


# Research on Posttraumatic Stress Disorder in the Context of the COVID-19 Pandemic: A Review of Methods and Implications in General Population Samples

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## Abstract

Increasing concern about the mental health sequelae to the COVID-19 pandemic has prompted a surge in research and publications on the prevalence of posttraumatic stress disorder in general population samples in relation to the pandemic. We examined how posttraumatic stress disorder in the context of the COVID-19 pandemic has been studied to date and found three general themes: (1) assessment of posttraumatic stress disorder and posttraumatic stress disorder symptoms relied on self-report measures and often did not determine direct trauma exposure as required by Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition Criterion A to diagnose posttraumatic stress disorder; (2) inadequate assessment of pre-existing mental disorders and co-occurring stress; and (3) the use of cross-sectional designs in most studies, often relying on snowball sampling strategies to conduct online surveys. Notwithstanding these methodological limitations, these studies have reported moderate to severe posttraumatic symptoms in 25.8% of the general population on average in relation to the pandemic (ranging from 4.6% to 55.3%). Opportunities for advancing future research that will inform public health planning are discussed.

## Keywords

COVID-19, methods, pandemic, posttraumatic stress disorder, research quality

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## Introduction

The spread of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) has claimed millions of lives around the world and continues to pose a serious threat. In the context of a disaster of global proportions with potentially life-threatening consequences, researchers have responded to the importance of understanding the mental health sequelae to the COVID-19 pandemic, especially with regard to posttraumatic stress disorder (PTSD). Such studies are essential in ensuring that targeted prevention and treatment interventions and resources can optimally serve the mental health needs of the public. However, as the number of studies focusing on PTSD in the general population around the world continues to soar,<sup>1–3</sup> there appears to be considerable variation in the methods used to study the mental health effects of this global health crisis. How this complex, evolving, and enduring experience is operationally defined and how its effects are subsequently interpreted—particularly with regard to COVID-19-related PTSD—has raised concern.<sup>4</sup> The remarkably wide range of reported PTSD prevalence among the general population during the pandemic also

points to the value of examining how studies are measuring the variables of interest.<sup>5</sup>

According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5<sup>6</sup>), diagnosis of PTSD requires exposure to a traumatic event followed by sustained symptoms and impairment. Identifying PTSD during an ongoing pandemic therefore raises the question of how PTSD DSM-5<sup>6</sup> Criterion A, which requires exposure

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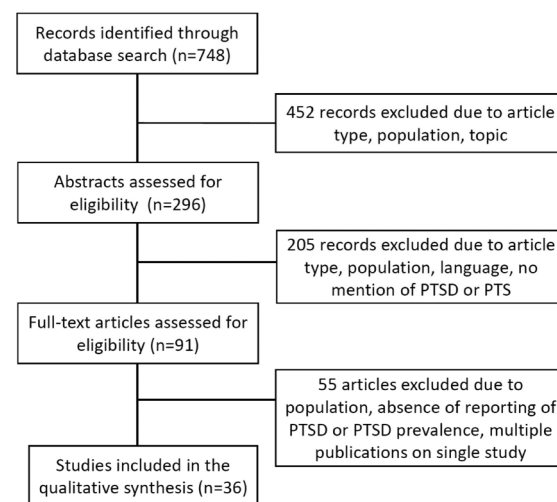
to a traumatic event involving “actual or threatened death, serious injury, or sexual violence,” was conceptualized and assessed for COVID-19 related studies. The DSM-5 further defines four types of qualifying exposure: direct exposure, witnessing it in person, learning it happened to a loved one (in the case of actual or threatened death only if it is violent or accidental), or repeated or extreme exposure to aversive details of the event though not through electronic media unless it is work-related. The DSM-5 further specifies that a life-threatening medical condition is not necessarily traumatic if it does not involve sudden or catastrophic events such as waking up during surgery or anaphylactic shock. With this definition in mind, there has been significant debate regarding whether and how the pandemic can be construed as a traumatic event that meets criterion A, and whether and how exposure to that event can be ascertained especially in general population samples.<sup>7–10</sup> Beyond the issue of criterion A, how PTSD symptomatology has been evaluated, and the time frame considered in such assessments has raised concerns.<sup>4</sup> In addition, three other concerns arise. First, understanding the mental health impact of the COVID-19 pandemic prompts the question of what other pre-pandemic or co-occurring mental health and stress-related variables are considered when evaluating the pandemic’s effects. Second, as research is being conducted in a rapid manner, convenience samples are often being used to estimate population-level prevalence. This raises the question of participant representativeness regarding age, gender, education, race, ethnicity, and income and may lead to an over-estimation of the association between the variables of interest. Third, use of participant “report” of sociodemographic variables also leaves uncertainty of representativeness within a named group. For example, in light of data indicating there are sex-and-gender-related differences in response to stress<sup>11</sup> as well as in COVID-19-related mortality rates, clarity is needed in the working definition of these terms, yet not routinely provided in the studies reviewed.<sup>12</sup> For the purposes of this review, when using the term sex, we are referring to a biological classification, generally as male or female. With regard to gender, we are referring to an internal sense of identity.<sup>13</sup>

In this review, we sought to understand the methodological approaches used in the rapidly growing literature on COVID-19-related PTSD in the general population and highlight methods and strategies that may help advance the study of PTSD during this ongoing global health crisis. We specifically focused on the assessment of PTSD with respect to exposure to traumatic events, consideration of prior and concurrent stressors and mental health status, and sample selection.

