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Mental Health and Occupational Stress in the Emergency Medical Services and 911 Workforce

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None of the investigators have any affiliations or financial involvement that conflicts with the material presented in this report. .

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Preface

The Agency for Healthcare Research and Quality (AHRQ), through its Evidence-based Practice Centers (EPCs), sponsors the development of systematic reviews to assist public- and private-sector organizations in their efforts to improve the quality of healthcare in the United States. These reviews provide comprehensive, science-based information on common, costly medical conditions, and new healthcare technologies and strategies.

Systematic reviews are the building blocks underlying evidence-based practice; they focus attention on the strength and limits of evidence from research studies about the effectiveness and safety of a clinical intervention. In the context of developing recommendations for practice, systematic reviews can help clarify whether assertions about the value of the intervention are based on strong evidence from clinical studies. For more information about AHRQ EPC systematic reviews, see https://effectivehealthcare.ahrq.gov/about/epc/evidence-synthesis

AHRQ expects that these systematic reviews will be helpful to health plans, providers, purchasers, government programs, and the healthcare system as a whole. Transparency and stakeholder input are essential to the Effective Health Care Program. Please visit the website (www.effectivehealthcare.ahrq.gov) to see draft research questions and reports or to join an e-mail list to learn about new program products and opportunities for input.

If you have comments on this systematic review, they may be sent by mail to the Task Order Officer named below at: Agency for Healthcare Research and Quality, 5600 Fishers Lane, Rockville, MD 20857, or by email to epc@ahrq.hhs.gov.

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Technical Expert Panel

In designing the study questions and methodology at the outset of this report, the EPC consulted several technical and content experts. Broad expertise and perspectives were sought. Divergent and conflicted opinions are common and perceived as healthy scientific discourse that results in a thoughtful, relevant systematic review. Therefore, in the end, study questions, design, methodologic approaches, and/or conclusions do not necessarily represent the views of individual technical and content experts.

Technical Experts must disclose any financial conflicts of interest greater than $5,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals with potential conflicts may be retained. The TOO and the EPC work to balance, manage, or mitigate any potential conflicts of interest identified.

The list of Technical Experts who provided input to this report follows:

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Peer Reviewers

Prior to publication of the final evidence report, EPCs sought input from independent Peer Reviewers without financial conflicts of interest. However, the conclusions and synthesis of the scientific literature presented in this report do not necessarily represent the views of individual reviewers.

Peer Reviewers must disclose any financial conflicts of interest greater than $5,000 and any other relevant business or professional conflicts of interest. Because of their unique clinical or content expertise, individuals with potential non-financial conflicts may be retained. The TOO and the EPC work to balance, manage, or mitigate any potential non-financial conflicts of interest identified.

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Mental Health and Occupational Stress in the Emergency Medical Services and 911 Workforce

Abstract

Objectives. This systematic review addresses the mental health of the Emergency Medical Services (EMS) and 911 telecommunicator workforces. We addressed four Key Questions (KQs) related to the: (1) incidence, prevalence, and severity of mental health and occupational stress issues; (2) benefits and harms of interventions to promote resistance and resilience regarding these issues; (3) contextual and implementation factors of studies with effective EMS and telecommunicator workforce practices to address these issues; and (4) future research that is needed to close existing gaps regarding addressing mental health and occupational stress issues in the EMS and telecommunicator workforces.

Data sources. We searched Medline®, Embase®, Cochrane CENTRAL, PsycINFO,® and CINAHL®, journals not indexed in Medline®, ClinicalTrials.gov, Websites, and from January 2001 through October 2023. To increase applicability to the U.S. decision-making context, we restricted to studies conducted in high-income countries.

Review methods. We used DistillerSR® for screening and the Systematic Review Data Repository Plus (SRDR+; https://srdrplus.ahrq.gov) for data extraction. We assessed the risk of bias, conducted meta-analyses, and evaluated the strength of evidence (SoE) using standard methods. We registered the protocol in PROSPERO (registration number CRD42023465325).

Results. We included 170 studies (2 randomized controlled trials, 1 nonrandomized trial, 4 pre-post studies, 6 cohort studies, and 157 cross-sectional studies). **KQ1:** We included 163 studies. No study reported on **incidence** of any outcome in any population. *Among telecommunicators during routine practice*, the **prevalence** of any depression is 15.5 percent, suicidal ideation is 12.4 percent, suicide plans is 5.7 percent, suicide attempts is 0.7 percent, alcohol abuse is 15.5 percent, high/extreme peritraumatic distress is 5 percent, high secondary traumatic stress is 16.3 percent, and acute stress disorder is 17 percent (low SoE for each). *Among telecommunicators after critical mass incidents*, the prevalence of high general stress is 39.7 percent (low SoE). *Among EMS clinicians during routine practice*, the prevalence of suicidal ideation is 33 percent, suicide plans is 8.7 to 10.9 percent, and suicide attempts is 2.8 to 5.6 percent (moderate SoE). *Among EMS clinicians during routine practice or after critical mass incidents*, the prevalence of depression, anxiety, post-traumatic stress disorder (PTSD), burnout, and stress vary considerably (low SoE for each). Regarding **severity** (based on mean levels), *among telecommunicators during routine practice*, depressive symptoms and stress are mild/low to moderate and burnout is mild to severe (moderate SoE for each). The mean level of peritraumatic distress is moderate and secondary traumatic stress is mild (low SoE for each). *Among telecommunicators after critical mass incidents*, the mean levels of burnout and general stress are moderate (low SoE). *Among EMS clinicians during routine practice*, the mean levels of depressive symptoms are minimal to mild while mean levels of anxiety and operational and organizational job stress are mild to moderate, mean levels of general stress and burnout are mild to severe; mean levels of secondary traumatic stress are mild; and mean alcohol use is of low risk (moderate SoE for each). The Suicide Behaviors Questionnaire-Revised (SBQ-R) mean score is 4.92 (95% confidence interval

[CI] 2.44, 7.39; 4 studies; SBQ-R ≥ 7 implies at risk of suicide; moderate SoE). The mean level of moral injury is moderate (low SoE). *Among EMS clinicians after critical mass incidents*, the mean levels of depressive symptoms are minimal to mild and for anxiety are mild to moderate (moderate SoE for each). Some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) may be associated with poor outcomes. **KQ2:** We included eight studies. Mindfulness-building interventions targeting resistance and resilience among EMS clinicians may be associated with reduced burnout at up to 6 months of follow-up (low SoE). **KQ3:** We included five studies. We found no evidence regarding effective telecommunicator workforce practices to improve mental health and occupational stress issues. **KQ4:** Future research should evaluate mindfulness-based interventions and various prioritized outcomes. Future studies should be randomized trials or non-randomized studies that account for important confounders. Future studies should report on characteristics of the agencies in which the study was conducted.

Conclusions. This systematic review documents the prevalence and severity of mental health and occupational stress issues in the EMS and telecommunicator workforces. Future research should evaluate the incidence of each mental health and occupational stress issue as well as the prevalence and severity of outcomes that were not adequately reported or had inconsistent results. Mindfulness-building interventions may be associated with reduced burnout among EMS clinicians. To develop and strength preventive and early therapeutic interventions, attention should be given to the modifying factors associated with poor outcomes.

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Executive Summary

Main Points

- No study reported on the **incidence** of mental health or occupational stress issues among Emergency Medical Service (EMS) clinicians or telecommunicators.
- **Prevalence** of mental health or occupational stress issues:
  - Among telecommunicators during routine practice, the prevalence of depression is 15.5 percent, suicidal ideation is 12.4 percent, suicide plans is 5.7 percent, suicide attempts is 0.7 percent, alcohol abuse is 15.5 percent, high/extreme peritraumatic distress is 5 percent, high secondary traumatic stress is 16.3 percent, and acute stress disorder is 17 percent (low strength of evidence (SoE) for each). After critical mass incidents, the prevalence of high general stress is 39.7 percent (low SoE).
  - Among EMS clinicians during routine practice, the prevalence of suicidal ideation is 33 percent, suicide plans is 8.7 to 10.9 percent, and suicide attempts is 2.8 to 5.6 percent (moderate SoE). During routine practice as well as after critical mass incidents, the prevalence of depression, anxiety, post-traumatic stress disorder (PTSD), burnout, and stress each varies considerably (low SoE for each).
- **Severity** (based on mean scores) of mental health and occupational stress issues:
  - Among telecommunicators during routine practice, the mean levels of depressive symptoms and stress are mild/low to moderate and mean levels of burnout are mild to severe (moderate SoE for each). The mean levels of peritraumatic distress are moderate and secondary traumatic stress are mild (low SoE for each). After critical mass incidents, the mean levels of burnout and general stress are moderate (low SoE).
  - Among EMS clinicians during routine practice, the mean levels of depressive symptoms are minimal to mild while the mean levels of anxiety and operational and organizational job stress are mild to moderate, and the mean levels of burnout and general stress are mild to severe; secondary traumatic stress are mild; and alcohol use are of low risk (moderate SoE for each). The Suicide Behaviors Questionnaire-Revised (SBQ-R) mean score from four studies is 4.92 (95% confidence interval [CI] 2.44 to 7.39; SBQ-R $\geq$ 7 implies risk of suicide; moderate SoE). The mean levels of moral injury are moderate (low SoE). After critical mass incidents, the mean levels of depressive symptoms are minimal to mild and anxiety are mild to moderate (moderate SoE for each).
- Mindfulness-building **interventions** targeting both resistance and resilience among EMS clinicians may be associated with reduced burnout at up to 6 months of follow-up (low SoE).

