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Challenges and Options for Adding Trauma Items to the National Survey on Drug Use and Health (NSDUH)

Christal L. Badour[1]

Amanda K. Gilmore[2]

Heidi S. Resnick[2]

[1]University of Kentucky, Department of Psychology

[2]Medical University of South Carolina, National Crime Victims Research and Treatment Center, Department of Psychiatry and Behavioral Sciences

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Posttraumatic stress disorder (PTSD) is a psychiatric diagnosis describing mental health symptoms occurring as a result of a traumatic experience yielding significant functional impairment. National estimates of lifetime PTSD range from 6.1 – 10.6% (Goldstein et al., 2016; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kilpatrick et al., 2013; Roberts, Gilman, Breslau, Breslau, & Koenen, 2011). Establishing national estimates of PTSD is complex, as prevalence of PTSD can differ based on assessment approach (e.g., varied definitions of potentially traumatic events (PTEs) and PTSD criteria, rules for administration, time frame for symptom assessment), assessment modality (e.g. in-person, telephone, online), and sampling approach (e.g., nationally representative sample, high-risk sample). It is essential to have the most accurate national estimates for mental health disorders as possible to fully understand the scope of the problem and to inform allocation of resources for treatment and prevention.

There is considerable comorbidity of PTSD with substance use disorders, with 15-42% of individuals with a substance use disorder also meeting criteria for PTSD (Dragan & Lis-Turlejska, 2007; Driessen et al., 2008; Mills, Teeson, Ross, & Peters, 2006). Individuals with co-occurring PTSD and substance use disorders can have more difficulties in treatment than when receiving treatment for PTSD alone because individuals oftentimes use substances to cope with PTSD symptoms (Ford, Hawke, Alessi, Ledgerwood, & Petry, 2007; Najavitz & Hien, 2013; Simpson et al., 2014). This pattern of using substances to cope resulting in a substance use disorder can lead to poorer outcomes for these co-occurring disorders compared to those with each disorder alone (for a review, see Hildebrand, Behrendt, & Hoyer, 2015). As such, it can be useful to consider PTSD when examining substance use disorders. The Substance Abuse and

Mental Health Services Administration (SAMHSA) has been a leader in the collection and dissemination of national estimates of substance use disorders with the annual National Survey on Drug Use and Health (NSDUH). In 2008, SAMHSA began to assess incidence rates of past year serious mental illness (including PTSD) with the Mental Health Surveillance Study (MHSS) using a subset of the sample assessed in the NSDUH (Karg et al., 2014). The current manuscript provides an overview of previous methods used to assess national estimates of PTSD and provides recommendations to inform SAMHSA's assessment process that would yield the most accurate national estimates of PTSD. Specifically, SAMHSA would like to evaluate whether inclusion of a limited number of brief screening items can yield accurate estimates of PTE exposure and PTSD. The current manuscript first provides an overview of several definitional issues and considerations regarding best practice for assessment of PTEs and PTSD. This is followed by a review of five existing major U.S. epidemiological studies in this area, including the NSDUH-MHSS. Finally, the manuscript concludes with a summary and recommendations for producing national estimates of PTSD based on empirical evidence from existing national studies and research on best practices for assessment of mental health.

Definitional Issues: What Constitutes *Trauma*?

Historically the term *trauma* has been used in two ways, creating considerable conceptual and methodological confusion in the field. Trauma has sometimes been used to describe exposure to *traumatic events*, but in other cases, trauma is used to describe *traumatic responses* that occur following exposure to traumatic events. Use of the same term to refer to both stimuli (i.e. traumatic events) and responses following exposure to those events is similar to the confusion generated in the stress field by using the term *stress* and failing to distinguish between

stressors (i.e. stimuli) and the resulting *stress response* (i.e. emotional and behavioral responses following exposure to stressors).

In this paper we use the term, *potentially traumatic events (PTEs)* to describe stressor stimuli that are capable of producing posttraumatic stress disorder (PTSD) and other traumatic responses. The term, PTEs, is more appropriate than the term traumatic events, because not everyone exposed to PTEs displays traumatic responses characteristic of PTSD or other stressor-related disorders. Moreover, stressor events constituting Criterion A traumatic events (i.e. those PTEs that are defined as capable of producing a PTSD diagnosis) have changed with each iteration of the Diagnostic and Statistical Manual of Mental Disorders (i.e., DSM-III, DSM-III R, DSM-IV, DSM-IV TR, and DSM-5). This has resulted in estimates of PTE prevalence that are not directly comparable across editions of the DSM. Likewise, each revision of the DSM PTSD diagnosis has produced other changes to the PTSD diagnostic criteria that make it difficult to compare prevalence across editions. The NSDUH-MHSS utilized DSM-IV-TR criteria for PTE and PTSD assessment, so estimates may not be directly comparable to more recent estimates based on DSM-5.

A detailed description of changes to the PTSD diagnosis in DSM-5 can be found elsewhere (Friedman, 2013). Briefly, there are four major changes in DSM-5 that warrant mention when considering comparisons of PTE exposure and PTSD prevalence across versions of the DSM. First, Criterion A has been revised in several ways that affect the types of events that now constitute PTEs. The DSM-IV (and DSM-IV-TR) Criterion A2 requirement that an event involve subjective feelings of fear, helplessness, or horror has been removed. Learning about the sudden, unexpected death of a close family member or friend no longer constitutes a qualifying Criterion A event except in situations where the death occurred due to accidental or

violent means. In addition, events constituting exposure to sexual violence have been expanded, and a new category involving repeated or extreme indirect exposure to aversive details of traumatic events experienced as a part of one's job (e.g., first responders, police) has been added. Second, the number of symptom clusters has been expanded from three in DSM-IV-TR (i.e., re-experiencing, avoidance/numbing, hyperarousal) to four in DSM-5 (i.e., re-experiencing, avoidance, negative alterations in cognitions and mood, alterations in arousal and reactivity). Third, the total number of PTSD symptoms has been expanded from 17 to 20, with four existing PTSD symptoms being substantially modified. Fourth, there is explicit recognition that exposure to multiple PTEs is common and that PTSD can occur in response to more than one PTE. The relevance of these changes to studies addressing the prevalence of PTE exposure and PTSD prevalence is clear because prior studies using assessment instruments based on previous DSM criteria are unlikely to have assessed PTEs as defined in DSM-5 Criterion A or to have measured all of the new and modified PTSD symptoms.

As the majority of major epidemiological studies reviewed in this manuscript have operationalized PTEs and PTSD based on various iterations of the DSM, we will focus on these definitions, and will specifically review studies that have utilized the DSM-IV, DSM-IV-TR, or DSM-5 criteria. However, it is worth noting that alternative definitions of PTEs and PTSD are offered by the World Health Organization's 10th edition of the International Classification of Diseases (ICD-10; WHO, 1992). The 11th edition of the ICD, which is due out in 2018, includes proposed criteria for PTSD that differ in significant ways from the DSM-5 and ICD-10 criteria. Some preliminary evidence suggests that use of assessment tools consistent with proposed ICD-11 PTSD criteria may result in significantly reduced numbers of individuals qualifying for a diagnosis of PTSD as compared to those using criteria from either DSM-5 or ICD-10 (Hansen,

Hyland, Armor, Shevlin, & Elklit, 2015; Hyland et al., 2016; O'Donnell et al., 2014; Wisco et al., in press; although see Stein et al. [2014] for an alternative discussion of the lack of consensus across the DSM-IV-TR, DSM-5, ICD-10, and proposed ICD-11 criteria).

