes Study Short Form Health Survey,<sup>71</sup> by modifying its role functioning items to increase the instrument's precision and discriminant validity.<sup>72</sup>

### Emerging Data Elements

The first group of emerging variables and measures listed on appendix 4 comprise a spectrum of potential operational stress outcomes—other than subclinical forms of posttraumatic stress, depression, or anxiety—for which valid self-report measures are available, but which are not yet well studied in current military populations. Two of these are rapidly emerging measures for psychological stress outcomes of recently increasing interest to operational stress researchers: the Inventory of Complicated Grief–Revised<sup>22</sup> and the Posttraumatic Growth Inventory.<sup>60</sup> Spirituality is a domain of potential operational stress

risk or resilience factors that is widely accepted as important, but as yet little studied. The Spiritual Attitudes Inventory<sup>61</sup> was created by combining a number of other validated spirituality measures into a single 28-item questionnaire that covers several aspects of spiritual and religious attitudes and practices. The Spiritual Attitudes Inventory and its manual for scoring are available for download from the U.S. Army Center for Health Promotion and Preventive Medicine.<sup>61</sup>

The Peritraumatic Behavior Questionnaire, Observer-Rated Version,<sup>63</sup> is the first instrument designed to allow third-person observers who are closely familiar with deployed service members, such as embedded medics or corpsmen, to recognize early changes in their behavior that may reflect stress injuries in the wake of intensely stressful events. The Peritraumatic Behavior Questionnaire in its retrospective self-report version has been validated in a sample of recent OIF and OEF veterans with and without PTSD,<sup>63</sup> and it is currently being studied in its observer-rated form in a Marine battalion deployed to Afghanistan.

Many current studies are searching for biological, psychological, or neuropsychologic moderators and mediators for adverse operational stress outcomes, both as potential early markers of risk and possible targets for prevention interventions. It is expected that this area of research will expand rapidly and yield methodologies that will aid both clinical and preclinical care, as well as promote more accurate modeling of operational stress processes over time. A number of such variable domains and measures are included in appendix 4 as emerging data elements. However, a complete survey of factors is beyond the scope of this article.

### Data Elements for Families and Children

It is beyond the scope of the current effort to make specific recommendations for variables and measures to use in research or surveillance with military families. It is not the intent of the OSWG to minimize the importance of operational stress studies involving military spouses, children, and extended family members. Many of the core, supplemental, and emerging data elements listed in appendices 2 through 4 may be effectively used with samples of adult family members. For children 12 years and younger, stressor exposures may be assessed from parents and other adult informants. The domains of stress outcomes for children are the same as for adults, but the methods for assessing them are obviously very different. For studies involving children in military families, an excellent resource is the Measures Review Database maintained by the National Child Traumatic Stress Network at the following website: [http://www.nctsn.org/nctsn/nav.do?pid=ctr\\_tool\\_searchMeasures](http://www.nctsn.org/nctsn/nav.do?pid=ctr_tool_searchMeasures).

### CONCLUSIONS

With the goal of increasing comparability and facilitating analyses across studies, we presented conceptual constructs and 3 tiers of empirical data elements (core, supplemental, and emerging). The terms, variables, and measures we recommended were those we believed to possess both the strongest evidence base and most direct applicability to future operational stress research and surveillance in the U.S. military. Key issues that emerged during the process of assembling these recommendations include the following: (1) operational stress is about much more than combat, and it occurs everywhere service members and their families live and work; (2) PTSD is not the only adverse mental or behavioral health outcome that may follow exposure to operational stressors—many other potential clinical and behavioral outcomes are of at least equal

public health importance; and (3) we need to develop methodologies for identifying preclinical and subclinical states of distress or dysfunction that are markers of risk for failure of

role performance and future clinical mental disorders, so that targeted prevention interventions can be developed and evaluated.