Background and Purpose

The incidence, prevalence, and severity of mental health issues and occupational stress issues among EMS clinicians and telecommunicators needs to be systematically documented. Comprehensive individual-level and system-level strategies are needed to improve mental health and reduce occupational stress issues in the EMS and telecommunicator workforces. Resistance refers to "the ability of an individual, a group, an organization, or even an entire population to

literally resist manifestations of clinical distress, impairment, or dysfunction associated with critical incidents, terrorism, and even mass disasters." [1] Resilience refers to the "ability of an individual, a group, an organization, or even an entire population to rapidly and effectively rebound from psychological and/or behavioral perturbations associated with critical incidents, terrorism, and even mass disasters." The intended audiences for this review are EMS clinicians, telecommunicators, mental health clinicians, guideline developers, and policymakers for EMS and telecommunicator workforce health. We addressed four Key Questions (KQs) related to: incidence, prevalence, and severity of mental health and occupational stress issues (**KQ1**); benefits and harms of interventions to promote resistance and resilience regarding these issues (**KQ2**); contextual and implementation factors of studies with effective EMS and telecommunicator workforce practices to prevent, recognize, and treat mental health and occupational stress issues (**KQ3**); and future research that is needed to close existing gaps regarding prevention, recognition, and treatment of mental health issues and occupational stress issues in the EMS and telecommunicator workforces (**KQ4**).

Methods

We used methods consistent with the Agency for Healthcare Research and Quality Methods Guide for Effectiveness and Comparative Effectiveness Reviews. We searched Medline® (using PubMed), Embase®, Cochrane Register of Clinical Trials (CENTRAL), PsycINFO®, and the Cumulative Index to the Nursing and Allied Health Literature (CINAHL®) from January 2001 through October 2023. We also searched Websites, the ClinicalTrials.gov registry, and journals not indexed in Medline®. To increase applicability to the U.S. decision-making context, we restricted to studies conducted in high-income countries. We screened records using DistillerSR® and extracted data into the Systematic Review Data Repository Plus (SRDR+). We used standard methods to assess the risk of bias, conduct pairwise meta-analyses, and evaluate the strength of evidence (SoE). The PROSPERO protocol registration number is CRD42023465325.

Results

We included 170 studies (KQ1: 163 studies, KQ2: 8 studies, and KQ3: 5 studies).

KQ1. Incidence, prevalence, and severity of mental health and occupational stress issues

- Of the 163 studies that addressed this KQ, 135 studies enrolled only EMS clinicians, 22 studies enrolled only telecommunicators, and six studies enrolled both EMS clinicians and telecommunicators.
- Tables ES-1 and ES-2 summarize the prevalence and severity among telecommunicators and EMS clinicians, respectively. No study reported on incidence.
- Some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) may be associated with poor outcomes (Tables ES-3 and ES-4).

KQ2. Interventions to promote resistance and resilience regarding mental health and occupational stress issues

- Of the eight studies (721 participants total) that addressed this KQ, six studies enrolled EMS clinicians and two studies enrolled telecommunicators.
- Mindfulness-building interventions targeting resistance and resilience among EMS clinicians may be associated with reduced burnout at up to 6 months of follow-up (low SoE).

- The evidence for other outcomes was insufficient to draw conclusions.

KQ3. Contextual and implementation factors of studies with effective telecommunicator and EMS workforce practices to address mental health and occupational stress issues

- Five studies (579 participants total) addressed this KQ, including three studies that enrolled EMS clinicians and two studies that enrolled telecommunicators.
- There is not enough information about contextual or implementation factors to make any conclusions regarding effective workforce practices to prevent, recognize, and treat mental health issues and occupational stress issues in the EMS or telecommunicator workforces.

KQ4. Future research needed to close existing evidence gaps regarding prevention, recognition, and treatment of mental health issues

- Future research should evaluate mindfulness-based and other interventions.
- Some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) that are associated with poor outcomes likely provide valuable insights into other potential avenues for future intervention development and evaluation.
- Future studies should be either randomized trials that are adequately powered and well-conducted or non-randomized studies that adequately account for important confounders.
- Future studies should also consistently evaluate and report prioritized outcomes.
- Future studies should be fully reported, including reporting various characteristics of the agencies in which the study was conducted.

Strengths and Limitations

The main strength of the evidence base is its applicability to the U.S. decision-making context. The evidence summarized provides insights into the prevalence and severity of various mental health and occupational stress issues among telecommunicators and EMS clinicians during routine practice and after critical mass incidents.

Although we found 170 studies, we were limited in our ability to make conclusions. For KQ1, there was considerable variation in prevalence and severity estimates across studies for various specific outcomes for specific populations. This variation arose from heterogeneous countries, settings, populations, contexts, and outcome measurement instruments and scoring methodologies/thresholds. Several modifying factors were also infrequently reported. For KQ2 and KQ3, many of the prioritized outcomes were either not reported in any included study for specific comparisons or were reported in an insufficient number of studies to merit conclusions.

Implications and Conclusions

The evidence on KQ1 indicates that the prevalence and severity of mental health and occupational stress issues in the EMS and telecommunicator workforce is substantial enough to merit greater attention by health systems. Much more research is needed because of the limited evidence on the effectiveness of interventions for strengthening the resistance and resilience of the EMS and telecommunicator workforce. Addressing the numerous mental health and occupational stress challenges facing EMS clinicians and telecommunicators will require evidence-based comprehensive strategies consider the modifying factors that are associated with poor outcomes.

Table ES-1. Key Question 1: Summary of Key Findings for Telecommunicators

Outcome	Study Context	Prevalence	Severity
Depression	Routine practice	3 studies (1,613 participants) (low SoE) Any: 15.5%, mild: 26.2%, moderate: 13.3% to 14.9%, and severe: 3.9% to 9.0%	6 studies (1,567 participants) (moderate SoE) Mild to moderate depressive symptoms
Anxiety	Routine practice	Insufficient evidence	Insufficient evidence
	Mass incidents	Insufficient evidence	0 studies
PTSD	During routine practice	6 studies (2,012 participants) (low SoE) Considerable variation for any (3.5% to 74.6%) and severe (17.6% to 69.6%)	Insufficient evidence
Suicidality	Routine practice	1 study (742 participants) (low SoE) Ideation: 12.4%; Plans: 5.7%; Attempts: 0.7%	0 studies
Substance use	Routine practice	1 study (742 participants) (low SoE) Alcohol abuse: 15.5%	Insufficient evidence
Burnout	Routine practice	Insufficient evidence	7 studies (2,295 participants) (moderate SoE) Mild to severe burnout
	Mass incidents	0 studies	1 study (546 participants) (low SoE) Moderate burnout
Stress	Routine practice	Insufficient evidence	7 studies (2,129 participants) (moderate SoE) Low to moderate job stress
	Mass incidents	2 studies (636 participants) (low SoE) High general stress: 39.7%; Medium general stress: 28.2%	1 study (546 participants) (low SoE) Moderate general stress
Peri-traumatic stress	Routine practice	2 studies (570 participants) (low SoE) High/extreme peritraumatic distress: 5%; High secondary traumatic stress: 16.3%	3 studies (1,389 participants) (low SoE) Moderate peritraumatic distress; mild secondary traumatic stress
Posttraumatic distress	Routine practice	1 study (205 participants) (low SoE) Acute stress disorder: 17%	0 studies

Abbreviations: SoE = strength of evidence; PTSD = posttraumatic stress disorder.

No study reported on incidence of any outcome among telecommunicators. No study reported on moral injury among telecommunicators. No study reported on depression, PTSD, suicidality, substance use, peritraumatic stress, or posttraumatic distress after mass incidents among telecommunicators.

Moderate SoE indicates moderate confidence that the estimated association lies close to the true association. Low SoE indicates limited confidence that the estimated association lies close to the true association; and insufficient indicates that evidence is unavailable or does not permit a conclusion.

Table ES-2. Key Question 1: Summary of Key Findings for Emergency Medical Services Clinicians

Outcome	Study Context	Prevalence	Severity
Depression	Routine practice	19 studies (36,774 participants) (low SoE) Considerable variation for any (0.7% to 26.5%), mild (3.5% to 28.0%), moderate (2.0% to 27.9%), and severe (0% to 24.1%)	15 studies (12,382 participants) (moderate SoE) Minimal to mild symptoms
	Mass incidents	12 studies (12,793 participants) (low SoE) Considerable variation for any (14.1% to 35.1%), mild (29.9%), moderate (18.0 to 31.7%), and severe (2.8%).	11 studies (9,423 participants) (moderate SoE) Minimal to mild symptoms
Anxiety	Routine practice	11 studies (29,436 participants) (low SoE) Considerable variation for prehospital EMS prevalence of any (2.9% to 26.1%), mild (2.5% to 5.4%), and moderate (2.7% to 27.1%)	10 studies (4,749 participants) (low SoE) Mild to moderate symptoms among prehospital EMS
	Mass incidents	6 studies (3,992 participants) (low SoE) Considerable variation for any anxiety (16.1% to 79.7%)	5 studies (3,704 participants) (moderate SoE) Mild to moderate anxiety symptoms among prehospital EMS
PTSD	Routine practice	27 studies (12,527 participants) (low SoE) Considerable variation for any (1.3% to 44.4%) and severe (9.7% to 30%)	Insufficient evidence
	Mass incidents	8 studies (6,552 participants) (low SoE) Considerable variation for any (1.3% to 36%) and severe (8.6%)	Insufficient evidence
Suicidality	Routine practice	9 studies (10,381 participants) (moderate SoE) Ideation: 33% (95% CI 32%, 34%); Plans: 8.7% to 10.9%; Attempts: 2.8% to 5.6%	4 studies (28,085 participants) (moderate SoE) SBQ-R mean 4.92 (95% CI 2.44, 7.39; 4 studies). SBQ-R ≥ 7 implies at risk of suicide.
	Mass incidents	2 studies (204 participants) (low SoE) Considerable variation for considering suicide/self-harm (9.5% to 24.4%)	0 studies
Substance use	Routine practice	Insufficient evidence	3 studies (1,536 participants) (moderate SoE) Low-risk alcohol use among prehospital EMS
	Mass incidents	Insufficient evidence	0
Burnout	Routine practice	13 studies (8,030 participants) (low SoE) Considerable variation for any burnout (13.9% to 87.7%), high depersonalization (13.3% to 99.3%), high emotional exhaustion (9.2% to 92%), low personal achievement (1% to 36.4%)	18 studies (10,250 participants) (moderate SoE) Mild to severe burnout
	Mass incidents	6 studies (1,580 participants) (low SoE) Considerable variation for any burnout (18.3% to 38.3%), high depersonalization (32% to 60.7%), high emotional exhaustion (35% to 68%), low personal achievement (48% to 61.2%)	Insufficient evidence
Stress	Routine practice	7 studies (24,787 participants) (low SoE) Considerable variation for any (32%), mild (3.1% to 26.3%), moderate (1.9% to 52.7%), severe (0% to 93%), and extremely severe (0% to 4.0%) general stress	15 studies (9,483 participants) (moderate SoE) Mild to severe general stress and operational and organizational job stress. Moderate psychological distress.
	Mass incidents	7 studies (3,845 participants) (low SoE) Considerable variation for severe general stress (11.0% to 67.5%) and high psychological distress (36.0% to 73.1%)	Insufficient evidence
Peri-traumatic stress	Routine practice	0 studies	3 studies (999 participants) (moderate SoE) Mild secondary traumatic stress
Moral injury	Routine practice	0 studies	1 study (184 participants) (low SoE) Moderate moral injury

Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; SoE = strength of evidence; PTSD = posttraumatic stress disorder, SBQ-R = Suicide Behaviors Questionnaire-Revised.

No study reported on incidence of any outcome among EMS clinicians. No study reported on posttraumatic distress among EMS clinicians. No study reported on peritraumatic stress or moral injury after mass incidents among EMS clinicians. Moderate SoE indicates moderate confidence that the estimated association lies close to the true association. Low SoE indicates limited confidence that the estimated association lies close to the true association; and insufficient indicates that evidence is unavailable or does not permit a conclusion.

Table ES-3. Key Question 1: Associations between modifying factors and all outcomes among telecommunicators

Level	Modifying Factor	Depression	Anxiety	PTSD	Burnout	Stress	Peritraumatic Stress	Posttraumatic Distress
Personal	↑ Age	~ (2)	~ (1)	.	↑↓ (1)	.	.	.
	Female sex	~ (2)	~ (1)	↑↓ (2)	~ (3)	.	↑↓[c,d] (1)	.
	Racial minority	~ (1)	.	.	~ (1)	.	.	.
	↑ Education	~ (2)	~ (1)	.	~ (2)	.	.	.
	↑ Work experience	~ (3)	~ (1)	~ (1)	↑↓ (3)	.	↑[c,d] (2)	~[e] (1)
	↑ Trauma exposure	↑ (1)	.	↑ (1)	.	.	↑[d] (1)	.
	↑ Burnout	.	.	.	N/A	↑[a,b] (2)	↑[d] (1)	↑[e] (1)
	↑ Alexithymia	.	.	.	.	↑[b] (1)	.	.
Agency	Shift: ↑ shifts/month	.	.	.	↑↓ (1)	↑[b] (1)	.	.
	Full-time work	.	.	.	↑ (1)	.	↓[d] (1)	.
	Staffing adequacy	.	.	.	↓ (1)	.	↓[d] (1)	.
	Mandatory overtime	.	.	.	↑ (1)	.	↑[d] (1)	.
	Demanding conditions	.	.	.	.	↑[b] (1)	.	.

Abbreviations: N/A = not applicable; PTSD = posttraumatic stress disorder.
Symbol legend: ↑ = higher/more; ↓ = lower/less; ~ = comparable; ↑↓ = inconsistent results; . = not reported.
Color legend: red = higher/more; green = lower/less; blue = comparable; grey = inconsistent results. The colors do not convey unique information.
[a] General stress; [b] Job stress; [c] Peritraumatic distress; [d] Secondary traumatic stress; [e] Acute stress disorder.
Numbers in parentheses refer to numbers of studies that evaluated the modifying factor (row) for the outcome (column). No studies evaluated modifying factors for the following outcomes among telecommunicators: suicidality, substance use, and moral injury.

Table ES-4. Key Question 1: Associations between modifying factors and all outcomes among Emergency Medical Services clinicians

Level	Modifying Factor	Depression	Anxiety	PTSD	Suicidality	Substance Use	Burnout	Stress	Peritraumatic Stress
Personal	↑ Age	↑↓ (5)	↑↓ (3)	↑↓ (6)	~ (2)	↓[a] (1)	↑↓ (6)	↑↓[b,d] (5)	.
	Female sex	↑↓ (10)	↑↓ (4)	↑↓ (13)	~ (2)	.	↑↓ (9)	↑↓[b,c,d] (7)	.
	Sexual minority	~ (1)	~ (1)	.	.	.	.	.	.
	Racial minority	↓ (1)	~ (1)	.	.	.	.	↑[b] (1)	.
	↑ Education	↑↓ (4)	↑↓ (4)	~ (4)	.	.	.	↑[b] (1)	.
	↑ Income	~ (1)	.	.	.	.	.	.	.
	Certification: Paramedic	.	↑ (1)	.	↑ (1)	.	.	↑[b] (1)	.
	Role: Paramedic	~ (4)	~ (1)	~ (2)	.	.	↑↓ (1)	↑[c,d] (2)	.
	Role: Ambulance worker	.	.	~ (2)	.	.	.	.	.
	Financing: Volunteer	.	.	~ (1)	.	.	↓ (1)	.	.
	↑ Work experience	↑↓ (6)	↑↓ (3)	↑↓ (5)	.	↓[a] (1)	↑ (2)	↑↓[b,c,d] (8)	↑[e] (1)
	↑ Trauma exposure	↑ (6)	↑ (4)	↑ (4)	↑ (1)	.	↑ (1)	↑[b,d] (4)	↑[e] (1)
	↑ Burnout	.	.	.	↑ (1)	.	N/A	.	.
Inter-personal	Peer support access	~ (1)	↓ (1)	↑↓ (2)	.	.	.	.	.
	Peer support use	~ (1)	↓ (1)	↑↓ (2)	.	.	.	↓[d] (2)	.
	No psychological help	.	.	↑ (1)	.	.	.	.	.
Agency	↑ Agency size	.	.	.	.	.	↑↓ (2)	.	.
	Shift: ↑ hours/week	↑ (1)	~ (1)	↑ (1)	.	.	.	.	.
	Shift: 24-hour shifts	~ (2)	.	~ (1)	.	.	↑↓ (2)	.	.
	Irregular shifts	.	.	~ (1)	.	.	.	.	.
	Having downtime	↓ (1)	.	~ (1)	.	.	.	.	.
	↑ Call volumes	↑ (1)	.	.	.	.	.	↑[b] (2)	.
	Mandatory overtime	.	.	.	.	.	.	↑[b] (1)	.
	Setting: Urban	.	.	.	↑ (1)	.	↑ (3)	.	.

Abbreviations: N/A = not applicable; PTSD = posttraumatic stress disorder.
Symbol legend: ↑ = higher/more; ↓ = lower/less; ~ = comparable; ↑↓ = inconsistent results; . = not reported.
Color legend: red = higher/more; green = lower/less; blue = comparable; grey = inconsistent results. The colors do not convey unique information.
[a] Alcohol use; [b] General stress; [c] Job stress; [d] Psychological distress; [e] Secondary traumatic stress.
Numbers in parentheses refer to numbers of studies that evaluated the modifying factor (row) for the outcome (column). No studies evaluated modifying factors for the following outcomes among Emergency Medical Services clinicians: posttraumatic distress and moral injury.

References

1. Kaminsky M, McCabe OL, Langlieb AM, et al. An Evidence-Informed Model of Human Resistance, Resilience, and Recovery: The Johns Hopkins' Outcome-Driven Paradigm for Disaster Mental Health Services. Brief Treatment and Crisis Intervention. 2007;7(1):1-11.

1. Introduction

1.1 Background

The general U.S. adult population prevalence of mental health diagnoses is estimated to be as follows: major depression 8.3%,[1] anxiety 19.1%,[2] and PTSD 3.6%.[2] The Emergency Medical Services (EMS) and telecommunicator workforces are routinely exposed to stressful events, shift work, and occupational environmental stressors. As trained healthcare professionals who assist in out-of-hospital emergencies, EMS clinicians provide around-the-clock, life-saving prehospital care to individuals with medical or traumatic emergencies. EMS clinicians are at high risk for anxiety, depression, posttraumatic stress disorder (PTSD), and suicide.[3] A 2018 systematic review documented the following prevalence among first responders: anxiety (15%), depression (15%), PTSD (11%), and general psychological distress (27%).[4] The proportion of deaths attributed to suicide among EMS clinicians (5.2%) was more than twice that in the general population (2.2%).[5]

Even larger proportions of the EMS workforce are impacted by burnout and moral injury. A 2019 survey of 1,547 EMS clinicians from the world's largest cities found that 60 percent agreed with the statement "I feel burned out in my EMS work" and 36 percent agreed with the statement "I don't want to do EMS work anymore."[6] In the wake of the COVID-19 pandemic, frontline healthcare workers (in general) have experienced high burdens of anxiety, depression, and PTSD.[7-9] A 2023 survey of 850 professionals working in 911 call centers in the United States, Canada, and Mexico found that 84 percent of respondents experienced high call volumes multiple times a week (50% experienced this daily).[10] Three in four respondents (75%) noted that their call center faced staff burnout.[10]

Burnout has now been classified as an occupational phenomenon by the International Classifications of Diseases-11 (ICD-11), which defines it as "a syndrome resulting from chronic workplace stress that has not been successfully managed."[11] Burnout is characterized by feelings of lethargy and emotional exhaustion when on the job, negativism toward one's occupation, and reduced professional output.[11] The EMS profession exposes clinicians to various traumatic or stressful circumstances in which they may "perpetrate, fail to prevent, or witness events that contradict deeply held moral beliefs and expectations."[12] Moral injury is defined as the distressing psychological, behavioral, social, and sometimes spiritual aftermath of exposure to such events.[13] Moral injury has been shown to contribute to burnout and a reduced ability to provide care.[14] Moral injury can also be a predecessor to mental health concerns among EMS clinicians and telecommunicators.[15] Note that because of the international scope of the studies included in this the current systematic review report, we refer to 911 telecommunicators, dispatchers, and other related call-center workers as "telecommunicators."