Key Methodological Issues for Studies of PTE and PTSD Prevalence

We now turn our attention to reviewing four major methodological issues that should be taken into consideration when developing or refining assessment tools for estimating the prevalence of PTE exposure and PTSD.

Representativeness of the Sample

For the purposes of this manuscript, we are primarily concerned with approaches that provide nationally representative estimates of PTSD following a range of PTEs. However, it is worth noting that many influential large-scale surveys in this area have focused on recruiting representative samples of individuals exposed to various specific PTEs (e.g., residents living in Manhattan during 9/11 [Galea et al., 2002]), at higher risk for exposure to specific PTEs (e.g., oversamples of younger women and college women when studying rape [National Women's Study-Replication; Kilpatrick, Resnick, Ruggiero, Conoscenti, & McCauley, 2007]) or from specific geographic regions (e.g., The 1996 Detroit Area Survey of Trauma [Breslau et al., 1998, 1999]).

The use of representative sampling is important, to allow for comparability of findings across broader population studies, including NSDUH-MHSS reports (e.g., Colpe, et al., 2010) that allow for understanding of health, mental health, and service needs within the United States. The NSDUH approach allows for state level estimates as well. As noted, the NSDUH target population is non-institutionalized residents ages 12 and older within the United States (with only participants aged 18 or older included in the MHSS). State census regions and segments are

obtained from which addresses are listed (SAMHSA, 2014). Sample persons are randomly selected for participation in the NSDUH from eligible sample units, with initial letters sent out to sampled addresses followed by in-person visits from interviewers (with follow-up MHSS component completed by telephone for a subset of participants), the use of Computer Assisted Interview (CAI) and Audio Computer Assisted Self-Interview (ACASI) techniques, and separation of identifying information from data collected (SAMHSA, 2014). Another potential approach to consider, is the use of address based sampling (ABS), which is currently being more widely used as a means of obtaining representative samples, in lieu of approaches such as random digit dialing (RDD) or dual sampling frames with cell phone numbers, which are costly, and have demonstrated lower response and coverage rates over time (National Academies of Sciences, Engineering, and Medicine, 2016; Montaquila et al., 2013).

Specifically, as discussed by Michael Kogan (National Academies of Sciences, Engineering, and Medicine, 2016), the National Survey of Children's Health (NSCH) and the combined National Survey of Children with Special Health Care Needs (NS-CSHCN) is making use of ABS, with push or encouragement to complete an online survey as opposed to over the telephone. Participants will also be allowed to complete by mail or by phone if preferred. Montaquila and colleagues (2013) observed that a two-phase mail based ABS strategy used within a field test for the National Household Education Surveys Program resulted in higher response and coverage rates compared to landline RDD. A study of the use of ABS as compared to RDD telephone surveys within the 2007 Health Information National Trends Survey (HINTS) indicated high population coverage with ABS but also higher nonresponse bias compared to RDD (Peytchev, Ridenhour, Krotki, 2010). Findings from Williams and colleagues (2016) however indicate that varying content of screening questionnaires, for example to increase

salience, can reduce nonresponse. Williams and colleagues emphasize the potential for reduced cost and greater coverage that can be obtained with ABS and suggest that it is possible to affect participation rates by varied content or survey design. Thus, use of ABS may increase response rates and coverage relative to landline RDD, appears to be feasible, and is currently being studied as an alternate approach with which to conduct representative population studies.

In addition to considering the use of push to web following sample recruitment using current NSDUH-MHSS methods, the use of internet panels might be considered as an option in future as data accumulate about this methodology. This approach includes drawing study participants from maintained panels (e.g., participants may be engaged in multiple research studies over time) initially identified from a larger sample with known demographics or other characteristics identified through ABS or other sampling designed to obtain a representative sample of US residents (Hays, Liu, & Kapteyn, 2015). Hays and colleagues review different types of panels and ongoing research related to potential advantages or limitations to their use depending on study goals.

It should be noted that all of these sampling methods fail to reach certain populations including those who are chronically homeless. However, given that there are only 75,000 chronically homeless adults on any given night (Cortes, Shivji, Buck, Khadduri, & Culhane, 2014), it might be ideal to collect data about this population by developing a survey specifically targeted toward sampling from this vulnerable population, as opposed to integrating the approach with the household data collection.

Survey Modality

There are several different options for survey modality including clinician-led (in-person semi-structured or structured clinical interviews), trained lay interviewer-led (phone or in-person

questionnaires or CAI), and self-report (paper and pencil, web-based, or app-based). Clinician or telephone-based interviews are no longer the primary recommended modality for collecting information about sensitive topics because they involve contact between the respondent and interviewer. This contact has been shown to often negatively impact willingness to disclose information about sensitive topics (Morral et al., 2014; National Research Council, 2014; Pew Research Center, 2015). Therefore, it is possible that surveys adopting modalities that eliminate contact between the respondent and interviewer would yield higher and more accurate prevalence estimates when sensitive topics are being assessed, including many PTEs and mental health symptoms following such experiences. Web-based surveys are the least expensive survey modality that would accomplish this. This approach can make use of visual and auditory question prompts as with other CAI approaches currently conducted in participants' homes as part of the primary NSDUH survey.

The use of the traditional comprehensive sampling employed in the NSDUH, combined with less expensive push to web might serve as a consistent strategy with what is already being implemented within the NSDUH with the exception that push to web could eliminate the need for in-person implementation of CAI or telephone administration of a clinician-led interview as was used in the MHSS supplement. This type of alternate approach might be researched to examine potential differences in response rates and patterns as well as prevalence data, length of time for survey item completion, and participant satisfaction and perceptions of privacy. The study by Kilpatrick and colleagues (2013) demonstrated the feasibility of web-based administration of a self-administered structured interview to assess PTE history and PTSD symptom criteria with a national web panel sample. If web-based administration appears to be comparable or even preferred, and saves time and expense, this might facilitate the addition of

questions to assess PTE history and PTSD symptom criteria with a large representative sample such as that studied as part of the NSDUH-MHSS or NCS-R, NESARC, and NESARC-III approaches. However, there are some downsides to web-based survey modes. See a report issued by the American Psychological Association (APA, 2002) outlining the risks for human subjects and protections needed for web-based research.

Measurement of PTEs

Several critical issues must be considered when constructing a measure of PTEs to be used in epidemiological surveys. These issues primarily cluster into two domains: approaches to defining events to be classified as PTEs and approaches to screening for PTE history.

Definition of events to classify as PTEs. Historically, studies in this area have taken one of two approaches to determining which events will count as PTEs: 1) constrain the definitions of PTEs to include events captured by the current DSM criterion A for PTSD, or 2) narrow the definition of PTEs to focus on a particular class or narrow classes of events in great detail (e.g., National Violence Against Women Survey—rape, physical assault, stalking; Tjaden, & Thoennes, 1998). Although the first of these options is likely to be of more relevance to the NSDUH as it involves a broader assessment of PTE exposure likely to result in more accurate estimates of population prevalence of PTSD, pragmatic constraints surrounding survey length necessarily limit the comprehensiveness of broad PTE screenings as compared to surveys focused on limited classes of PTEs.