## Study Selection and Data Extraction

A literature search of published studies on COVID-19 PTSD was conducted on 3 May 2021 using PubMed,

PsycARTICLES, and Psychology and Behavioral Sciences Collection. The following search terms were used: “COVID-19” or “pandemic” and “PTSD” or “posttraumatic stress.” Additional filters were applied to identify journal articles published as original research since 2019; pertaining to adults aged 18 years and above; reporting original research rather than a review or commentary; and written either in English or French (as the first author could provide the necessary translation). The initial search yielded 748 references after the removal of duplicates (Figure 1). To be included in the final review, studies had to report the assessment of PTSD symptoms or PTSD in the context of COVID-19 a general population-based sample of adults. Studies that met the following criteria were excluded: (1) no original data were described (i.e., publications providing a review, meta-analysis, commentary, or letter to the editor); (2) the sole focus was on specific populations in which any restriction applied due to reported age, gender, profession (e.g., health care workers and youth), pre-existing medical or psychiatric conditions (e.g., persons with diabetes); SARS-Cov-2 infection status (e.g., persons who developed COVID-19); high-risk groups due to exposure to specific ongoing or past political or military conflicts (e.g., persons in war zones); (3) no measure or report of either PTSD symptoms or PTSD was provided; and (4) an outcome other than PTSD or PTSD symptoms was the focus of the paper (e.g., service utilization and psychometric papers). Using these criteria, the initial screen of study titles followed by a screen of abstracts yielded a list of 91 articles for a full-text screen. The review of full-text articles based on the criteria listed above yielded a final pool of 36 articles examining COVID-19-related PTSD or PTSD symptoms in general population adults 18 years or older. Data extraction focused on the following items: country; study design; sample characteristics; instrument used to assess PTSD or PTSD symptoms



**Figure 1.** Flow diagram of the literature search strategy and review process.

including anchoring to a criterion A event; assessment of exposure to other traumatic events; and assessment of prior psychopathology (Table 1).

### PTSD Assessment

A variety of instruments were used to assess PTSD symptomatology in the COVID-related studies reviewed and, when using the same instruments, a variety of cutoff scores or scoring methods were applied. Whether and how criterion A was addressed differed between studies. In addition, in some studies reporting estimates of the prevalence of PTSD, the duration of symptoms did not always meet the requirements for a PTSD diagnosis, yet in some cases, the studies described their findings as reflecting a diagnosis of PTSD.

Among the most commonly used instruments was the 22-item Impact of Event Scale-Revised (IES-R),<sup>14</sup> which was used in one-third of the studies included in the current review. This self-report measure was designed to assess current subjective distress covering the past 7 days in response to a specific traumatic event. The IES-R yields a score ranging from 0 to 88. The studies included in the review applied various scoring patterns to identify PTSD symptomatology, and when studies used similar cutoffs, the meaning was often interpreted differently. For instance, although several studies<sup>15,16</sup> used scores of 24, 33, and 37 to identify mild, moderate, and severe symptoms, respectively; others<sup>17,18</sup> used a score as low as  $\geq 9$  to identify mild,  $\geq 26$  for moderate, and  $\geq 44$  for severe PTSD symptoms. Others applied a single cutoff score of  $\geq 24$ ,<sup>19</sup>  $\geq 33$ ,<sup>20,21</sup> or  $\geq 35$ <sup>22</sup> to identify the presence of “probable PTSD.” Some did not report the specific cutoffs used,<sup>23,24</sup> and some reported summing mean scores to which a cutoff of  $\geq 5.6$  was applied.<sup>25</sup> Considering the heterogeneity with which this instrument was scored across studies, caution is needed when comparing prevalence estimates obtained. Importantly, there was also considerable heterogeneity in the manner in which authors referred to what these estimates reflected—using terms such as “PTSD symptoms,”<sup>15,24,26</sup> “posttraumatic stress,”<sup>18,25</sup> “risk of PTSD,”<sup>21</sup> “partial, probable or definite COVID-19 related PTSD,”<sup>16</sup> “preliminary PTSD,”<sup>20</sup> or “mild, moderate or severe PTSD,”<sup>17,23</sup> despite the fact that the IES-Revised was not designed to be a diagnostic tool for the assessment of the disorder.

Another widely used instrument was the PTSD Checklist PCL-5,<sup>27</sup> which assesses PTSD symptoms experienced in the past month. The use of cutoff scores tended to be homogeneous, typically 31<sup>28,29</sup> or 33,<sup>30,31</sup> scores that have been previously validated in military veterans.<sup>32</sup> Some used symptom-criteria either alone<sup>33,34</sup> or in combination with a cutoff score.<sup>35</sup> Additional versions of the PCL were used, such as the PCL-S-specific stressor version with COVID-19 as the specific stressor, and the PCL-Civilian version PTSD Checklist-Civilian version (PCL-C) and its

abbreviated form (PCL-C-2).<sup>36</sup> Other instruments that were used included the Primary Care PTSD Screen for DSM-5,<sup>37</sup> International Trauma Questionnaire (ITQ),<sup>38</sup> Screen for Posttraumatic Stress Symptoms (SPTSS),<sup>39</sup> Global Psychotrauma Screen Posttraumatic Stress Symptoms Subscale (GPS-PTSS),<sup>40</sup> and Acute Stress Disorder Scale (ASDS).<sup>41</sup>