**APPENDIX 1: OPERATIONAL STRESS CONSTRUCTS**

Stressor Exposures		Stress Outcomes	
Construct	Definition	Construct	Definition
Stressor	An event, challenge, or demand that has the potential to generate distress, alter functioning, or inflict harm to biological, psychological, social, or spiritual systems in a person	Stress	Changes in biological, psychological, social, or spiritual functioning as a result of events, challenges, or demands, whether environmental or internal, instantaneous or cumulative
Operational stressor	A stressor produced by or involving military operations, training, or life	Operational stress	Stress resulting from instantaneous or cumulative exposure to military operations, training, or life
Combat stressor	A stressor produced by or involving military armed conflict, especially the use of lethal force	Combat stress	Stress resulting from exposure to military armed conflict, especially the use of lethal force
Potentially traumatic event	An event involving actual or threatened death or serious injury, or a threat to the physical integrity of self or others	Traumatic stress	Stress resulting from experiencing, witnessing, or being confronted by death, serious injury, or a loss of physical integrity
Loss	An event involving the disappearance of someone or something cherished, whether another person, an aspect or portion of oneself, or an external object or place	Grief	Stress resulting from the disappearance of someone or something cherished
Potentially morally injurious event	Acts or failures to act that transgress deeply held and communally shared moral beliefs and expectations	Moral injury	Stress resulting from witnessing or perpetrating acts or failures to act that transgress deeply held, communally shared moral beliefs and expectations
		Stress injury	A disruption to the integrity of the brain, mind, or spirit resulting from exposure to intense or persistent stress, manifested in significant but subclinical distress or loss of functioning
		Combat and operational stress reaction	Any maladaptive stress reaction occurring during combat or other military operation

**APPENDIX 2: CORE DATA ELEMENTS FOR OPERATIONAL STRESS RESEARCH AND SURVEILLANCE**

Domain	Variables	Measures
Demographics	Traditional demographics  Military-specific demographics <ul style="list-style-type: none"> <li>• Rank group:                             <ul style="list-style-type: none"> <li>- Junior enlisted (E1–E3)</li> <li>- Noncommissioned officer (E4–E9)</li> <li>- Warrant officer (W1–W5)</li> <li>- Junior officer (O1–O4)</li> <li>- Senior officer (O5–O9)</li> </ul> </li> <li>• Branch of service</li> <li>• Military occupational specialty (either a code designation or written descriptor of a specialty or specialty category)</li> </ul>	See Maas et al, <sup>40</sup> published in this issue  Ad hoc questionnaire
Study setting	Military setting in which each data collection occurs (eg, war-zone deployed, training, garrison, home, medical facility)	Ad hoc
Deployment-related stressors	Direct combat experiences	DRRI, <sup>41</sup> Combat Experiences scale, modified to allow 5-point Likert-type responses <sup>42</sup>

**APPENDIX 2: CORE DATA ELEMENTS FOR OPERATIONAL STRESS RESEARCH AND SURVEILLANCE  
(Cont'd)**

Domain	Variables	Measures
	Postcombat experiences Perceptions of threat Noncombat operational stressors	DRRI, Post-Battle Experiences scale <sup>41</sup> DRRI, Deployment Concerns scale <sup>41</sup> DRRI, Deployment Environment and Life and Family Concerns scales <sup>41</sup>
Predeployment stressors	Exposures to potentially traumatic or morally injurious events, or losses before deployment	DRRI, Pre-Deployment Life Events scale <sup>41</sup>
Postdeployment stressors	Exposures to potentially traumatic or morally injurious events, or losses after deployment	DRRI, Post-Deployment Life Events scale <sup>41</sup>
Operational stress outcomes	Traumatic stress Depression symptom severity Anxiety symptom severity Alcohol abuse or dependence	See Kaloupek <sup>10</sup> Revised Beck Depression Inventory <sup>43</sup> Beck Anxiety Inventory (BAI) <sup>44</sup> Alcohol Use Disorders Identification Test (AUDIT) <sup>45</sup>