Various underlying factors contribute to burnout, moral injury, and mental health issues (Figure 1). We have conceptualized these underlying factors as psychosocial factors (e.g., health behaviors, social support), organizational conditions (e.g., long hours, shift work), and environmental exposures (e.g., witnessing or experiencing violence on the job). This categorization is based on the Psychosocial Factors, Organizational Conditions, and Environmental Exposures (POE) framework.[16-18] Frequent shifts and high call volumes (i.e., frequent calls during shifts) can lead to inadequate sleep, poor diet, overwork, injuries on the job, and greater numbers of interactions with abusive or difficult patients and family.[3, 19] Owing to such factors, EMS clinicians are routinely exposed to high levels of stress. Approximately 69 percent of first responders do not have enough time to recover completely from occupational

stressful events because of their frequent occurrence.[20] Constant exposure to such situations leads to chronic stress, which is often untreated. Occupational stressors include excessive work hours,[21] job dissatisfaction, inadequate salaries and financial stress, workplace violence, and repeated layoffs of professional staff (which increases the burden on remaining staff).[22] During the coronavirus disease 2019 (COVID-19) pandemic, major stressors included exposure to the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), related shortages of personal protective equipment (PPE), and the inability to provide adequate care for all patients.[15] These stressors fueled additional burnout, moral injury, anxiety, and depression among EMS clinicians.[23] In one study, one third of paramedics suffered high levels of emotional exhaustion and one third had high levels of depersonalization while treating COVID-19 patients, reflecting significant burnout.[24]

There is an urgent need to address burnout, moral injury, and mental health issues among EMS clinicians. Burnout, moral injury, and mental health concerns have threatened clinician retention in the EMS workforce.[25] Even for those EMS clinicians who remain in the workforce, these challenges impact their ability to provide care that addresses the needs of their patients.[26] The patient population that needs emergency care is perhaps the most vulnerable to the impacts of clinician burnout and a diminished workforce. Better resources and interventions are needed urgently to improve the mental and behavioral health of the EMS and telecommunicator workforces.

Research has identified some factors, such as strengthened social networks, positive coping responses, and religious beliefs, that may mitigate the impact of mental health and burnout among EMS clinicians.[27] Although widely accepted approaches exist to cope with stress in the general population, such as promoting sleep, exercise, engagement with peers, and meditation, these approaches may not be feasible for many EMS clinicians in the context of increased burden on a diminishing workforce. Healthcare organizations try to mitigate stressors on the EMS workforce through resilience training, wellness courses, and similar strategies. Frontline clinicians have reported that peer-to-peer support and dedicated wellness spaces have helped them cope with the stress and burnout related to the pandemic,[28] but whether these are effective on a wider scale is unclear.

Kaminsky and colleagues described the Johns Hopkins Resistance–Resilience–Recovery Model.[29] According to this model, resilience is conceptualized along the spectrum that includes resistance, resilience, and recovery. Resistance refers to “the ability of an individual, a group, an organization, or even an entire population to literally resist manifestations of clinical distress, impairment, or dysfunction associated with critical incidents, terrorism, and even mass disasters.”[29] In other words, resistance is “a form of psychological/behavioral immunity to distress and dysfunction.”[29] Resilience refers to the “ability of an individual, a group, an organization, or even an entire population to rapidly and effectively rebound from psychological and/or behavioral perturbations associated with critical incidents, terrorism, and even mass disasters.”[29] Resilience is considered one of the antidotes to the challenges faced by EMS professionals. Improved health and resilience of EMS clinicians are essential to foster the well-being of the EMS and telecommunicator workforces and to sustain their effectiveness in handling the general population's emergency needs. Recovery refers to the “ability of an individual, a group, an organization, or even an entire population to literally recover the ability to adaptively function, both psychologically and behaviorally, in the wake of a significant clinical distress, impairment, or dysfunction subsequent to critical incidents, terrorism, and even mass disasters.”[29] Similarly, the Substance Abuse and Mental Health Services Administration

(SAMHSA) defines recovery as "a process of change through which individuals improve their health and wellness, live self-directed lives, and strive to reach their full potential."[30] Thus, recovery is considered as a process rather than an end state.

1.2 Purpose and Scope of the Systematic Review

Interventions that target behavioral health issues can be conceptualized as targeting resistance, resilience, and/or recovery. Interventions that aim to promote resistance include pre-incident primary prevention of the behavioral health issues,[31] such as behavioral preparation and psychological preparation (e.g., in areas such as dedication, tenacity, embracing challenges, confidence, sense of control/self-efficacy). The goal of interventions that target resistance is to enable the person faced with adversity to maintain a relatively or consequentially imperturbable level of well-being and functioning.

Interventions that aim to promote resilience include acute, short-term psychological crisis interventions. For example, psychological first aid can be administered during and shortly after a potentially distressing incident to stabilize and mitigate acute distress (secondary prevention of behavioral health issues).[31]

Interventions that aim to promote recovery address the subacute manifestations of distress and dysfunction through counseling, psychotherapy, and psychiatric medications. Among telecommunicators and EMS clinicians, interventions that promote resistance and resilience are tailored to the population (i.e., those who work in these areas), whereas we are not aware of any evidence that interventions that promote recovery are tailored (or should be tailored). Therefore, the current systematic review focuses on interventions that promote resistance and/or resilience.

The decisional dilemma underpinning the proposed systematic review relates to the identification of strategies, both at the individual level and the organizational system level, to build resistance and resilience in the EMS and telecommunicator workforces. The overall goal is to improve mental health and reduce burnout, stress, and moral injury in the EMS and telecommunicator workforces. The intended audiences for this review are EMS clinicians, telecommunicators, mental health clinicians, guideline developers, and policymakers for EMS and telecommunicator workforce health.

2. Methods

2.1 Review Approach

We followed the methods outlined in the Agency for Healthcare Research and Quality (AHRQ) Methods Guide for Effectiveness and Comparative Effectiveness Reviews. This systematic review is reported in accordance with the Preferred Items for Reporting in Systematic Reviews and Meta-Analyses (PRISMA). The topic of this report was finalized in consultation with the U.S. National Highway Transportation Safety Administration (NHTSA) Office of Emergency Medical Services (EMS), the National 911 Program, and the Agency for Healthcare Research and Quality (AHRQ).

We recruited a Technical Expert Panel (TEP) to review the protocol. The TEP included experts in EMS practice, EMS education, EMS stress management, psychology, psychiatry, and social work, as well as representatives of government organizations. With feedback from the TEP, NHSTA, and AHRQ, we finalized the protocol and posted it on the AHRQ Effective Health Care Program's website (https://effectivehealthcare.ahrq.gov) and registered it prospectively with the PROSPERO registry (registration number CRD42023465325).

2.2 Key Questions (KQs)

KQ1. What are the incidence, prevalence, and severity of mental health issues (depression, anxiety, posttraumatic stress disorder [PTSD], suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among EMS and telecommunicator workforces?

a. Are the incidence, prevalence, and severity modified by:
   i. Agency composition, including workflow, regulations, financing?
   ii. Characteristics of EMS clinicians and telecommunicators (e.g., education/training, proficiency, experience, trauma exposure)?
   iii. Physical and mental health resources?

KQ2. What are the effectiveness and comparative effectiveness, including benefits and harms, of interventions to promote resistance and resilience regarding mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among EMS and telecommunicator workforces?

a. Is the effectiveness of the interventions modified by:
   i. Intervention type?
   ii. Characteristics of EMS and telecommunicator personnel (e.g., education/training, proficiency, experience)?
   iii. EMS and telecommunicator agency characteristics (e.g., workflow, regulations, financing)?
   iv. Physical and mental health resources?