PTE screening approach. Broad assessments of PTE exposure typically rely on a series of screening questions that inquire as to whether participants have ever experienced an event(s) that would fall into a range of PTE event classes (e.g., combat, accident, sexual assault). These PTE screenings can range considerably in length. For example, the approach adopted by the

NSDUH-MHSS study included only two brief screening items, which combined all assessed PTE categories into two questions:

1. *Sometimes things happen to people that are extremely upsetting—things like being in a life-threatening situation like a disaster, very serious accident or fire; being physically assaulted or raped; seeing another person killed or dead, or badly hurt; or hearing about something horrible that happened to someone you are close to. At anytime during your life, have any of these things happened to you?*
2. *Have you ever been in any serious car accidents or have you been victim of a crime?*

Participants in this study were only asked the second screening question if they did not positively endorse the first item. This approach contrasts with the screening approaches used in the National Comorbidity Survey-Revised (NCS-R; Kessler, Chiu et al., 2005), both versions of the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC [Pietrzak, Goldstein, Southwick, & Grant, 2011; Roberts et al., 2011], NESARC-III [Goldstein et al., 2016]), and the National Stressful Events Survey (NSES; Kilpatrick et al., 2013). These studies all included at least 20 stem questions (one or more items to assess each class of events and an *other* category/categories) plus additional follow-up questions to assess richer characteristics of certain (e.g., chronologically first, worst index) positively endorsed event classes (e.g., age at which PTE occurred, number of times PTE was experienced). Although such in-depth screening questions are more time-intensive to administer, there are at least three advantages to the more comprehensive screening approach that we would argue outweigh the time saved by adopting a briefer screening.

First, many epidemiological surveys have included behaviorally-specific descriptors of PTE event classes that are absent in the NSDUH-MHSS screening questions. The importance of designing surveys that include behaviorally-specific questions to assess for PTEs has been informed by decades of survey research in the area of sexual assault (Bachman, 1998; Fisher & Cullen, 2000; Kilpatrick, 2004; Koss, 1996; Morral et al., 2014; National Research Council, 2014). The term rape is not recommended as a sensitive approach to assessment because respondents may not know what it means and/or may hold biases about what constitutes rape (e.g., Resnick et al., 1993). Further, penetrative rape is only one type of sexual assault that would meet criteria as a PTE. Instead of asking a respondent to self-identify whether she/he has ever been raped, a behaviorally-specific item might ask whether that individual had ever engaged in unwanted vaginal, anal, or oral sex because another person used physical force or the threat of physical force. An additional behaviorally-specific question that was included in the NSES (Kilpatrick et al., 2013) asked about unwanted sexual incidents that had occurred when the respondent was passed out or unable to consent or stop what was happening due to the effects of alcohol or drugs. Victims are less likely to label an event as rape if they are intoxicated at the time of the event (Schwartz & Leggett, 1999; Bondurant, 2001), however, such incidents meet the criteria for sexual assault that occurs when a victim is incapacitated. This issue is likely to generalize to other event classes as well. For example, victims of intimate partner physical violence or childhood physical abuse might not respond with a yes to a question asking about physical assault if they are unsure that the question is asking about incidents perpetrated by close family members or intimate partners rather than an assault by a stranger or an incident that was reported to police. In addition to behaviorally-specific questions, the use of opening prefaces that make clear the types of circumstances of events being asked about (e.g., such incidents can occur

at any age and the person who did these things may be a family member, close friend, or romantic partner) is likely to result in more accurate estimates of PTE exposure. Examples of such opening prefaces are included in the NSES (Kilpatrick et al., 2013). Failure to assess relevant criterion A events may result in missing participants from the symptom assessment. For example, participants may not be cued to Criterion A events and this may result in their not thinking about associated PTSD symptoms and being skipped out of the diagnostic section. In addition, as noted, participants may hold biases and misunderstandings about what types of events qualify (e.g., intimate partner violence, sexual or physical abuse by a family member) and therefore might say no to a question asking about traumatic events that led to symptom distress due to lack of recognition of the event as meeting the described parameters.

Second, the NSDUH-MHSS screening items included a narrower range of possible PTEs compared to the range of event classes assessed by other epidemiological surveys. In addition to including additional PTE classes when screening for PTEs, other epidemiological surveys have also assessed whether respondents experienced any *other* PTEs not captured by specific PTE classes. Wording of the *other* question(s) have varied, but it is important to note that specificity in these categories (e.g., any other event vs. any other event involving threatened or actual injury to you or others) is important to minimize endorsement of events that would not constitute PTEs. Failure to include a prompt to assess *other* events may have resulted in an underestimate of the prevalence of PTE exposure, particularly if respondents did not recognize their PTEs as fitting within the described event classes on the NSDUH-MHSS screening items.

Finally, devoting time and interview content to the careful assessment of PTEs is cost effective in the sense that a positive history of PTE exposure has been reliably found to relate to increased negative physical and mental health outcomes, as well as health risk behaviors, and to

contribute significantly to the leading causes of death (Felitti et al., 1998; Stein et al., 2010). Stronger associations between interpersonal violence and negative health outcomes are observed across studies (e.g., Kessler et al., 1995; Kilpatrick et al., 2013; Stein et al., 2010). Therefore, in addition to assessing a history of PTE exposure with careful attention to assessment of interpersonal violence events as part of necessary criteria for PTSD, information about a history of exposure to traumatic events should be carefully examined (in addition to full criteria for PTSD) in association with substance disorder, other mental health correlates, health behaviors, and service seeking (Campbell, Walker, & Egede, 2016; Elhai, North, & Frueh, 2005; Felitti et al., 1998; Kartha et al., 2008).

Another important issue to consider when selecting an approach to PTE assessment is the lack of consensus regarding which PTE(s) PTSD diagnostic criteria should be linked to when estimating PTSD prevalence. If a respondent has experienced only one PTE, assessment of PTSD should clearly be conducted in reference to that event. However, many respondents have experienced multiple PTEs, which raises the question of which event(s) PTSD should be assessed in relation to. Several epidemiological studies including the NESARC, NESARC-III, and NSDUH-MHSS, as well as the original National Comorbidity Survey (using DSM-III-R criteria; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995) have assessed PTSD in reference to an event identified by respondents as being the “worst” or most distressing PTE (i.e., worst index event). Others, such as the NCS-R have assessed PTSD to both a worst index and a randomly selected PTE. Using this latter approach from data collected as part of the Detroit Area Trauma Survey, Breslau, Peterson, Poisson, Schultz, & Lucia, (2004) demonstrated that tying PTSD prevalence estimates to a worst index PTE tends to result in small, but significant overestimation of PTSD prevalence compared to when PTSD is tied to a randomly selected PTE.

Of note, the two approaches do converge on the PTE event classes that are most likely to result in PTSD (i.e., PTEs with the highest conditional risk of PTSD), with various forms of assaultive violence resulting in the highest conditional prevalence. Breslau and colleagues recommended that studies utilizing a worst index event approach implement a bias correction by setting the distribution of worst index events equal to their expected distribution using a Monte Carlo-type estimation. The observed probabilities of PTSD associated with specific event classes should then be applied to the corrected distribution. They further note that the representativeness of uncorrected estimates among studies tying PTSD prevalence to a worst index PTE is likely to be higher among samples with a greater proportion of participants exposed to only one, or relatively few, PTE(s).

Two more recent alternative approaches developed by Kilpatrick and colleagues (2013) involve allowing participants to indicate which event or events (of a comprehensive list assessed) a given PTSD symptom relates to. This information is then used when determining whether full diagnostic criteria are met to one or more events. This approach, designated as *same event* PTSD, allows for participants to meet diagnostic criteria to any number of qualifying PTEs. A second approach referred to as *composite* PTSD, is defined as meeting criteria for PTSD by having symptoms to more than one PTE (e.g., intrusive memories of a past physical assault, avoidance of reminders of a motor vehicle accident). These more comprehensive ways of evaluating the potential impact of exposure to more than one PTE requires determining which PTE or PTEs are involved with each PTSD symptom, thus potentially making it more time consuming to assess. However, assessing which PTE or PTEs are involved in each PTSD symptom also confers the advantage of being able to determine whether respondents meet criteria for *same event* PTSD (all necessary PTSD criteria are met to the same event) or to multiple PTEs, while overcoming bias

associated with the more limited worst index event approach. In addition, it is clear based on data reported by Kilpatrick and colleagues (2013) and others that risk of PTSD is increased for those reporting multiple PTE exposure. Thus, failure to adequately account for multiple event exposure may lead to underestimates in PTSD prevalence.