**APPENDIX 3: SUPPLEMENTAL DATA ELEMENTS FOR OPERATIONAL STRESS RESEARCH AND SURVEILLANCE**

Domain	Variables	Measures
Deployment history	<ul style="list-style-type: none"> <li>Duration of current or most recent deployment</li> <li>Total number of prior war-time deployments</li> <li>Duration of previous war-time deployments</li> <li>Duration of "dwell time" in garrison before each deployment</li> <li>Total number of months deployed during the last 36 months</li> </ul>	Ad hoc questionnaire, military records
Other deployment-related stressors	Personal illness or injury during deployment, especially possible traumatic brain injury Unit relationship stressors (including sexual harassment during deployment) Exposure to chemical, biological, radiologic, or nuclear weapons	Ad hoc questionnaire, other military records DRRI, Relationships Within Unit scale <sup>41</sup> DRRI, Exposure to Nuclear, Biological, Chemical Agents scale <sup>41</sup>
Nonoperational stressors	Lifetime exposures to potentially traumatic events Current and recent life stressors	See Kaloupek <sup>10</sup> Conservation of Resources Evaluation (COR-E) <sup>46</sup>
Potential perievent mediators	Peritraumatic distress Peritraumatic cognitive dissociation	Peritraumatic Distress Inventory (PDI) <sup>47</sup> Peritraumatic Dissociative Experiences Questionnaire (PDEQ) <sup>48</sup>
Peritraumatic somatoform dissociation	Somatoform Dissociation Questionnaire (SDQ-20) <sup>49</sup>	
Psychologic risk or resilience factors	General coping style Trait resilience Trait dissociation Emotional disposition Trauma-related anger	Brief COPE <sup>50</sup> Connor-Davidson Resilience Scale (CD-RISC) <sup>51,52</sup> Dissociative Experiences Scale (DES) Positive and Negative Affect Scale (PANAS) <sup>53</sup> State Trait Anger Expression Inventory Revised (STAXI-2) <sup>21</sup>
Social risk or resilience factors	Childhood family environment Unit support while deployed Vertical and horizontal unit cohesion Postdeployment social support Current family functioning	DRRI, Childhood Experiences scale <sup>41</sup> DRRI, Unit Support scale <sup>41</sup> Vertical and Horizontal Cohesion Scale <sup>54</sup> DRRI, Post-Deployment Support scale <sup>41</sup> McMaster Family Assessment Device (FAD), General Function scale <sup>55</sup>

### APPENDIX 3: SUPPLEMENTAL DATA ELEMENTS FOR OPERATIONAL STRESS RESEARCH AND SURVEILLANCE (Cont'd)

Domain	Variables	Measures
Behavioral risk factors or outcomes	Drug abuse	Drug Abuse Screening Test (DAST) <sup>56</sup>
Health risk factors or outcomes	Sleep quality Health-related quality of life	Pittsburgh Sleep Quality Index <sup>57</sup> Veterans RAND 36-Item Health Survey (VR-36) <sup>58</sup>

### APPENDIX 4: EMERGING DATA ELEMENTS FOR OPERATIONAL STRESS RESEARCH AND SURVEILLANCE

Domain	Variables	Measures
Other self-reported operational stress outcomes	Aggression or violence	Conflict Tactics Scale (CTS) <sup>59</sup>
	Complicated grief	Inventory of Complicated Grief—Revised (ICG-R) <sup>22</sup>
	Posttraumatic growth	Posttraumatic Growth Inventory (PTGI) <sup>60</sup>
Observable operational stress outcomes	Spiritual and religious attitudes and practice	Spiritual Attitudes Inventory (SAI) <sup>61</sup>
Observable perievent stress behaviors	Sleep duration and timing	Actigraphy <sup>62</sup>
Spiritual risk or resilience factors	Peritraumatic and posttraumatic behavioral changes	Peritraumatic Behavior Questionnaire, Observer-Rated version (PBQ-OR) <sup>63</sup>
Biologic risk or resilience factors	Sympathetic nervous system activation	Heart rate variability <sup>64</sup>
	Psychophysiological reactivity and inhibition	Acoustic startle eye-blink response (ASER) <sup>64</sup>
	Biomarkers	Cortisol, neuropeptide-Y assays <sup>64</sup>
	Cognitive resources and performance	Performance-based neuropsychologic tests <sup>65</sup>
Neuropsychologic risk and resilience factors	Changes in basic assumptions	World Assumptions Scale (WAS) <sup>66</sup>
	Trauma-related guilt	Trauma-Related Guilt Inventory (TRGI) <sup>67</sup>

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