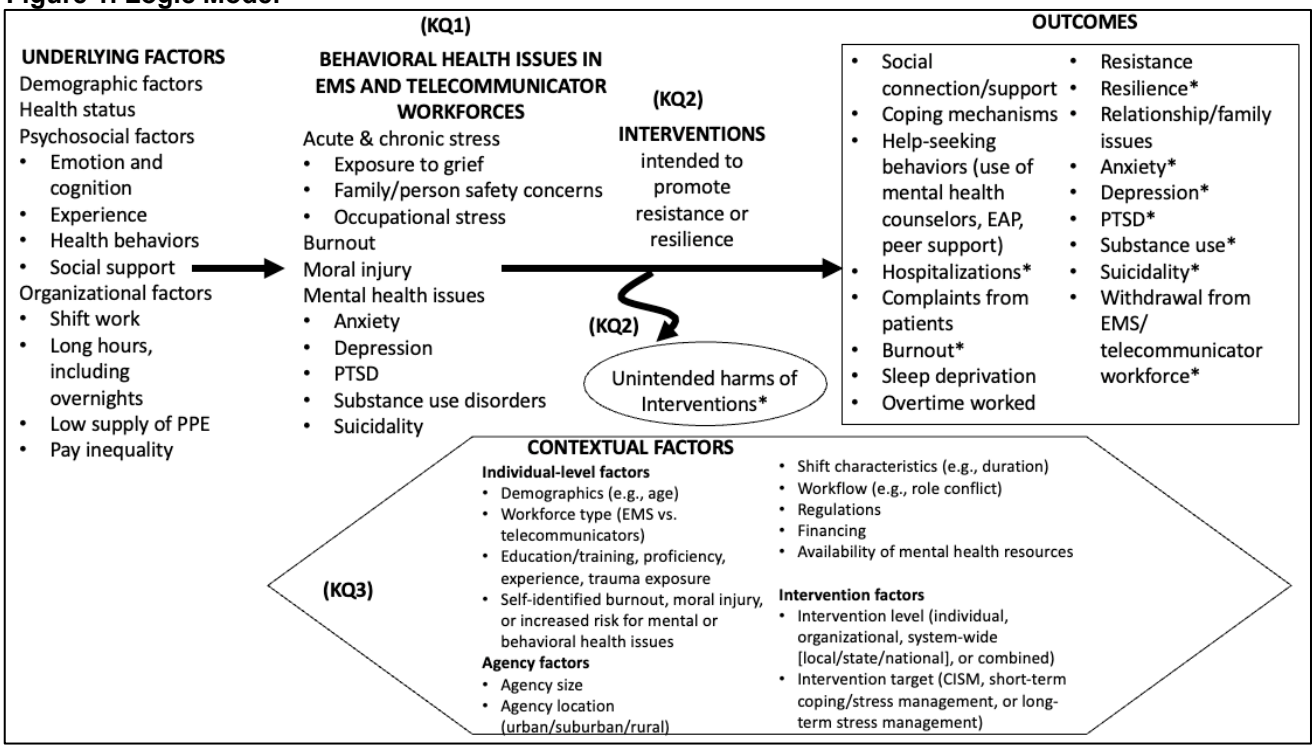
KQ3. What are the contextual and implementation factors of studies with effective EMS and telecommunicator workforce practices to prevent, recognize, and treat mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury)? This description might include distinguishing factors, such as workforce training, surveillance, resilience training, occupational health services, peer-

to-peer support, preparedness for trauma exposure, and program funding.

KQ4. What future research is needed to close existing evidence gaps regarding prevention, recognition, and treatment of mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) in the EMS and telecommunicator workforces?

2.3 Logic Model

Figure 1. Logic Model



Abbreviations: CISM = critical incident stress management; EAP = employee assistance program; EMS = Emergency Medical Services; KQ = Key Question; PPE = personal protective equipment; PTSD = posttraumatic stress disorder.

KQ1 = What are the incidence, prevalence, and severity of mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among EMS and telecommunicator workforces?

KQ2 = What are the effectiveness and comparative effectiveness, including benefits and harms, of interventions to promote resistance and resilience regarding mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among EMS and telecommunicator workforces?

KQ3 = What are the contextual and implementation factors of studies with EMS and telecommunicator workforce practices to prevent, recognize, and treat mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury)?

KQ4 = What future research is needed to close existing evidence gaps regarding prevention, recognition, and treatment of mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) in the EMS and telecommunicator workforces?

*Prioritized outcomes for strength of evidence assessment.

2.4 Study Selection

We searched Medline® (using PubMed), Embase®, the Cochrane Register of Clinical Trials (CENTRAL), PsycINFO®, and the Cumulative Index to the Nursing and Allied Health Literature

(CINAHL®). We restricted the search to English-language studies published in the year 2001 onwards because older studies likely have little relevance to modern EMS and telecommunicator practices. This year threshold corresponds to the September 11, 2001, attacks in the United States. A librarian independently peer reviewed the searches using the Peer Review of Electronic Search Strategies (PRESS) checklist. We also searched the following journals that were not indexed in Medline®: *International Journal of Paramedicine*, *Journal of Paramedic Practice*, *International Paramedic Practice*, *Irish Journal of Paramedicine*, and *Annals of Emergency Dispatch and Response*. We also hand-searched the reference lists of relevant systematic reviews.

To identify studies and data not published in journals, we searched the ClinicalTrials.gov registry for ongoing studies, unpublished study protocols, and unpublished study results. We also searched the Websites of the National Association of State EMS Officials (https://nasemso.org), the National Association of Emergency Medical Technicians (EMTs) (https://naemt.org), the National Association of EMS Educators (https://naemse.org), the EMS Eagles Global Alliance (https://useagles.org), the Administration for Strategic Preparedness and Response Technical Resources, Assistance Center, and Information Exchange (ASPR TRACIE; https://asprtracie.hhs.gov), and the International Academies of Emergency Dispatch (https://emergencydispatch.org/home). In addition, AHRQ posted a Federal Register Notice requesting submission of relevant information using a Supplemental Evidence and Data for Systematic Review (SEADS) portal. Full details on the search strategy are in Appendix A and the excluded studies are listed in Appendix B.

We used DistillerSR® (Evidence Partners, 2010) to manage the screening process. Study selection was based on predefined eligibility criteria of populations, interventions, comparators, outcome measures, and study design (see Table 1). To ensure consistency and clarity in applying eligibility criteria, we conducted two rounds of pilot title-abstract screening by having the entire team review 200 abstracts together.

After the pilot rounds, two screeners independently screened each of the remaining abstracts. Both screeners needed to agree that a record met at least one of the exclusion criteria to be excluded. Conflicts regarding screening eligibility were resolved through consensus. Potentially eligible abstracts underwent full-text screening using the same process in DistillerSR®.

The searches will be updated when this draft report is undergoing peer review. Records identified during the updated search will be screened using the process described above. Any new eligible studies will be incorporated into the report before finalization.

2.4.1 Use of Artificial Intelligence and/or Machine Learning

We used AI Classifier Manager®, the artificial intelligence (AI) feature of DistillerSR®, as a semi-automated screening tool to assist with abstract screening. First, paired reviewers screened the abstracts of 4,263 (17.1%) of the total abstracts. The machine learning uses screening by team members to teach the AI Classifier Manager®. The remaining abstracts were screened by the AI Classifier Manager® using the results of the initial sample of screening.

2. Methods

Table 1. Eligibility Criteria

Element	Key Question 1	Key Question 2	Key Question 3

Population	• EMS workforce: Civilian field responders (either ground or air personnel, based either in the field [e.g., street corners] or non-field [e.g., station, hospital])
	  ○ Paramedics, including firefighter paramedics, flight medics, critical care paramedics
	  ○ EMTs, including AEMTs and firefighter-EMTs, flight EMTs
	  ○ EMRs
	  ○ Field response physicians
	  ○ Field response nurses
	  ○ Field response advance practice providers
	  ○ EMS medical directors
	  ○ Firefighters, rescue workers, emergency workers, or first responders, as long as they do EMS work. For this criterion, we included studies that enrolled ≥80% participants who qualified. For studies in which <80% participants qualified, we only included the study if data were reported separately for the participants who qualified, and we extracted those data specifically.
	• Telecommunicator workforce: Public safety telecommunicators (e.g., 911 call takers, dispatchers)		

Interventions	Not applicable	• Interventions to promote resistance and resilience regarding mental health issues (depression, anxiety, PTSD, suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) in the EMS and telecommunicator workforces
		• Interventions must target promotion of at least one of the following:
		  ○ Resistance
		  ○ Resilience
		• Interventions can be any of the following:
		  ○ Individual-level, organizational, system-wide (i.e., local/state/national), or combined
		  ○ CISM, subacute coping/stress management, or long-term stress management interventions	

Comparators	Not applicable	• Other interventions • Less intensive version of the same intervention • Standard of care (as defined in individual studies) • No intervention	
Outcomes	• Incidence of behavioral health issue or occupational stress • Prevalence of behavioral health issue or occupational stress • Severity of behavioral health issue or occupational stress	• Social connection or support • Coping mechanisms • Help-seeking behaviors: Use of mental health counselors, EAP, or peer support • Hospitalizations • Complaints from patients • Burnout • Sleep deprivation • Overtime or excessive hours worked • Resistance • Resilience • Relationship or family issues • Anxiety • Depression • PTSD • Substance use • Suicidality • Withdrawal from EMS and telecommunicator workforces (e.g., job/job location changes) • Unintended harms of intervention	

Study Designs	• Cross-sectional studies
	• Cohort studies
	• For EMS clinician studies, ≥100 participants
		• RCTs
		• Non-randomized comparative studies
		  ○ Non-randomized controlled trials
			• RCTs
			• Non-randomized comparative studies
			  ○ Non-randomized controlled trials

Element	Key Question 1	Key Question 2	Key Question 3
		○ Observational cohort studies with a comparison group • Pre-post studies	○ Observational cohort studies with a comparison group ○ Pre-post studies Implementation studies without a comparison group
Modifying Factors	• Individual-level factors ○ Demographics (e.g., age, sex, race, ethnicity) ○ Workforce type (EMS clinicians vs. telecommunicators) ○ Education/training, proficiency, experience/career stage, trauma exposure ○ People with self-identified burnout, occupational stress, moral injury, or who may be at increased risk for mental or behavioral health issues • Agency factors ○ Agency size ○ Agency location (urban vs. suburban vs. rural) ○ Shift characteristics (e.g., duration, frequency, timing, predictability) ○ Workflow (e.g., role conflict, role ambiguity, warnings before psychological exposures) ○ Regulations ○ Financing ○ Availability of mental health resources • Intervention factors ○ Intervention level (i.e., individual, organizational, system-wide [local/state/national], or combined) ○ Intervention target (i.e., CISM, subacute coping/stress management, or long-term stress management)		
Timing	• 2001 to present		
Setting	• Prehospital • PSAP or ECC • In-hospital/emergency department • Any high-income country (according to World Bank Criteria)		

Abbreviations: AEMT = advanced emergency medical technician; CISM = critical incident stress management; EAP = Employee Assistance Program; ECC = Emergency Communication Center; EMR = emergency medical responder; EMS = Emergency Medical Services; EMT = emergency medical technician; PSAP = Public Safety Answering Point; PTSD = posttraumatic stress disorder; RCT = randomized controlled trial.