Measurement of PTSD

In addition to using different versions of the DSM and measuring PTSD in relation to different PTEs, epidemiological studies have also varied as to whether they report PTSD among the entire sample (population prevalence), and/or among those exposed to at least one PTE (conditional prevalence). Additionally, some studies like the NCS-R, NESARC, and NSES have also reported the conditional prevalence of PTSD given exposure to particular classes of PTEs, which allows for direct comparisons of PTE classes to determine which events are the most likely to result in a PTSD diagnosis. Again, valid and sensitive assessment of PTE exposure is critical to determining conditional probabilities as well as overall sample estimates of PTSD. Timeframe for measurement of PTSD has also varied. The most common period assessed is lifetime prevalence of PTSD; however, past-year and past six-month prevalence have also been assessed in some studies. This variability makes it difficult to compare estimates across studies that have utilized different time periods.

A particularly important consideration when adopting an approach to assessing for PTSD is whether to administer all symptom questions to each respondent in the study or to include gating questions in order to reduce survey length. Gating questions are items that require a positive endorsement before respondents are asked additional follow up questions in a particular category of items. Gating questions in measures of PTSD typically include screening items to assess for positive history of one symptom cluster, typically re-experiencing symptoms (criteria

B) in relation to a particular PTE, before assessing for additional symptom cluster criteria (criteria C – E in DSM-5 or C – D in earlier versions). Surveys utilizing gating questions in their PTSD modules (i.e., NSDUH-MHSS, NCS-R) included skip out rules to determine when additional PTSD symptom items would not be administered to a given respondent. The NSDUH-MHSS included the most conservative skip out rules of the studies reviewed here, such that respondents were not administered any of the remaining PTSD symptom criteria if they did not positively endorse re-experiencing symptoms. The PTSD module in the NCS-R utilized a slightly relaxed set of gating questions, wherein the module was discontinued if participants did not endorse a sufficient number of symptoms in the first two symptom clusters (Criteria B and C per DSM-IV-TR).

Although gating questions and corresponding skip out rules are included to save time and money by reducing the number of questions administered to each respondent, best practice guidelines for surveys assessing sensitive behaviors and experiences suggest that researchers should administer the same series of questions for all respondents rather than relying on gating questions (Fisher & Cullen, 2000; National Research Council, 2014). In relation to PTSD, these skip out rules have the particular downside of limiting the investigators' ability to examine prevalence of subclinical PTSD—sometimes referred to as partial or subthreshold PTSD. Subclinical PTSD has been defined in different ways (Schnurr, 2014). Prior to DSM-5, one common approach adopted by the NESARC study (Pietrzak et al., 2011) and other investigators (Breslau, Lucia, & Davis, 2004; Stein, Walker, Hazen, & Forde, 1997) was to require that respondents endorse at least one symptom from the B, C, and D criteria. Others have suggested that a subclinical PTSD diagnosis should be given to individuals fully meeting the minimum symptom thresholds for criteria B and C or B and D (Blanchard et al., 1994). Still others yet have

adopted some combination of these approaches (Schnurr, Friedman, & Rosenberg, 1993). McLaughlin and colleagues (2015) have suggested that meeting two or three of the four B – E criteria for DSM-5 is the most optimal formula for defining subclinical PTSD per DSM-5. Although there is not universal consensus regarding the best approach to defining partial or subclinical PTSD, there is substantial research to suggest that regardless of the algorithm used, individuals with subclinical PTSD demonstrate impaired functioning relative to those exposed to PTEs without PTSD (Breslau, Lucia, & Davis, 2004; Pietrzak et al., 2012; Schnurr et al., 2000; Stein et al., 1997; Zlotnick, Franklin, & Zimmerman, 2002). This group may also be at substantially increased risk for delayed onset PTSD (Smid, Mooren, van der Mast, Gersons, & Kleber, 2009). Thus, surveys such as the NESARC, NESARC-III and NSES, which do not include gating questions leading to early skip out procedures are better equipped to address questions related to the prevalence and impact of subclinical PTSD.

With these various methodological considerations in mind, we now turn our attention to providing an overview of the methodological approaches adopted by the NCS-R, NESARC, NESARC-III, NSDUH-MHSS, and NSES to assessing PTE exposure and prevalence of PTSD. We then contrast these approaches with the brief survey methodology adopted by the NSDUH-MHSS and discuss possible reasons for discrepancies in the prevalence estimates observed across these studies.

Review of Major Epidemiological Surveys

Table 1 includes an overview of the major epidemiological studies reviewed below.

National Comorbidity Survey-Replication (NCS-R)

Sampling. The NCS-R (Kessler et al., 2004; Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005; Kessler, Chiu et al., 2005) was conducted between 2001 and 2003 with a

sample of 9282 English-speaking adults over the age of 18 using a stratified, multistage clustered area probability sample of households in the 48 contiguous states. The sampling frame included students living in campus group housing who maintained a permanent household address. Similar to the approach in the original NCS (Kilpatrick, et al., 1995), weights were generated to adjust for nonresponse bias, to adjust for differences in probability of within- and without-household selection, and to stratify the final sample to approximate the 2000 US Census on several socio-demographic variables. Also following the approach adopted by the NCS, the NCS-R data collection was completed in two parts. Part 2 was only administered to a subsample of 5692 participants, which included an oversample of participants meeting criteria for clinical diagnoses on Part I of the interview.

Modality. The NCS-R used an updated version of the CIDI developed for the World Health Organization World Mental Health (WMH) Survey Initiative (WMH-CIDI; Kessler & Üstün, 2004). The WMH-CIDI was delivered in-person using CAI technology by trained interviewers who were not clinicians. The WMH-CIDI is a structured diagnostic interview designed to assess DSM-IV-TR diagnoses. The WMH-CIDI was substantially longer than the earlier version used in the NCS. The entire interview took a minimum of 90 minutes to complete among respondents with no lifetime disorders, and took as long as 5 to 6 hours to complete among respondents with a complex psychiatric history. Part 1 took a mean of 33.8 minutes to complete, while Part 2 (which included the PTE history and PTSD assessments) took a mean of 109.4 minutes to complete (Kessler et al., 2004).

Assessment of PTEs. Assessment of PTEs was conducted by asking participants to check off in a response booklet whether they had ever experienced any of 27 potential PTEs that were divided into three broad groups of events: Traumatic personal experiences (e.g., combat,

automobile accident, natural disaster), personal violence (e.g., beaten up as a child by caregiver, raped), events affecting others (e.g., unexpected death of a loved one, witnessed death or dead body or saw someone seriously hurt). A final *other* event category was included in the third grouping of events that included "any other traumatic or life-threatening event." This approach was substantially expanded from the NCS (12 stem questions) to the NCS-R (28 stem questions). New categories of PTEs (e.g., exposure to toxic chemicals, stalking, sudden death of a loved one) as well as increased details for previously assessed categories (e.g., participating in combat versus living as a civilian in a place where war or other conflict occurred) were added. Questions were also added to account for accidental or purposeful harm that the respondent caused to someone else, and to account for other PTEs that respondents may not be willing to disclose to the interviewer. One major limitation of the NCS-R PTE assessment approach was the lack of inclusion of behaviorally-specific descriptors for PTEs involving personal violence.