Collectively, the instruments used to assess PTSD symptomatology in the reviewed studies were, for the most part, widely used survey instruments. However, notable heterogeneity was observed regarding the cutoff scores used to determine the presence or absence of PTSD or PTSD symptoms, especially with the IES-R. Furthermore, a number of studies referred to positive screens as indicative of PTSD while they were more likely assessing a form of distress that could not be equated to PTSD as formal diagnostic criteria were not met. Lastly, in the absence of anchoring symptoms to a specific event, it is unclear whether the assessed PTSD symptoms are related to the COVID-19 pandemic or other events. Taken together, these points raise serious questions regarding the value of disorder prevalence rates reported in such circumstances and point to the risk of greatly overestimating the prevalence of PTSD in the general population.

### COVID-19 Pandemic and Criterion A Conceptualization and Assessment

In the reviewed studies, the methods used to assess criterion A varied considerably. As noted previously, many studies did not specifically report how the scales used to assess PTSD symptomatology were anchored to a qualifying traumatic event. Although it may have been done but omitted in the publication, it remains unclear in these studies whether and how criterion A was defined and met by the index event. Some studies reported anchoring their assessment of PTSD symptomatology to the COVID-19 pandemic. However, some surveys asked respondents to report symptoms in relation to: “COVID-19,”<sup>17,20,35,42–44</sup> “the COVID-19 pandemic,”<sup>16</sup> “their experience of the COVID-19 pandemic,”<sup>45,46</sup> the “COVID outbreak,”<sup>33</sup> or “the impact of COVID-19 on their income and occupation status.”<sup>23</sup> This variability raises the question of the meaning of such terms across respondents. In one study,<sup>47</sup> respondents were asked whether the worst event they had experienced was COVID-19 related (e.g., death of someone close from COVID-19 or COVID-19 infection) and found that only 3.0% of the sample endorsed a COVID-19-related index trauma. Although most of the studies were initiated at the early stages of the outbreak in their respective regions, using broad terms rather than specific COVID-19-related event questions makes it unclear if the definition of criterion A was met. Studies assessing PTSD symptoms without clarifying whether these symptoms are related to a criterion A trauma-qualifying aspect of the COVID-19 pandemic

(e.g., exposure to mass COVID-19 casualties) may lead to an overestimation of the prevalence of PTSD in the general population. Consequently, data provided to public health officials may not be sufficiently informative or may even be misleading. In addition, as the pandemic progresses, a “generic” use of “COVID-19 exposure” as an index event to which PTSD symptoms are anchored may be less informative from a public health standpoint.

### *Exposure to Other Stressful Events*

Cumulative exposure to multiple traumatic events increases the risk of subsequent PTSD,<sup>48</sup> particularly events involving interpersonal violence.<sup>49</sup> Furthermore, experiencing prior events increases the likelihood of developing PTSD following subsequent exposure.<sup>49,50</sup> The majority of adults report exposure to at least one potentially traumatic event in their lifetime, with an estimated average of 3.2 traumatic events per capita.<sup>51</sup> Moreover, additional exposures occurring in the form of adverse childhood experiences are common in the general population.<sup>52,53</sup> Such adversities are also known to contribute to PTSD risk, as well as the capacity to adjust to subsequent stressful events.<sup>53–57</sup> Other sources of stress, such as chronic deleterious life conditions and socioeconomic strain, are also associated with poor mental health outcomes.<sup>58–60</sup>

Considering these factors, and evidence that the cumulative exposure to stress across the lifespan is directly associated with the level of adjustment, understanding the consequences of the COVID-19 pandemic would benefit from consideration of prior stressful experiences and ongoing chronic stressors. In the present review, only 8 studies (22.2%) assessed prior exposure to some form of a stressful event.<sup>10,28,29,47,61–64</sup> The remaining studies did not report assessing prior exposure to stressful experiences when examining pandemic-related PTSD or PTSD symptoms. In terms of ongoing stressors, pandemic-related lockdowns have been shown to drive an increase in domestic violence.<sup>65</sup> This increase, although indirectly related to the pandemic, may contribute to the potential risk for PTSD and thus should be addressed in PTSD-related studies. Additional stressors indirectly associated with the pandemic such as loss of income, childcare responsibilities, and relationship strains are likely to have a deleterious impact and deserve attention.

### *Pre-existing Psychiatric Conditions*

In general population samples of adults, 50.8% of individuals will have a mental disorder at some point in their life.<sup>66</sup> This is in addition to the 26.2% to 27.0% of individuals affected by at least one disorder in the past 12 months.<sup>67,68</sup> In the case of PTSD, a history of mental illness prior to exposure to a traumatic event increases one’s probability of developing PTSD with an average effect size of .11.<sup>69</sup> Yet, of the studies

included in the current review, only 30.5% considered pre-existing mental health when assessing pandemic-related PTSD symptoms. For example, such studies asked respondents whether they were ever diagnosed with a mental health problem,<sup>42</sup> or had a history of anxiety disorders, mood disorders, or psychosis,<sup>25</sup> experienced prior<sup>34,46,61,64</sup> or current mental illness,<sup>17</sup> or had received prior mental health treatment.<sup>70</sup> These studies have consistently observed that prior mental illness is a strong predictor of PTSD and other mental health problems during the pandemic.<sup>71,72</sup> In the general population, a portion of those that had PTSD prior to the pandemic likely still had PTSD during the pandemic. Based on estimates from the World Mental Health Surveys, the mean duration of PTSD symptoms is approximately 6 years, although duration varies by type of event, ranging from 1 year (e.g., natural disaster) to over 13 years (e.g., combat exposure).<sup>51</sup>