2.5 Data Extraction

We extracted data into the Systematic Review Data Repository Plus (SRDR+) (https://srdrplus.ahrq.gov). Each eligible study was extracted by one researcher. Data extracted included study characteristics, study participants, intervention and comparator names and descriptions, relevant outcomes and their definitions, results, and funding sources. All extracted data were verified by a second researcher. Discrepancies were resolved through discussion.

2.6 Risk of Bias Assessment

We evaluated each study for risk of bias. One researcher completed the assessment, and a second reviewer verified the data. For longitudinal studies addressing KQ1 (incidence/prevalence/severity), we used items from the Joanna Briggs Institute Checklist for Cohort Studies[32] and the Newcastle Ottawa Scale for Cohort Studies.[33] For cross-sectional studies, we used items from the tool proposed by Hoy and colleagues.[34] For RCTs addressing KQ2 and KQ3 (intervention effectiveness and harms), we used items from the Cochrane Risk of Bias Tool.[35] For non-randomized comparative studies of interventions, we used items from the Risk of Bias in Nonrandomized Studies of Interventions (ROBINS-I) Tool.[36] For KQ4 (summary of the gaps identified in the evidence), we did not conduct a risk of bias assessment.

2.7 Data Synthesis and Analysis

We have organized the report by KQ and by outcome. We summarized the evidence narratively and, when feasible and appropriate, quantitatively (i.e., by meta-analysis). We described each included study in tables presenting study design features, study participant characteristics, descriptions of interventions, outcome results, and risk of bias/methodological quality. Summary tables briefly describe the studies and their findings. We conducted pairwise meta-analyses using random-effects models when there were at least three studies from the same country that compared sufficiently similar interventions and reported sufficiently similar outcomes at similar time points.

We anticipated heterogeneity among studies reporting estimates of incidence, prevalence, and severity, and estimates of intervention effectiveness and harms. We detailed these features in evidence tables and summarized them in the text of the report to allow readers to compare estimates as well as how and why they may differ.

As reported data allowed, we primarily evaluated relative risks (RRs) for dichotomous outcomes (e.g., presence of suicidality), net mean differences (NMDs) (i.e., difference in differences or between-intervention comparisons of within-intervention changes) for continuous outcomes with both pre- and post-intervention data (e.g., depression instruments), and differences (between interventions) in continuous outcome data post-intervention (e.g., anxiety instruments). We explored opportunities to evaluate outcomes by effect modifiers both from within-study data and across studies.

2.8 Grading the Strength of the Body of Evidence

For KQ1 and KQ2, we graded the strength of the body of evidence as per the AHRQ Methods Guide on assessing strength of evidence.[37, 38] We evaluated strength of evidence for each of the following outcomes that was deemed important before compiling the evidence: depression, anxiety, PTSD, substance use, suicidality, burnout, stress, and moral injury for KQ1; and hospitalizations, burnout, resilience, anxiety, depression, PTSD, substance use, suicidality, withdrawal from EMS or telecommunicator workforces, and unintended harms of interventions for KQ2.

For each strength of evidence assessment, we considered the number of studies, study designs, study limitations (i.e., risk of bias and overall methodological quality), directness of the evidence to the KQs, consistency of study results, precision of any estimates of effect, likelihood of reporting bias, other limitations, and overall findings across studies. Based on these assessments, we assigned a strength of evidence rating as being either high, moderate, low, or insufficient to estimate an effect.

Outcomes with inconsistent findings across studies that preclude a conclusion, or data from only one study are deemed to have insufficient evidence to allow for a conclusion (with the exception that a particularly large, low risk of bias, well-generalizable single study could provide low strength of evidence). This approach is consistent with the concept that, for imprecise evidence, any estimate of effect is very uncertain, which is the definition of very low-quality evidence per the Grading of Recommendations, Assessment, Development, and Evaluations (GRADE) system.[39]

3. Results

We begin by providing the results of the literature searches and an overall description of the included studies. The remainder of this Results chapter is organized by Key Question (KQ) and outcomes.

3.1 Description of Included Evidence

We identified 24,871 unique citations across the database searches, grey literature, and hand searches. During title and abstract screening, we excluded 23,390 citations; during the full-text screening and KQ applicability screening we excluded 1,197 citations. This systematic review includes 170 eligible studies that were reported in 226 articles. Appendix B includes a list of the studies excluded at the full-text review and KQ applicability stages. Appendix Figure C-1 summarizes the results of the search and screening processes.

The 170 studies included two randomized controlled trials (RCTs), one non-randomized controlled trial, and 167 observational studies. A total of 163 studies addressed KQ1 (incidence/prevalence/severity), eight studies addressed KQ2 (intervention effectiveness and harms), and five studies addressed KQ3 (contextual and implementation factors for effective EMS and telecommunicator workforce practices) (Table 2). KQ4, which is about future research, does not include any studies.

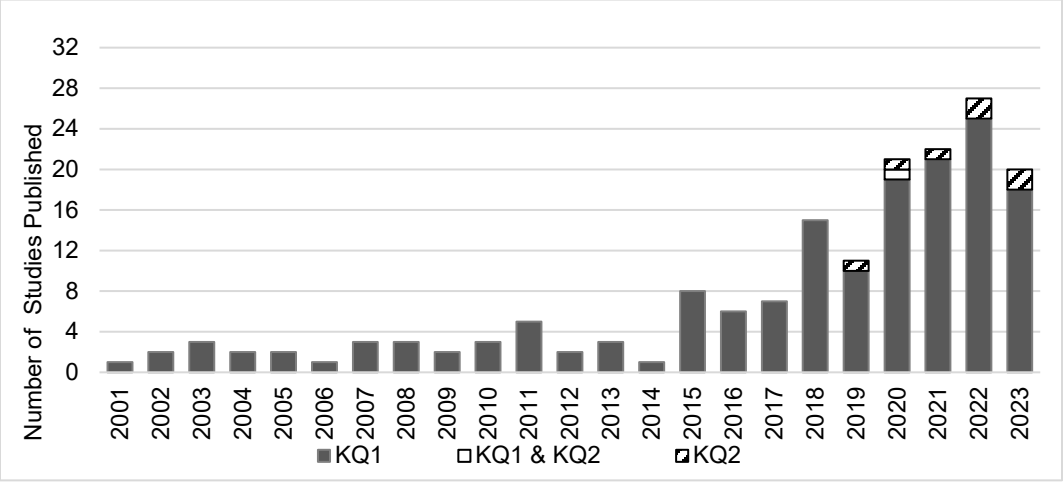
Table 2. Number of studies and articles by Key Question

Key Question	N studies	N articles
Key Question 1	163	219
Key Question 2	8*	8*
Key Question 3	5**	5**
Key Question 4	0	0
Total (unique)	**170**	**226**

* One Key Question 2 study/article also addressed Key Question 1. ** All five Key Question 3 studies/articles also addressed Key Question 2.

More than two-thirds of the studies (116/170; 68%) were published in 2018 or more recently (Figure 2).

Figure 2. Number of studies by year of publication

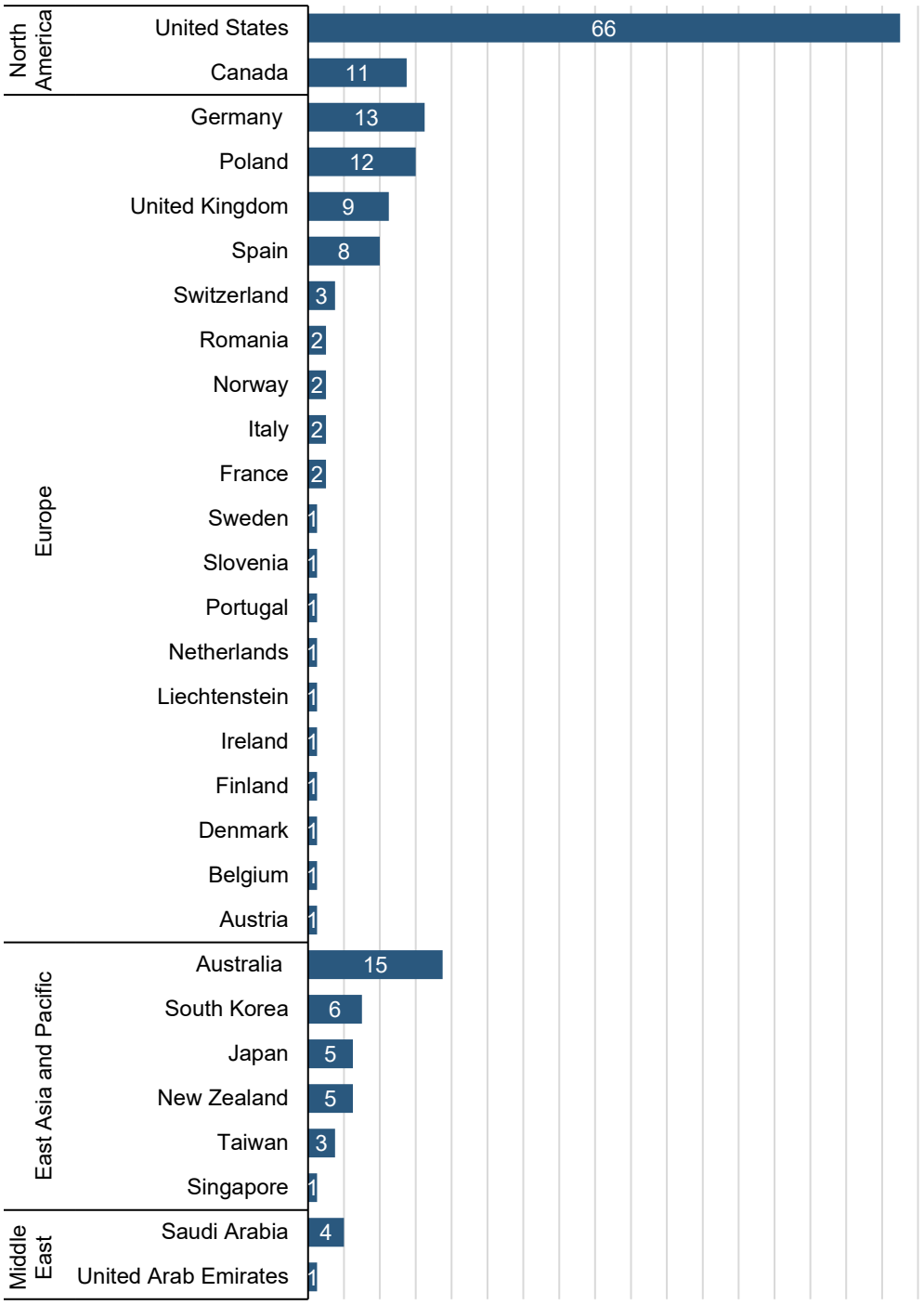


Abbreviations: KQ =Key Question.