Assessment of PTSD. Questions assessing lifetime and past 12-month DSM-IV-TR PTSD criteria B – D were administered in relation to the PTE respondents identified as causing them "the most problems" (worst index event). Participants were categorized as PTSD positive if they met DSM-IV-TR criteria for PTSD to either the worst or the randomly selected event.

Subthreshold PTSD. Subthreshold PTSD was not assessed in the NCS-R. In contrast with the original NCS, where the PTSD interview was discontinued if criterion B was not met, criterion B and criterion C questions were administered for all respondents endorsing at least one PTE in relation to their worst index and random event (in the case of multiple events). However, if respondents did not endorse the minimum number of symptoms needed to meet criterion C, the interview was discontinued before assessing for criterion D. Thus, it is possible that a respondent may have met criteria for subthreshold PTSD by meeting criterion B and D or by meeting

criterion B as well as endorsing one symptom each from criterion C and D, but this would not have been captured by the interview used in the NCS-R (Kulka, 1990; Schnurr et al., 2000).

National Epidemiologic Survey on Alcohol and Related Conditions (NESARC)

Sampling. The NESARC consisted of two waves. Wave 1 was conducted from 2001 to 2002 and Wave 2 was conducted from 2004 to 2005 with a total sample of 43,093. Estimates of PTSD were only assessed during Wave 2 (n = 34,653). The NESARC included a nationally representative sample of noninstitutionalized adults living in households and group quarters in the 50 US states including the District of Columbia was used. The 2000 Census Supplementary Survey was used to form the sampling frame for the household portion of the NESARC study and the Census 2000 Group Quarters Inventory formed the sampling frame for the group quarters portion of the sample. The NESARC oversampled Blacks, Hispanics, and young adults aged 18-24 at the household level. One adult was randomly selected for interview within each household. Sampling weights were constructed to adjust for nonresponse at household and person levels, and to adjust for the oversampling of young adults, Hispanics, and Blacks. Wave 2 data also included weights to account for attrition from Wave 1. The data were also then adjusted to be representative of the 2000 Census on various sociodemographic variables (i.e., region, age, sex, race, ethnicity).

Modality. Mental health disorders in the NESARC were assessed per DSM-IV criteria using the fully structured Alcohol Use Disorder and Associated Disabilities Interview Schedule-IV (AUDADIS-IV; Grant, Dawson, & Hasin, 2001, 2004). Similar to the NCS-R, the AUDADIS-IV was delivered in-person using CAI technology by trained interviewers who were not clinicians. The PTSD module of the AUDADIS-IV has good test-retest reliability, internal consistency, and reliability for related risk factors (Ruan et al., 2008).

Assessment of PTEs. PTE exposure was assessed with 27 questions enumerating specific PTE classes. Six of the 27 questions described events involving terrorism. If positively endorsed respondents were asked to clarify whether the events occurred on September 11, 2001. An *other* category was also included in which respondents were asked to indicate whether they had experienced any other injury or shocking events that had not been included in the remaining categories. Respondents reporting multiple PTEs were asked to nominate a worst index event: "Which of these experiences would you single out as the WORST stressful event?" and were then asked to provide information regarding whether that event satisfied the Criterion A1 and A2 requirements per DSM-IV for qualifying PTEs. Similar to the NCS-R, the NESARC assessment of PTEs could have been improved by including behaviorally-specific descriptors of event classes. Although they did include detailed information that would help participants identify event classes such as asking about age and perpetrator when inquiring about childhood physical abuse: "were you physically attacked, beaten, or injured before age 18 by a parent or caretaker?" questions about sexual assault did not include any behaviorally-specific descriptors, as participants were asked if they were "sexually assaulted, molested, raped, or experienced unwanted sex" in their lifetime.

Assessment of PTSD. Criteria for DSM-IV PTSD were assessed as lifetime and past-year based on the only or worst index PTE. Individuals were considered to meet criteria for PTSD if they met the minimum symptom thresholds for criteria B – D, symptoms for at least one month and there was clinically significant distress or impairment present. All questions from the PTSD symptom module were administered to all participants.

Subthreshold PTSD. Individuals were considered to have subthreshold PTSD if they did not meet criteria for PTSD as described above but did endorse at least one symptom in each of the B, C, and D symptom criteria for at least one month (Pietrzak et al., 2011).

National Survey on Drug Use and Health Mental Health Surveillance Study (NSDUH-MHSS)

Sampling. The NSDUH is an annual survey conducted by SAMHSA with a sample of individuals aged 12 and older with the goal of obtaining national substance use estimates. Between 2008 and 2012, SAMHSA conducted the MHSS to collect annual national and state estimates of selected mental health disorders, including PTSD (Karg et al., 2014). A total of 8,629 individuals over the age of 18 who participated in the NSDUH study in English were invited to participate in the MHSS. A sample of 5,653 respondents completed the NSDUH-MHSS. Data were weighted to account for nonresponse and exclusion of respondents completing the main NSDUH interview in Spanish. These weights were poststratified to NSDUH population control totals and an annual scaling factor was applied to all cases to account for different clinical sample designs and sizes across the five years of the study.

Modality. Although the primary NSDUH survey was completed in-person, the MHSS clinical interview was conducted over the telephone using a modified paper-pencil version of the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I; First, Spitzer, Gibbon, & Williams, 2002). This semi-structured clinical interview was conducted by masters- and doctoral-level clinical interviewers (Karg et al., 2014), as this instrument requires clinical judgment to determine diagnostic outcomes (First et al., 2002). The survey took an average of 72 minutes to complete (Karg et al., 2014).

Assessment of PTEs. A verbatim description of the two items used to assess PTEs is included above in the section detailing methodological considerations to assessing PTEs. These two items are designed to capture all PTE event classes in very brief screening items. Participants who answered no to these two questions were not asked any further questions regarding PTSD symptoms and were considered to not have PTSD. If the answer to the screening question is yes, then reported event(s) are documented and the participant proceeds to the next section of the PTSD interview. Of all the studies reviewed in this manuscript, this approach to PTE assessment is the briefest and is likely to underestimate the prevalence of PTE exposure as it does not include a comprehensive list of event classes, does not offer respondents an *other* category to endorse event classes not included in the descriptor, and it lacks contextual descriptors and behaviorally-specific event descriptors.

Assessment of PTSD. Past-year DSM-IV-TR PTSD was assessed using a modified version of the SCID-I to assess for past year PTSD. The PTSD assessment included gating questions that resulted in skip out rules where the clinician discontinued the PTSD module at the end of each Criterion B – D question set if that Criterion was not met. In other words, a participant who failed to meet Criterion B (Reexperiencing), or C (Avoidance) immediately skips out of the PTSD interview and does not complete the subsequent C or D criterion sections; respectively. Within the MHSS, if a clinical interviewer was unable to determine if PTSD symptoms were met, the participant would receive a score of "?" which was later recoded as not having PTSD (Karg et al., 2014). Participants who did meet full PTSD criteria were labeled as having PTSD in the past year.

Subthreshold PTSD. The skip out rules associated with the PTSD module precludes assessment of subclinical PTSD because not all participants received all of the questions as indicated by the SCID-I procedures.