### *Study Design and Sample Characteristics*

All but one of the studies that were reviewed used cross-sectional web-based surveys. Cross-sectional designs in the context of an ongoing pandemic may be useful to describe the status of the general population at a given point in time. However, attributing symptoms to the pandemic is best achieved by comparing pre-pandemic and current data. The reliance on cross-sectional designs also highlights the importance of assessing prior mental health status so as not to conflate pre-existing conditions with ongoing distress. The only longitudinal study included in this review relied on an international sample, covering over 50 countries, and including adults who completed an online survey in April and again in August/September 2020 (n = 1567).<sup>42</sup> At baseline, 51% of the sample was described as at risk for PTSD or presenting with acute stress based on an IES cutoff score of 11. At follow-up, the average acute stress symptom scores had decreased significantly.

In the current review, country-specific sample sizes ranged from n = 107 in Norway<sup>21</sup> to n = 18,147 in Italy.<sup>20</sup> One study involving 20 countries and a total of 733 participants did not report country-specific sample sizes.<sup>73</sup> This also occurred in another study, which surveyed 1567 adults in 50 countries.<sup>42</sup> In some studies, countries were combined due to low sample sizes, for example, Australia and New Zealand<sup>10</sup> and Iraq and Palestine.<sup>29</sup> All studies reported the specific timing of data collection, thereby providing a precise indication of the status of the pandemic in the region at the time of the survey. The spread of the virus and its variants differed markedly across regions of the world and in various areas of any given country at different times, and the manner in which the pandemic was managed by local authorities (<https://covid19.who.int/>) also differed. Thus, it is likely that prevalence estimates of PTSD also varied as a function of local conditions and time since exposures.

Only one study relied on an existing nationally representative research panel from which the researchers extracted their sample,<sup>45</sup> another reported a 95.6% response rate using the JD Health platform,<sup>17</sup> another 4 studies solicited commercial panels to constitute their sample. The latter achieved their sampling using MTurk,<sup>10</sup> Prolific,<sup>10</sup> Qualtrics,<sup>63</sup> Sojump,<sup>35</sup> the JD Health platform,<sup>17</sup> or complemented their convenience sample with such panels to oversample certain groups such as men.<sup>63</sup> Studies relying on research panels designed to reflect the broader population achieved a reported gender and age distribution that was more representative of existing population benchmarks.

Snowball sampling, in which research subjects recruit other subjects, was the most frequently used method to enroll general population study participants. The proportion of women in such samples ranged from 24.9% in Turkey<sup>28</sup> to 91.4% in China,<sup>74</sup> with nearly half of the study samples reporting a proportion of women >70%. In addition, the samples tended to mostly include young adults, though studies often reported mean age rather than the median age. In some cases, the median age was as young as 25 years.<sup>70</sup>

Overall, the majority of studies used convenience samples with a large proportion of women and generally young adults, raising the question of the representativeness of the samples and their relevance with regard to establishing the prevalence of COVID-19-related PTSD in the general population. In addition, while cross-sectional surveys conducted during the pandemic can be informative regarding the level of distress experienced at a particular time, attributing the cause of that distress to the pandemic may overextend the interpretation of the data. In sum, cross-sectional studies that do not assess lifetime mental disorders or that do not assess the exacerbating effects of other traumatic events and secondary stressors that occurred during the pandemic, may run the risk of over- or underestimating the mental health effects of the pandemic in the general population.

## Limitations of the Present Review

The main limitation of the present review is the risk of omitting studies that may have met the criteria for inclusion. A second limitation is that data extraction was based on data provided in the manuscript only. While two authors were contacted to clarify methods and findings, one did not respond.

## Conclusions

There is a continuing need to understand the mental health effects of the ongoing COVID-19 pandemic, which has caused substantial loss of life, enormous personal and economic costs for billions of people, and undeniable distress in the general population around the world. We reviewed COVID-19-related studies conducted in general population samples that focused on the assessment of PTSD or PTSD

symptoms to examine how this methodologically and conceptually complex task has been undertaken. The reviewed studies demonstrated that a significant portion (mean = 25.8%, median = 23.4%, ranging from 4.6%<sup>35</sup> to 55.3%<sup>21</sup>) of respondents drawn from the general population reported moderate to severe posttraumatic symptomatology, which raises the question of the stress-related burden associated with the ongoing pandemic. However, these findings are hampered by several methodological issues, which if remedied in future research, may help enhance the precision of results and better inform efforts to address the mental health needs of the general population.