3. Results

Seventy-seven (45%) of the 170 studies were conducted in North America (United States or Canada), followed by Europe and Central Asia (63 studies; 37%), East Asia and Pacific (35 studies; 21%), and the Middle East (5 studies; 3%) (Figure 3).

Figure 3. Number of included studies by country*



*Some studies were conducted in more than one country.

Evidence tables describing study designs, and participants characteristics; risk of bias; and details of outcome data are in Appendix D.

3.2 Key Question 1. What are the incidence, prevalence, and severity of mental health issues (depression, anxiety, posttraumatic stress disorder [PTSD], suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among the EMS and the 911 workforce?

Are the incidence, prevalence, and severity modified by:

i. Agency composition including workflow, regulations, financing?

ii. Characteristics of EMS and 911 personnel (e.g., education/training, proficiency, experience, trauma exposure)?

iii. Physical and mental health resources?

3.2.1 Description of Included Studies

A total of 163 studies (reported in 219 articles published between 2001 and 2023) reported on the prevalence or severity of mental health issues and occupational stress issues among telecommunicators and EMS clinicians. No study reported on incidence of any outcome. When discussing a study published across multiple articles, we refer to the primary article. Appendix C provides a complete list of the primary and associated articles for all studies. Most of the studies were published in 2018 or later. Table 3 summarizes the characteristics of included studies.

Across the 163 studies, 22 studies enrolled telecommunicators, 135 studies enrolled EMS clinicians, and six studies enrolled both EMS clinicians and telecommunicators. Sixty-three studies (39%) were conducted in the United States.

Sample sizes ranged from 8[40] to 833 participants[41] in telecommunicator studies, from 72[42] to 25,633 participants[43] in EMS clinician studies, and 167[27] to 940 participants[44] in studies of combined populations. Forty-five studies (13 telecommunicator studies, 31 EMS clinician studies, and 1 combined population study) reported on race; most participants in those studies were White. Forty-five studies reported that their participants had advanced life support (ALS) and/or basic life support (BLS) training. The characteristics of the studies, participants, and agency are listed in Appendix D-Evidence Tables D-1 through D-5. A list of instruments used in the studies along with their ranges and available thresholds for defining severity is included in Appendix C, Table C-3.

Of the six cohort studies, we rated three at overall moderate risk of bias and three at high risk. Moderate and high risks of bias were mostly related to lack of specification of how confounders were addressed, lack of adjustment for confounders (when specified), and incompleteness of followup with inadequate strategies to address incomplete followup.

Among the 157 cross-sectional studies, we rated 15 at overall low risk of bias, 118 at moderate risk, and 24 at high risk. Moderate and high risks of bias were mostly related to the study's target population not being a close representation of the national population, the lack of random sampling or a census being taken to select the study sample, and the non-minimal likelihood of non-response bias (Appendix D-Evidence Tables D-5 and D-6).

3. Results

Table 3. Characteristics of included studies

Characteristics	Category	Telecommunicators studies n (%) (N=22)	EMS Clinician Studies n (%) (N=135)	Telecommunicators and EMS Clinician Studies n (%) (N=6)
Study Design	Cohort study	0	5 (4%)	0
	Cross-sectional study with controls	1(5%)	3 (2%)	2 (33%)
	Cross-sectional study without controls	20 (91%)	127(94%)	4 (67%)
	Pre-post study/Before-after study	1(5%)	0	0
Setting (EMS or combined studies only)	In-hospital	N/A	1 (1%)	0
	Pre-hospital	N/A	92 (68%)	6 (100)
	Pre-hospital and in-hospital	N/A	10 (7%)	0
	Unspecified	N/A	32 (24%)	0
Funding source	Industry	0	7(5%)	0
	Non-industry	2(9%)	43(32%)	2(33%)
	Not funded	1(5%)	28(21%)	2(33%)
	Not reported	19(86%)	57(42%)	2(33%)
Critical mass incident	No	21(95%)	100(74%)	5(83%)
	Yes, aftermath of September 11, 2001	0	3(2%)	0
	Yes, 2016 Taiwan earthquake	0	1(1%)	1(17%)
	Yes, COVID-19 pandemic	1(5%)	31(23%)	0
Agency location	Rural	0	4(3%)	0
	Suburban	0	2(1%)	0
	Urban	3(14%)	22(16%)	0
	Urban and rural	1(5%)	9(7%)	1(17%)
	Urban and suburban	0	3(2%)	0
	Urban, suburban, and rural	1(5%)	12(9%)	3(50%)
	Not reported	17(77%)	83(61%)	2(33%)
Agency mental health resource availability	Yes	0	5(4%)	1(17%)
	Not reported	22(100%)	130(96%)	5(83%)
Agency financing	A mix	0	12(9%)	0
	Career	5(23%)	19(14%)	1(17%)
	Volunteer	0	4(3%)	0
	Not reported	17(77%)	100(74%)	5(83%)
Shift work restriction	No	0	1(1%)	0
	NR	22(100%)	134(99%)	6(100%)
Overtime restriction at the agency	Yes	0	1(1%)	0
	No	0	1(1%)	0
	Not reported	22(100%)	133(99%)	6(100%)
Qualification of the participants	EMT	0	13(10%)	0
	EMT paramedic	1(5%)	38(28%)	4(67%)
	EMT, EMT paramedic	0	23(17%)	0
	EMT, EMT-I, EMT paramedic	0	11(8%)	0
	NR	21(95%)	50 (37%)	2(33%)

Abbreviations: EMS = Emergency Medical Services; EMT = emergency medical technician; EMT-I = emergency medical technician-intermediate

We organized the results for KQ1 by outcome, first describing mental health issues (in the following order: depression, anxiety, PTSD, suicidality, and substance use) and then occupational stress issues (in the following order: burnout, stress, peritraumatic stress, posttraumatic distress, and moral injury). Tables 4 and 5 provide our strength of evidence (SoE) assessments for these outcomes among telecommunicators during routine practice and after critical mass incidents, respectively. Tables 6 and 7 provide our SoE assessments for these outcomes among EMS clinicians during routine practice and after critical mass incidents, respectively. See Appendix D, Evidence Tables D-7 through D-250 for detailed outcome results data.

3. Results

Table 4. Key Question 1: Evidence profile of mental health and occupational stress outcomes among telecommunicators during routine practice

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Depression	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	3 (1,613)	High	Consistent	Precise	Direct	Undetected	Low	Prevalence of any: 15.5%, mild: 26.2%, moderate: 13.3% to 14.9%, and severe: 3.9% to 9.0% (Figure 4)
	Severity	6 (1,567)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild to moderate symptoms (Figure 5)
Anxiety	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	2 (813)	High	Unknown	Precise	Direct	Undetected	Insufficient*	None
	Severity	2 (768)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
PTSD	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	6 (2,012)	High	Consistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (3.5% to 74.6%) and severe (17.6% to 69.6%) (Figure 14).
	Severity	8 (1,510)	High	Consistent	Precise	Direct	Undetected	Insufficient**	None
Suicidality	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (742)	Moderate	Unknown	Precise	Direct	Undetected	Low	Ideation: 12.4%; Plans: 5.7%; Attempts: 0.7%
	Severity	0 (0)	-	-	-	-	-	-	None
Substance use	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (742)	Moderate	Unknown	Precise	Direct	Undetected	Low	Alcohol abuse: 15.5%
	Severity	1 (758)	High	Unknown	Precise	Direct	Undetected	Insufficient	None
Burnout	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (491)	High	Unknown	Precise	Direct	Undetected	Insufficient	None
	Severity	7 (2,295)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild to moderate (Figure 25)
Stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (61)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient	None
	Severity	7 (2,129)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Low to moderate job stress (Figure 29)
Peri-traumatic stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	2 (570)	Moderate	Unknown	Precise	Direct	Undetected	Low	High/extreme peritraumatic distress: 5%; High secondary traumatic stress: 16.3%
	Severity	3 (1,389)	High	Consistent	Precise	Direct	Undetected	Low	Moderate peritraumatic distress; mild secondary traumatic stress
Post-traumatic distress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (205)	Moderate	Unknown	Precise	Direct	Undetected	Low	Acute stress disorder: 17%
	Severity	0 (0)	-	-	-	-	-	-	None
Moral injury	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None

Abbreviations: N/A=not applicable, PTSD=posttraumatic stress disorder. The colors are used only to distinguish successive outcomes.
The colors do not add unique information. *Inconsistent outcome measures. ** Measurement instruments did not allow gradations of severity of PTSD.