National Stressful Events Survey (NSES)

Sampling. The National Stressful Events Survey (Kilpatrick et al., 2013) was conducted in September of 2010 with a sample of 2,953 US adults. Participants were recruited from Survey Sampling International (SSI), which maintains web panels of potential participants matched to U.S. Census demographics from all geographic regions who are invited to participate in web studies. Eligible participants were stratified based on sex and age categories within the U.S. Census breakdown for the population. Survey data were weighted by age, sex, and race/ethnicity based on the 2010 U.S. Census.

Modality. The NSES used a structured self-report interview designed to be completed online with an average length of 20 minutes. This interview mirrored the format of an interactive structured clinical interview by using a conditional branching format that included follow-up questions contingent on prior responses.

Assessment of PTEs. Opening preface statements were used to orient participants to different types of PTEs (e.g., interpersonal violence) which gave contextual information including the fact that such incidents may occur at any age, including childhood, that the person committing the violence may be a stranger, or someone known to the victim including a parent, other family member, romantic partner or spouse, or other person who is well known. In addition, it was clarified that such events could happen to men and women and that such incidents are not always reported to police or other authorities or discussed with others.

The survey contained 25 screening questions about specific PTE's included in DSM-IV-TR and/or DSM-5 criteria for PTSD using questions similar to those included in the event assessment section of the WMH-CIDI. Questions were reviewed by the PTSD Work Group for DSM-5 to ensure that they mapped on closely to proposed DSM-5 criteria that were under evaluation at the time of data collection. Behaviorally-specific descriptors were included for all PTE classes that involved directly or indirectly experienced violence (e.g., "Before you were age 13, did anyone who was five or more years older than you ever have sexual contact with you? That means they touched your private sexual parts or they made you touch their private sexual parts and it includes unwanted sexual intercourse, oral sex, or anal sex."). A set of 3 open-ended questions asked about *other* events that resulted in injury or were perceived as life threatening or extraordinarily stressful. Participant descriptions of these *other* events were reviewed to determine whether they met Criterion A for DSM-IV-TR or DSM-5. Based on experiences with the *other* event responses in this study, it might be feasible in future research to phrase the questions in a way that would more easily capture events meeting DSM-5 criteria without the requirement for further review by a clinician (e.g., using phrasing specific to other events occurring due to accident or violence). Among participants who reported multiple PTEs, follow up questions were included to nominate a first and/or worst event. Acute emotional reactions were also assessed in relation to the first/worst index/only PTE(s), to determine whether DSM-IV-TR Criterion A2 was met.

Assessment of PTSD. Criteria for DSM-IV-TR and DSM-5 PTSD were assessed. A series of clarifying questions followed each of the 20 *DSM-5* PTSD symptoms endorsed by participants. These follow up questions asked 1) whether symptoms began or worsened following a PTE (when relevant) and 2) whether symptoms occurred in relation to each of the 14

PTE event types described above. Participants were shown an abbreviated list of PTEs and they were allowed to report if symptoms occurred in relation to more than one event type. Most recent occurrence of symptoms was also assessed, allowing for evaluation of lifetime, past year, past 6 month, and past month prevalence. For those reporting past month prevalence, questions regarding past month symptom severity were also asked. Overall distress and functional impairment was indexed by positive endorsement of a question assessing whether PTSD symptoms resulted in problems with employment, personal life, relationships, or school *or* a separate item asking whether symptoms were perceived as quite a bit or extremely distressing.

Prevalence of PTSD was determined in two ways: *same event* PTSD (all necessary Criterion B, C, D, and E for DSM-5 and B, C, and D for DSM-IV-TR were met to the same event) and *composite event* PTSD (sufficient symptom criteria for PTSD were met, but they could not be attributed to any single qualifying Criterion A event). Individuals who met criteria for *same event PTSD* automatically met criteria for *composite event* but some met *composite event* based on combined symptom attribution to multiple events, who did not meet *same event* PTSD to one or more single events. Lifetime, past 12-month, and past 6-month prevalence estimates of PTSD are displayed in Table 1. Prevalence estimates for *composite event* PTSD were higher than *same event* PTSD using both DSM-IV-TR and DSM-5 criteria. Among participants meeting criteria for lifetime *same event* PTSD per DSM-5 (8.3% of the full sample), 10.5% met criteria in relation to two event types, 5.4% met criteria in relation to three event types, and 2.6% met criteria to four distinct event types.

Both overall population prevalence and conditional prevalence of PTSD were reported in Kilpatrick et al. (2013). For example, overall lifetime prevalence of DSM-5 PTSD was 8.3%, while prevalence was 9.3% among those reporting a Criterion-A event. Highest conditional

probability of PTSD was associated with physical or sexual assault, followed by violent or accidental death of a loved one and combat or warzone exposure. Although the conditional probabilities of PTSD to interpersonal violence and combat exposure were somewhat lower than those observed in previous studies, this may relate to the breadth of events assessed, the lack of selection of worst index events (as is done in many previous studies), and the inclusion of all event types as opposed to only focusing on a worst index event.

Subthreshold PTSD. Subthreshold PTSD was not reported in Kilpatrick et al. (2013), though it is possible to determine subthreshold for either the *same event* or *composite event* PTSD definitions, as all symptoms were assessed, and participants were asked to provide event-symptom linkage with reference to all symptoms.

National Epidemiologic Survey on Alcohol and Related Conditions (NESARC-III)

Sampling. The NESARC-III was a continuation of the original NESARC. It included a nationally representative sample of noninstitutionalized adults over the age of 18 from the 50 states and the District of Columbia oversampled for Hispanic, Black, and Asian respondents and households with at least four eligible individuals who were ethnic or racial minorities, resulting in 36,309 civilians recruited from households and noninstiutional group quarters (Grant, 2015). Data were collected from April 2012 through June 2013. Primary sampling units included counties or groups of continuous counties. Data were weighted through poststratification analyses for oversampling, screener- and person-level nonresponse, and to represent the population based on the 2012 American Community Survey (Bureau of the Census, 2013). This study had a household response rate of 72%, a person-level response rate of 84%, and an overall response rate of 60.1% (Goldstein et al., 2016)

Modality. The NESARC-III used the Alcohol Use Disorder and Associated Disabilities Interview-5 (AUDADIS-5; Grant et al., 2015), an updated version of the AUDADIS used in the original NESARC for DSM-5. The AUDADIS-5 was delivered in-person using CAI technology by trained interviewers who were not clinicians. Index cards were used to supplement face-to-face questions and to allow participants to provide numbers corresponding to endorsed PTEs to increase participant comfort with disclosing personal information. Interviewer training included an 8-hr home study package combined with 3.5 days of in-person training by NESARC-III study staff.

Assessment of PTEs. First, a list of 19 potentially traumatic experiences were presented on an index card to participants and participants were asked to indicate if they had personally experienced any of the traumatic events or an option of any other traumatic event. Participants were then asked if they had personally witnessed 13 other events or any "other" traumatic event. They were then asked if they had ever been repeatedly exposed to those same 13 events or another event and then asked if they had ever learned or heard about any of the events happening to a relative or close friend. Although the PTE checklist did include some distinctions within broad event classes (e.g., sexually abused before age 18, sexually assaulted as an adult), this approach relied on general descriptors of event classes as opposed to utilizing behaviorally-specific descriptors of PTEs. After completing the checklist, participants endorsing multiple PTEs were asked to identify a worst index event by indicating which PTE they feel was the most stressful and upsetting.