We propose five recommendations for future studies. First, although there is value in convenience samples in uncovering the direction for further research, sole reliance on such samples to determine PTSD prevalence in the general population is not optimal. Further sampling strategies must ensure that population demographics are well-represented, or that special populations are identified as the focus of inquiry. Second, although cross-sectional studies help detect associations, longitudinal studies are needed to determine potential causal relationships between direct exposures to the events of the pandemic and PTSD or PTSD symptoms. In addition, opportunities for direct comparisons with matched pre-pandemic cohorts should be pursued. Third, the use of online surveys has considerable practical advantages in recruiting subjects. However, particularly for online data collection, a limited survey duration is necessary to help ensure study completion. Yet, additional data need to be gathered that likely require further engagement with participants. For example, data on pre-existing and ongoing psychiatric conditions and stressors, as well as prior exposure to traumatic events are required to identify a COVID-19 related first occurrence of PTSD. Further subject engagement is also likely needed to determine an anchor to an index traumatic event. Fourth, increased clarity is needed in standardizing assessments of PTSD and PTSD symptoms, cutoff scores used to operationalize positive screens, and recognizing whether PTSD or symptoms of this disorder are the targets of the investigation. Although in-person interviews are costly in the context of general population studies, the use of the Clinician-Administered PTSD Scale for DSM-5<sup>75</sup> to detect COVID-related PTSD, as was done in one study among patients with severe COVID-infection,<sup>76</sup> would significantly improve the assessment of PTSD.<sup>77</sup> Fifth, a robust finding in the PTSD literature is the presence of gender differences in the prevalence of PTSD in the general population with women at increased risk compared to men.<sup>51,78–82</sup> The majority of studies included in this review reported that women generally had greater severity of PTSD symptoms; however, others reported an absence of significant gender differences,<sup>43,83</sup> and some studies indicated that the prevalence of PTSD was higher in men compared to women.<sup>64</sup> Yet, little was discussed regarding how the gender-based findings can be understood, how gender

**Table 1.** Summary of studies examining posttraumatic stress symptomatology in general population samples in the context of the COVID-19 pandemic.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
Kar et al. <sup>73</sup>	20 countries	29 March–7 April 2020	Cross-sectional survey	N = 733 41.5% women Mean age = 30.7, SD = 11.6	No	No	PC-PTSD-5 cutoff = 3 for probable PTSD Criterion A: anchoring not specified	34.1% probable PTSD
Veldhuis et al. <sup>42</sup>	50+ countries	Baseline: 5–19 April 2020; Follow-up: 28 August–11 September 2020	Longitudinal survey	N = 1567 88.2% women 38.0% ages 18 to 30 years	No	Ever diagnosed with specific mental health issues	15-item IES Cutoff score = 11 for potential risk for PTSD Criterion A: anchored to COVID-19	51% risk for PTSD at baseline
Passavanti et al. <sup>21</sup>	Australia, China, Ecuador, Iran, Italy, Norway, and the United States	17–30 April 2020	Cross-sectional survey	N = 1612 60% women mean age = 28, SD = 9.36	No	No	22-item IES-R Cutoff score = 33 for probable PTSD Criterion A: anchoring not specified	14.9% mild, 8.5% moderate, and 46.8% severe risk of PTSD
Goularte et al. <sup>25</sup>	Brazil	20 May–14 July 2020	Cross-sectional survey	N = 1996 84.5% women mean age 24.22, SD = 12.57	No	History of the previous psychiatric disorders including anxiety and mood disorders and psychosis	22-item IES-R Cutoff >5.6 based on “the sum of the average of each domain” indicating “psychological stress” Covering the past two weeks Criterion A: anchoring not specified	34.2% moderate to severe PTSD symptoms
Sommer et al. <sup>47</sup>	Canada	May–July 2020	Cross-sectional survey	N = 1260 76.0% women 30.5% ages 18 to 29 years	Lifetime trauma exposure, instrument not specified		PC-PTSD-5 Cutoff not specified Criterion A: anchored to COVID-19-related event if it was reported as the worst event	64.3% PTS among those with COVID-19 as index trauma and 3% of the sample reported COVID-19 items as index trauma (n = 28)
Liu et al. <sup>34</sup>	China	1–10 February 2020	Cross-sectional survey	N = 2858 53.6% women 24.2% ages 18 to 25 years, 22.6% ages 26 to 30 years	No	Presence of “prior psychological problems”	PCL-5 Symptom criteria Criterion A: anchoring not specified	19.5% PTSD
Lu et al. <sup>74</sup>	China	8–18 June 2020	Cross-sectional survey	N = 1035 73.0% general population adults 91.4% women 8.9% ages 18 to 25 years, 34.3% ages 26 to 30 years, and n = 387 frontline HCW	No	No	17-item PCL-C Cutoff = 50 for PTSD Criterion A: anchoring not specified	13.6% PTSD in general population adults

(continued)