Assessment of PTSD. PTSD was assessed using the AUDADIS-5 based on DSM-5 symptoms using a modified criteria for the majority of the outcomes examined and DSM-5 criteria for lifetime prevalence. The AUDADIS-5 has acceptable convergent validity with other

assessments of PTSD according to the DSM-5 (Hasin et al., 2015). The modified DSM-5 criteria was more stringent than the DSM-5 on symptom D and E criteria (requiring 3 symptoms rather than 2) based on a pre-final version of the DSM-5 criteria (Elhai et al., 2012); therefore, does not accurately reflect DSM-5 criteria but does provide an estimate of PTSD symptoms using more stringent than DSM-5 criteria. The majority of prevalence rates to date from this dataset use the modified DSM-5 criteria and only one estimate of lifetime prevalence is provided for actual DSM-5 criteria (Goldstein et al., 2016). Past year and prior to past year symptoms were assessed. An estimate of lifetime PTSD was calculated by combining past year and prior to past year endorsement of PTSD. Participants were administered all PTSD symptom questions.

Subthreshold PTSD. Subthreshold PTSD was not reported in Goldstein et al. (2016), though it is possible to determine subthreshold PTSD as gating questions were not used, so all participants were administered each symptom question.

Summary

As noted in Table 1, there is considerable variation in the prevalence estimates of lifetime and past year PTSD across the studies reviewed here. Of note, the NSDUH-MHSS study found the overall past year prevalence of PTSD to be 0.7%. This is contrasted with 3.5% in the NCS-R, 4.7 - 6.9% in the NSES (based on DSM-IV-TR vs. DSM-5 and *same event* vs. *composite event* PTSD definitions), and 4.7% in the NESARC-III. Given that the NSDUH-MHSS study classified PTSD to a worst index PTSD per the DSM-IV-TR, the NCS-R, and NSES *same event* (4.7%) DSM-IV-TR estimates of PTSD offer the best comparison. Karg and colleagues (2014) present a detailed analysis of possible reasons for discrepancies in the past year prevalence of several disorders between the NSDUH-MHSS and the NCS-R. In brief, these authors acknowledge that the following issues may have resulted in different prevalence estimates: differences in survey

modality (telephone vs. in-person), training of interviewers (clinicians vs. trained lay interviewers), use of follow-up questions (structured with unstructured follow-up vs. structured with no follow-up probes), context effects associated with order of interviews (following mood disorders vs. following mood disorders, other anxiety disorders, substance use disorders, eating disorders, and impulse control disorders), assessment time frame (past year only vs. lifetime and past year only if lifetime is met), and differential use of gating questions leading to different gating questions/skip out rules. The authors also suggested that since the NCS-R data were collected between 2001 and 2003 and the NSDUH-MHSS data were collected between 2008 and 2012, the differences may reflect genuine population-level changes in the intervening years. While this is possibly true for other disorders assessed in these studies, this is unlikely to be the case with PTSD, as two more recently conducted nationally representative surveys (NSES, NESARC-III) found past year estimates of PTSD comparable to or higher than the NCS-R.

In addition to the methodological differences highlighted by Karg and colleagues (2014) between the NCS-R and NSDUH-MHSS that are applicable to all disorders assessed by these two studies, it is important to note that differences in assessment of PTE history may have substantially contributed to the lower estimates of PTSD in the NSDUH-MHSS compared to the NCS-R and other epidemiological studies. Specifically, the NSDUH-MHSS included only two brief screening items designed to assess PTE history. As reviewed throughout this manuscript, accurate estimates of PTE exposure history are difficult to obtain, and are likely to be underestimated by a general screening approach that fails to specify a broad range of event classes, include an option for endorsing *other* potential PTEs, and include behaviorally specific descriptors and context information. Given the fact that PTSD assessment is hinged upon a thorough assessment of PTE

exposure history, if PTE exposure is underestimated, PTSD prevalence will necessarily be underestimated as well.

Recommendations

As reviewed above, there are numerous considerations when attempting to obtain national estimates of PTSD including sampling methodology, mode of assessment, assessment of PTEs, and assessment of PTSD symptoms. One potential option is to add a number of items (10 - 15 in total to include additional PTE and symptom items) assessing exposure to PTEs and traumatic stress symptoms to the existing annual NSDUH survey. This method would be highly feasible, as there is already an existing infrastructure associated with the sampling methodology and assessment implementation. What would be required/recommended would be to enhance the PTE exposure assessment, independent of related symptom distress, to include sensitive and comprehensive behaviorally-specific questions assessing Criterion A events. In conjunction with this, it is recommended that all DSM-5 PTSD symptoms be assessed without skip-outs. Although the addition of select questions could be perceived as an additional burden to participants, it would likely not add more than a few minutes to the assessment battery. However, there are several items currently included on the NSDUH that yield very low response rates including specific types of convictions that could be condensed to allow for additional questions regarding PTEs and PTSD symptoms. We outline below the pros and cons of adding trauma items to the existing NSDUH to obtain national estimates of PTSD and subclinical PTSD symptoms.

Sampling Methodology. As described above, the current NSDUH-MHSS or an alternative or hybrid ABS sampling strategy could be enhanced by including push to web strategies to potentially increase feasibility and lower costs associated with NSDUH.

Mode of Assessment. The current method adopted by NSDUH through the MHSS has yielded lower than anticipated rates of past year PTSD incidence, this may be partly due to the mode of assessment. The MHSS utilized a telephone interview strategy administered by clinicians, which differed from the fully structured in-person or online survey methodologies employed by other studies.

Assessment of PTEs. Because PTSD symptoms are linked to the experience of a particular PTE, it is necessary to assess for a broad range of PTEs. As discussed in detail previously, the use of brief, general screening questions to assess for PTEs is likely to result in an underestimate of PTE exposure. In-depth screening questions that use behaviorally-specific language to describe a broad range of event classes including any other events not captured by the assessment are necessary to yield the most accurate estimates. Based on this review of methods used across studies, it is likely that a primary factor in the lower observed prevalence in the NSDUH-MHSS is the insensitive assessment of PTE history and possibly interpersonal violence events in particular. Although prevalence of multiple PTEs was reported (Forman-Hoffman et al., 2016), information about specific PTE type (i.e., interpersonal violence) was not reported. It would be helpful to know the prevalence of such events to state this more definitively. However, this pattern of findings is somewhat similar to an early general population prevalence study (Helzer, Robins, & McEvoy, 1987) that found very low lifetime PTSD prevalence (1%) and correspondingly used very limited questions to assess PTEs. Specifically, Helzer and colleagues did not include a comprehensive assessment of exposure to Criterion A events, including behaviorally specific questions regarding a range of violence events. In addition, with the exception of questions to assess reported mugging or beating incidents and combat-related incidents (service in Vietnam and combat exposure), PTEs were not assessed

independent of reported symptom distress. In contrast, subsequent research (e.g. Kessler et al., 1995), which included sensitive and more comprehensive assessment of a range of PTEs including interpersonal violence prior to assessment of related PTSD symptoms, yielded much higher prevalence of PTSD. Although tying PTSD prevalence to an event nominated as a worst index PTE is likely to be a more time- and resource-efficient approach compared to using a randomly selected event, or obtaining PTE attributions to each endorsed symptom as in the *same event* and *composite event* approaches described by Kilpatrick and colleagues (2013), it is important to consider implementing a bias correction for the fact that estimates of PTSD tied to a worst index event are likely to be inflated (Breslau, Peterson et al., 2004). In addition, as noted by Kilpatrick and colleagues (2013) PTSD related to multiple traumatic event history may be complex, with some symptoms attributed to varied PTEs within an individual's history. Another possible approach would be to assess PTSD symptoms reportedly occurring in reference to *any* qualifying PTE within their history. This approach could simplify assessment while still allowing for symptom attribution that might occur in reference to any PTE and/or multiple PTEs. It is possible that research could be conducted that could evaluate alternate approaches to PTSD symptom attribution.