Table 1. Continued.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
Luo et al. <sup>18</sup>	China	29 January–11 February 2020	Cross-sectional survey	N = 490 general population adults 58.6% women 38.6% ages 18 to 30 years and N = 915 frontline HCW, n = 1659 non-frontline HCW	No	No	22-item IES-R Cutoff = 9 for mild, 26 for moderate, and 44 for moderately severe PTSD symptoms Criterion A: anchoring not specified	4.9% of general population adults “moderately severe” PTSD, 22.4% moderate, 36.9% mild
Ren et al. <sup>84</sup>	China	14 February–29 March 2020	Cross-sectional survey	N = 1172 69.3% women median age = 22 years	No	No	Started the study with ASDS (n = 714), continued with PCL-5 (n = 458) Cutoff = 33 Criterion A: anchoring not specified	7.0% clinical PTSD
Sun et al. <sup>35</sup>	China	30 January–3 February 2020	Cross-sectional survey	N = 2091 60.8% women 1.4% under 18 years, 31.5% ages 18 to 29 years	No	No	PCL-5 Cutoff ≥ 33, and symptom criteria Criterion A: anchored to COVID-19	4.6% score > 33, 5.3% met symptom criteria, and 3.3% met both
Yang et al. <sup>17</sup>	China	6–8 June 2020	Cross-sectional survey	N = 15 000 57.1% women 0.7% age < 18 years, 6.3% ages 18 to 25 years	No	Presence or absence of “current mental illness/chronic disease”	22-item IES-R Cutoffs = 9 mild, 26 = moderate, 44 severe PTSD Criterion A: anchored to COVID-19	20.1% present with moderate to severe PTSD (4.7% severe and 15.4% moderate) and 37.8% mild PTSD
Zhang et al. <sup>30</sup>	China	30 January–3 February 2020	Cross-sectional survey	N = 2027 61.2% women Mean age = 35.47 years, SD = 11.32	No	No	PCL-5 Cutoff = 33 Criterion A: anchoring not specified	4.7% PTSS
Shuwiekh et al. <sup>29</sup>	Egypt, Kuwait, Jordan, Saudi Arabia, and Iraq	28 April–25 May 2020	Cross-sectional survey	Egypt (N = 255, 78.8% women, mean age = 24.27 years, SD = 6.77), Kuwait (N = 442, 89.6% women, mean age = 27.11 years, SD = 11.29), Jordan (N = 216, 88.4% women, mean age = 28.76 years, SD = 10.67), Saudi Arabia (N = 212, 80.7% women, mean age = 41.25 years, SD = 11.18), Algeria (N = 110, 82.7% women, mean age 40.99 years, SD = 12.47), Iraq and Palestine (N = 139, 55.4% women, mean age = 42.40 years, SD = 13.11)	No	No	PCL-5 Cutoff = 31 for probable PTSD Criterion A: anchoring not specified	36.6% probable PTSD
Makhashvili et al. <sup>43</sup>	Georgia	25 May–25 June 2020	Cross-sectional survey	N = 2088 86.5% women	No	No	Adapted ITQ 1 of 2 symptoms from the 3 symptom clusters +	11.8% of women and 12.5% of men have PTSD

(continued)

Table 1. Continued.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
Kalaitzaki <sup>31</sup>	Greece	5–30 April 2020	Cross-sectional survey	N = 1661 55.12% of women ages 18 to 39 years 75.5% women mean age = 39.5 years, SD = 12.2; (59.4% general population and 40.6% HCW)	No	No	endorsement of at least one indicator of functional impairment Criterion A: anchored to emotional reactions to COVID-19 PCL-5 Cutoff = 33 Criterion A: anchoring not specified	27.2% PTSD in a general population sample
Karaivazoglou et al. <sup>16</sup>	Greece	10 April–4 May 2020	Cross-sectional survey	N = 1443 72.9% women 28.8% ages 18 to 30 years	No	No	22-item IES-R Cutoff scores for partial = 24, probable = 33, and definite PTSD = 37 Criterion A: anchored to COVID-19 pandemic	19.6% partial PTSD, 8.7% probable PTSD, and 36.4% definite PTSD
Singh and Khokhar <sup>19</sup>	India	Last week of April 2020	Cross-sectional survey	N = 234 59.4% women mean age 28.59 years, SD = 10.47	No	No	22-item IES-R Cutoff >24 used to define "PTSD" Criterion A: anchoring not specified	28.2% PTSD reported based on >24 cutoff, "13.4% with a score from 24 to 32, 8.1% probable diagnosis, and 5.4% high enough to suppress immune system's functioning"
Jowett et al. <sup>45</sup>	Ireland	31 March–5 April 2020	Cross-sectional survey	N = 1041 51.5% women 11.1% ages 18 to 24	No	No	Adapted ITQ ≥2 for at least one of two symptoms from each cluster and at least one functional impairment item to be endorsed (≥2). Criterion A: anchored to their experience of the COVID-19 pandemic	17.7% met criteria for PTSD "with COVID-19 as the stressor"
Bonichini and Tremolada <sup>20</sup>	Italy	1–30 April 2020	Cross-sectional survey	N = 1839 77.7% women mean age = 32.63 years, SD = 13.03	No	Presence of "precedent pathologies" NOS	22-item IES-R Cutoff = 33 for preliminary PTSD	23.5% PTSD
Di Giuseppe et al. <sup>24</sup>	Italy	13–18 March 2020	Cross-sectional survey	N = 5683 75% women 34% ages 18 to 30 years	No	No	Anchored to COVID-19 22-item IES-R Cutoff not specified Criterion A: anchoring not specified	29.4% clinically significant symptoms of PTSD
Favieri et al. <sup>44</sup>	Italy	18–25 March 2020	Cross-sectional survey	N = 1639 75.8% women 66.4% ages 18 to 29 years	No	No	Adapted PCL-5 (19-item) scores higher than the mean of the sample plus 1.5 SD were indicative of higher PTSD symptomatology	5.1% PTSD

(continued)