Assessment of PTSD and subclinical PTSD symptoms. Although only assessing a few questions related to PTSD symptomology would be time efficient for participants, it is unlikely to result in accurate estimates of PTSD or subclinical PTSD symptoms. The DSM-5 outlines 20 symptoms associated with PTSD divided across four distinct symptom clusters. In addition to assessing whether participants report the minimum number of symptoms within each symptom cluster, assessments must also include questions about duration of symptoms, associated distress, and impairment to collect sufficient information to render a diagnosis. Although gating questions

(and associated skip patterns) could be employed to decrease the time of the survey for some participants, existing best practice recommendations for survey methodology suggest that the same series of questions should be administered for all respondents when assessing for sensitive behaviors and experiences (Fisher & Cullen, 2000; National Research Council, 2014). Utilization of skip patterns that eliminate administration of entire clusters of PTSD symptoms (avoidance, negative alterations in cognition and mood, alterations in arousal and reactivity) if participants did not meet the minimum symptom threshold for the preceding cluster (re-experiencing) precludes accurate estimates regarding the prevalence of subclinical PTSD. Therefore, it is recommended to ask participants all 20 symptom questions tied to a particular PTE.

While we agree with SAMHSA's assessment that it is important to consider expanding the scope of the NSDUH to obtain more comprehensive annual estimates of mental health diagnoses including PTSD prevalence, there are significant disadvantages to implementing a limited screening approach where a few brief screening items are added to the existing survey. Due to the complexity involved in obtaining accurate representative estimates of PTE exposure and PTSD it is unlikely that such an approach would be able to accomplish the aim of obtaining valid prevalence estimates.

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Table 1.
Overview of major epidemiological studies assessing prevalence of trauma exposure, PTSD, or conditional PTSD given PTE exposure

STUDIES AND PRIMARY PUBLICATION	SAMPLING	DSM VERSION	PTEs ASSESSED	PREVALENCE OF PTE EXPOSURE, PTSD, AND CONDITIONAL PTSD
National Comorbidity Survey-Replication (NCS-R) • Kessler, Chiu et al., 2005	Nationwide probability sample of household residing adults (*N* = 5,692)	*DSM-IV-TR*	27 specific PTEs *Other* traumatic or life-threatening event PTSD assessed to worst index and randomly selected PTE	Lifetime prevalence of PTE exposure • Not reported Lifetime prevalence of PTSD (to a worst index event or randomly selected event within full sample) • Overall – 6.8% • Women – 9.7% • Men – 3.6%$^{+}$ Past 12-month prevalence of PTSD (to a worst index event or randomly selected event within full sample) • Overall – 3.5% Lifetime/past 12-month conditional prevalence of PTSD given PTE exposure • Not reported
National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) • Roberts et al., 2011	Wave 2 of a nationwide probability sample of civilian, non-institutionalized population (*N* = 34,653; Roberts et al., 2011)	*DSM-IV*	27 specific PTEs *Other* injury or shocking event PTSD assessed to worst index PTE	Lifetime prevalence of PTE exposure • 79.7% Lifetime prevalence of PTSD (to a worst index event) within full sample • Overall - 7.3% Lifetime conditional prevalence of PTSD (to a worst index event) given PTE exposure • Overall 9.1%
National Survey on Drug Use and Mental Health – Mental Health Surveillance Study (NSDUH-MHSS) • Karg et al., 2014	Subsample of individuals over the age of 18 who participated in the NSDUH (*N* = 8,629) were invited to participate over the phone, for a total of 5,653 participants.	*DSM-IV-TR*	2 broad screening items with multiple PTE event classes in each PTSD assessed to worst index PTE	Lifetime prevalence of PTE exposure • Not reported Past 12-month prevalence of PTSD (to a worst index event) within full sample • Overall – 0.7% • Women – 0.8% • Men – 0.6%

				Past 12-month conditional prevalence of PTSD (to a worst index event) given PTE exposure • Not reported
National Stressful Events Survey (NSES) • Kilpatrick et al., 2013	Online sample recruited from a nationally-representative panel of adults (*N* = 2,953)	*DSM-5 and DSM-IV-TR*	25 specific PTEs 3 *Other* events that resulted in injury or were perceived as life-threatening or extraordinarily stressful (open-ended) PTSD assessed to each PTE	<u>*DSM-5*</u> Lifetime prevalence of PTE exposure • Overall – 89.6% Lifetime prevalence of PTSD • Overall – 9.4% (composite event); 8.3% (same event) • Women – 12.8% (composite event); 11.0% (same event) • Men – 5.7% (composite event); 5.4% (same event) Past 12-month prevalence of PTSD • Overall – 5.3% (composite event); 4.7% (same event) • Women – 7.3% (composite event); 6.2% (same event) • Men – 3.2% (composite event); 3.0% (same event) Past 6-month prevalence of PTSD • Overall – 4.2% (composite event); 3.8% (same event) • Women – 5.3% (composite event); 4.6% (same event) • Men – 3.1% (composite event); 3.0% (same event) Lifetime conditional prevalence of PTSD given PTE exposure • Overall – 10.5% (composite event); 9.3% (same event) <u>*DSM-IV-TR*</u> Lifetime prevalence of PTE exposure • Not reported Lifetime prevalence of PTSD • Overall – 10.6% (composite event); 9.8% (same event) • Women – 14.4% (composite event); 12.2% (same event) • Men – 6.5% (composite event); 6.1% (same event) Past 12-month prevalence of PTSD • Overall – 6.9% (composite event); 6.3% (same event) • Women – 8.8% (composite event); 8.1% (same event) • Men – 4.7% (composite event); 4.4% (same event) Past 6 month prevalence of PTSD

				• Overall – 5.1% (composite event); 4.7% (same event) • Women – 6.5% (composite event); 6.0% (same event) • Men – 3.6% (composite event); 3.4% (same event) Lifetime conditional prevalence of PTSD given PTE exposure • Not reported
National Epidemiologic Survey on Alcohol and Related Conditions III (NESARC-III) • Goldstein et al., 2016	Wave 3 of a nationwide probability sample of civilian, non-institutionalized population (*N* = 36,309)	*Modified PTSD criteria (DSM-5 symptoms, criteria modified to require ≥ 3 in D and E) and DSM-5 criteria (only overall lifetime prevalence assessed)*	19 personally experienced PTEs 13 witnessed PTEs *Other* traumatic event PTSD assessed to worst index and randomly selected PTE	Lifetime prevalence of PTE exposure • 68.6% Lifetime prevalence of modified PTSD criteria (to a worst index event) within full sample • Overall – 6.1% • Women – 8.0% • Men – 4.1% Lifetime prevalence of DSM-5 criteria PTSD within full sample • Overall – 10.7% Past 12-month prevalence of modified PTSD (to a worst index event within full sample) • Overall – 4.7% • Women – 6.1% • Men – 3.2% Lifetime/past 12-month conditional prevalence of modified PTSD given PTE exposure • Not reported

Note: worst index event = potentially traumatic event (PTE) reported as most distressing/"worst" or only experience; composite event = PTSD to a combination of cumulative PTEs; same event = PTSD to any single event.

[+]Prevalence estimates drawn from National Comorbidity Survey (2006). NCS-R appendix tables: Table 1. Lifetime prevalence of DSM-IV/WMH-CIDI disorders by sex and cohort. Accessed at: www.hcp.med.harvard.edu/ncs/ftpdir/NCS-R_Lifime_Prevalence_Estimates.pdf.