Table 1. Continued.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
Rossi et al. <sup>61</sup>	Italy	27 March–6 April 2020	Cross-sectional survey	N = 18 147 79.6% women median age = 38	IADQ adapted to COVID-19	Prior mental illness using GPS module	Criterion A: anchored to COVID-19 GPS-PTSS 3 out of 5 symptoms were reported as present Criterion A: anchoring not specified	37.14% PTSD
González Ramírez et al. <sup>22</sup>	Mexico	27 March–2 April 2020	Cross-sectional survey	N = 3932 74.5% women mean age = 33 years	No	No	22-item IES-R Cutoff $\geq 35$ , + for the subscales of emotional distress, $\leq 14$ for normal, 15 to 20 for "moderate," and $>20$ points for "severe distress" Criterion A: anchoring not specified	27.7% clinically significant PTSD (using total score cutoff)
Agberotimi et al. <sup>26</sup>	Nigeria	20 March–19 April 2020	Cross-sectional survey	n = 502 general population adults 45.8% women N = 382 HCW The overall sample mean age = 28.75 years, SD = 8.17	No	No	22-item IES-R Cutoff = 24 mild, 33 moderate, 37 severe Criterion A: anchoring not specified	42.8% in the general population for severe PTS symptoms
Bonsaksen et al. <sup>33</sup>	Norway	8 April–20 May 2020	Cross-sectional survey	N = 4527 85% women 25.5% ages 18 to 29 years	No	No	PCL-5 Symptom criteria, current symptoms Criterion A: anchored to the COVID-19 outbreak	12.5% for men and 19.5% for women symptom-defined PTSD
Alshehri et al. <sup>46</sup>	Saudi Arabia	June 2020	Cross-sectional survey	N = 1374 50.95% women 61.9% ages 34 years or younger	No	Presence of prior psychiatric conditions	17-item PCL-5 Cutoff = 45, + symptom-based scoring (items scoring 3-5 with 1B, 3C, and 2D), + both combined Criterion A: anchored to their experiences with the COVID-19 pandemic	22.6% with cutoff, 24.8% with symptom criteria, and 19.6% combined
Joseph et al. <sup>83</sup>	Saudi Arabia	12 April–10 May 2020	Cross-sectional survey	N = 584 38.2% women 22.6% ages 18 to 24 years	No	No	IES-6 Cutoff $\geq 7$ for "clinical concern" and =9 for probable PTSD Criterion A: anchoring not specified	51.3% met the level of probable PTSD diagnosis, Overall, 65.5% met levels of clinical concern for PTSD
Del Río-Casanova et al. <sup>15</sup>	Spain	23–28 March 2020	Cross-sectional survey	N = 3520 74.2% women Mean age = 39.24 years, SD = 12	No	Antecedents of psychiatric illness	22-item IES-R Cutoff = 24 mild, 33 moderate, 37 severe	19% of women versus 7.4% of men have severe PTS

(continued)

Table 1. Continued.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
Gonzalez-Sanguino et al. <sup>85</sup>	Spain	21–28 March 2020	Cross-sectional survey	N = 3480 75% women mean age = 37.92 years	No	Presence or absence of "previous illness" and "mental health" no further details	Criterion A: anchoring not specified PCL-C-2 Cutoff not specified Criterion A: anchoring not specified	15.8% with moderate to extreme PTSD symptoms
Odirozola-González et al. <sup>70</sup>	Spain	28 March–4 April 2020	Cross-sectional survey	N = 3550 64.9% women mean age = 32.1 years, SD = 14.1, median = 25	No	Prior MH tx, psychotropic medication intake	15-item IES Cutoff score not specified Criterion A: anchoring not specified	11.5% severe, 35.5% moderate IES-R scores (47.5% presented moderate-to-severe psychological impact)
Kakajic et al. <sup>62</sup>	Syria	6–13 April 2020	Cross-sectional survey	N = 5588 69.6% women mean age = 26.84 years, SD = 7.81	Distress related to war noises or displacements	No	SPTSS Cutoff not specified Criterion A: anchoring "not linked to a specific event."	23.3% met the criteria for probable PTSD
Kira et al. <sup>28</sup>	Turkey	2 October–13 November 2020	Cross-sectional survey	N = 262 29.4% women Mean age = 28.25 years, SD = 10.35	CTS-S-36 items	No	PCL-5 Cutoff = 31 Criterion A: anchoring not specified	33.2% probable PTSD
Kolacz et al. <sup>63</sup>	United States	29 March–13 May 2020	Cross-sectional survey	N = 1666 59.7% women Mean age = 45.87 years, SD = 16.17	Adverse and traumatic experiences scale	No	17-item PTSD-C At least one re-experiencing item, 3+ avoidance items, and 2+ hyper-arousal symptoms Criterion A: anchoring not specified	27.8% PTSD
Murata et al. <sup>64</sup>	United States	27 April–13 July 2020	Cross-sectional survey	N = 2007 adults 73% women Mean age = 41.8 years, SD = 17.7 n = 1672 HCW n = 583 adolescents	As part of the PC-PTSD	LT NSSI, STB	PC-PTSD-5 Cutoff = 3 Criterion A: anchored to a traumatic event, COVID-19 listed as an event	Only 1.3% endorsed COVID-19 as a traumatic event, among adults: 33% PTSD
Bridgland et al. <sup>10</sup>	United Kingdom, Canada, Australia, and New Zealand	10–21 April 2020	Cross-sectional survey	N = 1040 adults 48.8% women Mean age = 35.7 years, SD = 12.3; USA: n = 260 (41.5% women); Australia and New Zealand: n = 259 (49.0% women); Canada: n = 260 (45.2% women); UK: n = 260 (61.2% women)	COVID-19-related events	No	Adapted PCL-5 (20-items) Cutoff = 33 Timing reduced to one week, Criterion A: anchored to COVID-19 experiences	13.2% PTSD
Le et al. 2020 <sup>23</sup>	Vietnam	April 2020	Cross-sectional survey	N = 1382 62.0% women	No	Comorbidities, how and what is unclear	22-item IES-R Cutoff not specified, only categories "normal, clinical	10.3% clinically concerning PTSD, and 7.7% severe PTSD

(continued)

Table 1. Continued.

Authors	Country	Data collection dates	Study type	Study sample size (gender distribution, and age)	Assessment of exposure to other stressful events	Assessment of prior mental disorders	Assessment of PTSD, cutoff scores, and anchoring to a traumatic event (criterion A)	Prevalence of PTSD or PTSD symptoms in the general population
				mean age = 36.4 years, SD = 9.7			concern, PTSD diagnosis, and severe PTSD. <sup>11</sup> Criterion A: anchored to the impact of COVID-19 on their income and occupation status	

ASDS: Acute Stress Disorder Scale; CTS-S-36: Cumulative stressors and traumas scale-36 items; GPS-PTSS: Global Psychotrauma Screen Posttraumatic Stress Symptoms Subscale; HCW: health care workers; IADQ: International Adjustment Disorder Questionnaire; ITQ: International Trauma Questionnaire; PCL-5: Posttraumatic Stress Disorder Checklist; PCL-C: PTSD Checklist-Civilian Version; PCL-S: Specific Stressor Version of the PCL; PC-PTSD: Primary Care Posttraumatic Stress Disorder Screen for DSM-5; PTS: posttraumatic stress; NOS: not otherwise specified; PTSD-C, IES-R: Impact of Event Scale-Revised; MH: prior mental health treatment; SPTSS: Screen for Posttraumatic Stress Symptoms; LT NSSI, STB: Lifetime non-suicidal self-injury, suicidal thoughts and behaviors.

was defined, and the importance of pre-existing and concurrent stressors that may disproportionately affect more women than men. For example, there is growing evidence that public health measures to reduce the speed of viral progression (e.g., lockdowns, school closures, and working from home) have had a greater effect on women.<sup>86</sup>

A conceptual question has also become apparent in the review of recent studies attempting to determine the PTSD-related impact of the pandemic. Namely, can the COVID-19 pandemic as a disruptive global experience be construed as direct exposure to a traumatic event in the general population? Based on the traditional use of the DSM-5 criteria, even actual contact with the SARS-CoV-2, testing positive or developing COVID-19 symptoms may not meet criterion A and could be considered non-traumatic stressful events.<sup>87</sup> A systematic review of studies examining disaster-related PTSD identified two dimensions for an incident to qualify as a disaster, namely its large scale and significant outcomes.<sup>88</sup> Based on this definition, the pandemic can be construed as a disaster. However, even if the pandemic is seen as a natural disaster, exposure requirements are not automatically met in the general population.<sup>87</sup> To meet the current diagnostic conceptualization of PTSD, exposure must be addressed to satisfy criterion A. Consequently, future studies estimating the psychological consequences of the pandemic should carefully consider whether outcomes reflect PTSD or some form of the stress-related condition. Some have suggested considering a new type of pandemic-related stress disorder, such as COVID-19 stress syndrome<sup>89</sup> to account for clinically significant distress related to the pandemic. However, other possibilities include considering other existing DSM-5 disorders such as adjustment disorders,<sup>7</sup> or other specified trauma- and stressor-related disorders. Relatedly, rather than considering the pandemic as a general traumatic experience in future studies, it may be important to consider multiple stressors that would not have occurred without the pandemic (e.g., loss of a close friend or family member to COVID-19, hospitalization due to severe COVID-19 symptoms, major loss of income due to job closure during COVID-19, homeschooling children, lockdowns, and mandated restrictions in activities). A recent study examining the number of COVID-19-related stressors in relation to posttraumatic stress symptoms and confirmed the usefulness of this approach in general population samples.<sup>90</sup> Other major, as well as less severe life stressors, could be assessed as those that either pre-existed the pandemic or judged by a study participant as not *directly* related to the pandemic (e.g., divorce or separation). This type of approach would allow a more exhaustive picture of individual exposure to various stressors and take the latter into account when measuring associated symptoms.

We identified and discussed the methodological issues arising from research focused on COVID-19-related PTSD and PTSD symptoms in general population samples. As new variants of SARS-CoV-2 spread, signaling an uncertain

end to the pandemic, additional studies with enhanced precision and methodologies are needed to understand the evolving and longer-term prevalence of PTSD and PTSD symptoms globally. We suggest that this will be best achieved by evaluating psychological distress in the context of lifetime psychopathology and lifetime and ongoing exposure to stress and trauma, and by using representative samples and longitudinal or matched-cohort sample approaches. We conclude that the study of PTSD and other stress-related disorders in the context of the ongoing pandemic requires further conceptualization to address both the issue of stressor burden and the complexity of pandemic-specific symptomatology. Within studies of stress, we also suggest that research should seek to identify cognitive styles, personal beliefs, and support systems that can be modified to reduce stress or enhanced to promote resilience during this uniquely difficult time. Such modifiable factors could be integrated into public health efforts to respond to the mental health challenges of this global health crisis.

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