3. Results

Table 5. Key Question 1: Evidence profile of mental health and occupational stress outcomes among telecommunicators after critical mass incidents

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Depression	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Anxiety	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	1 (246)	Moderate	Unknown	Unknown	Direct	Undetected	Insufficient*	None
	Severity	0 (0)	-	-	-	-	-	-	None
PTSD	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Suicidality	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Substance use	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Burnout	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	1 (546)	Moderate	Unknown	Precise	Direct	Undetected	Low	Moderate
Stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	2 (636)	Moderate	Unknown	Precise	Direct	Undetected	Low	High general stress: 39.7%; Medium general stress: 28.2%
	Severity	1 (546)	Moderate	Unknown	Precise	Direct	Undetected	Low	Moderate general stress
Peri-traumatic stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Post-traumatic distress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Moral injury	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None

Abbreviations: N/A=not applicable, PTSD=posttraumatic stress disorder.
The colors are used only to distinguish successive outcomes. The colors do not add unique information.
*Single study only with no estimate of prevalence reported.

3. Results

Table 6. Key Question 1: Evidence profile of mental health and occupational stress outcomes among Emergency Medical Services clinicians during routine practice

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Depression	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	19 (36,774)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (0.7% to 26.5%), mild (3.5% to 28.0%), moderate (2.0% to 27.9%), and severe (0% to 24.1%) (Figure 6).
	Severity	15 (12,382)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Minimal to mild symptoms (Figure 7)
Anxiety	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	11 (29,436)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prehospital EMS prevalence of any (2.9% to 26.1%), mild (2.5% to 5.4%), and moderate (2.7% to 27.1%) (Figure 10).
	Severity	10 (4,749)	High	Consistent	Precise	Direct	Undetected	Low	Mild to moderate symptoms among prehospital EMS. (Figure 11)
PTSD	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	27 (12,527)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (1.3% to 44.4%) and severe (9.7% to 30%) (Figure 16).
	Severity	28 (12,250)	Moderate	Inconsistent	Precise	Direct	Undetected	Insufficient**	None
Suicidality	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	9 (10,381)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Ideation: 33% (95% CI 32%, 34%; 4 studies); Plans: 8.7% to 10.9%; Attempts: 2.8% to 5.6%.
	Severity	4 (28,085)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	SBQ-R mean 4.92 (95% CI 2.44, 7.39; 4 studies). SBQ-R ≥ 7 implies at risk of suicide.
Substance use	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	4 (3,941)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
	Severity	3 (1,536)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Low-risk alcohol use among prehospital EMS (Figure 24).
Burnout	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	13 (8,030)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any burnout (13.9% to 87.7%), high depersonalization (13.3% to 99.3%), high emotional exhaustion (9.2% to 92%), and low personal achievement (1% to 36.4%).
	Severity	18 (10,250)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild to severe burnout
Stress	Incidence	0 (0)	-	-	-	-	-	-	None

3. Results

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
	Prevalence	7 (24,787)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (32%), mild (3.1% to 26.3%), moderate (1.9% to 52.7%), severe (0% to 93%), and extremely severe (0% to 4.0%) general stress (Figure 30; 7 studies).
	Severity	15 (9,483)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild to moderate general stress (8 studies; Figure 31) and operational and organizational job stress (7 studies). Moderate psychological distress (3 studies).
Peri-traumatic stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	3 (999)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild secondary traumatic stress
Post-traumatic distress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Moral injury	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	1 (184)	Moderate	Unknown	Precise	Direct	Undetected	Low	Moderate

Abbreviations: CI = confidence interval; EMS = emergency medical service; N/A = not applicable; PTSD = posttraumatic stress disorder; SBQ-R = Suicide Behaviors Questionnaire-Revised.

*Inconsistent outcome measures. **Measurement instruments did not allow gradations of severity of PTSD.

The colors are used only to distinguish successive outcomes. The colors do not add unique information.

3. Results

Table 7. Key Question 1: Evidence profile of mental health and occupational stress outcomes among Emergency Medical Services clinicians after critical mass incidents

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Depression	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	12 (12,793)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (14.1% to 35.1%), mild (29.9%), moderate (18.0 to 31.7%), and severe (2.8%) (Figure 8).
	Severity	11 (9,423)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Minimal to mild symptoms (Figure 9)
Anxiety	Incidence	0 (0)	-	-	-	-	-	-	None (no evidence)
	Prevalence	6 (3,992)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any anxiety (16.1% to 79.7%) among EMS in unspecified settings (Figure 12).
	Severity	5 (3,704)	Moderate	Consistent	Precise	Direct	Undetected	Moderate	Mild to moderate symptoms among prehospital EMS (Figure 13).
PTSD	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	8 (6,552)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any (1.3% to 36%) and severe (8.6%) (Figure 19).
	Severity	3 (529)	Moderate	Inconsistent	Precise	Direct	Undetected	Insufficient**	None
Suicidality	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	2 (204)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of considering suicide/self-harm (9.5% to 24.4%).
	Severity	0 (0)	-	-	-	-	-	-	None
Substance use	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	5 (3,869)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
	Severity	0 (0)	-	-	-	-	-	-	None
Burnout	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	6 (1,580)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of any burnout (18.3% to 38.3%), high depersonalization (32% to 60.7%), high emotional exhaustion (35% to 68%), and low personal achievement (48% to 61.2%).
	Severity	10 (13,019)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
Stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	7 (3,845)	Moderate	Inconsistent	Precise	Direct	Undetected	Low	Considerable variation in prevalence of severe general stress (11.0% to 67.5%; Figure 32) and of high psychological distress (36.0% to 73.1%).
	Severity	3 (1,080)	Moderate	Inconsistent	Precise	Direct	Undetected	Insufficient	None

3. Results

Outcome	Measure	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Peri-traumatic stress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Post-traumatic distress	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None
Moral injury	Incidence	0 (0)	-	-	-	-	-	-	None
	Prevalence	0 (0)	-	-	-	-	-	-	None
	Severity	0 (0)	-	-	-	-	-	-	None

Abbreviations: EMS = emergency medical service; N/A=not applicable, PTSD=posttraumatic stress disorder.
*Inconsistent outcome measures. ** Measurement instruments did not allow gradations of severity of PTSD.
The colors are used only to distinguish successive outcomes. The colors do not add unique information.

3.2.2 Incidence, Prevalence, and Severity of Mental Health Issues (Depression, Anxiety, Posttraumatic Stress Disorder, Suicidality, and Substance Use Disorders)

3.2.2.1 Depression

Sixty studies reported data on the prevalence or severity of depression. These included six studies exclusively among telecommunicators, 53 studies exclusively among EMS clinicians, and one study among both telecommunicators and EMS clinicians. See Appendix D, Evidence Tables D-7 through D-46 for details.

3.2.2.1.1 Key Points for Depression

- Among telecommunicators during routine practice, the overall prevalence of any depression is 15.5 percent. When examined separately, the prevalence of mild depression is 26.2 percent, the prevalence of moderate depression ranges from 13.3 to 14.9 percent, and the prevalence of severe depression ranges from 3.9 to 9.0 percent (Low strength of evidence [SoE]).
- Among telecommunicators during routine practice, the mean levels of depressive symptoms tend to be of mild to moderate severity (moderate SoE).
- Among EMS clinicians during routine practice, there is considerable variation in the prevalence of any (0.7% to 26.5%), mild (3.5% to 28.0%), moderate (2.0% to 27.9%), and severe depression (0% to 24.1%) (low SoE). Similarly, among EMS clinicians after critical mass incidents, there is considerable variation in the prevalence of any (14.1% to 35.1%), mild (29.9%), moderate (18.0% to 31.7%), and severe depression (2.8%) (low SoE).
- Among EMS clinicians, the mean levels of depressive symptoms tend to be of minimal to mild severity during routine practice (moderate SoE) and of mild to moderate severity after critical mass incidents (moderate SoE).
- No eligible studies reported on the incidence of depression among telecommunicators or EMS clinicians.
- Modifying factors: Among telecommunicators, having more trauma exposure may be associated with more depression. Among EMS clinicians, having more trauma exposure, working more hours per week, and higher call volumes may be associated with more depression. Among EMS clinicians, belonging to a racial minority and having downtime may be associated with less depression.

3.2.2.1.2 Depression Among Telecommunicators

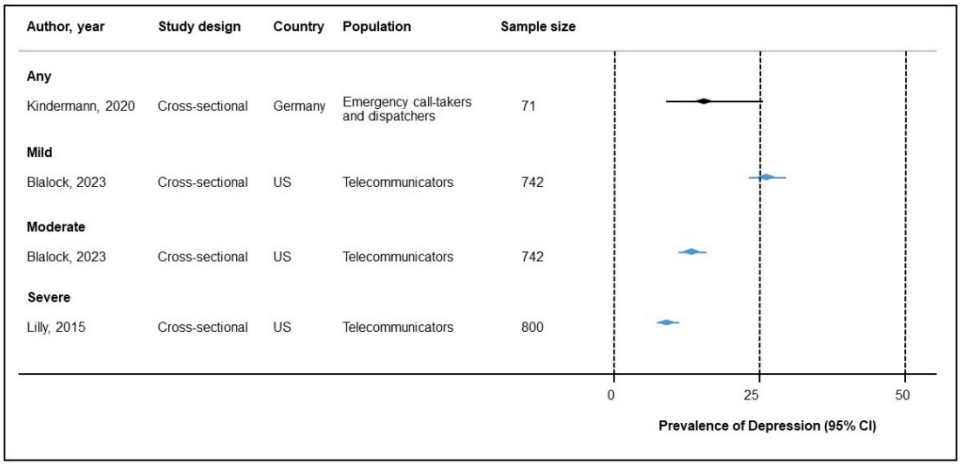
3.2.2.1.2.1 Depression Among Telecommunicators During Routine Practice

Seven cross-sectional studies, published between 2005 and 2023, reported on the prevalence or severity of depression among telecommunicators during routine practice. Six studies were conducted in the United States, and one was conducted in Germany. The studies used a range of tools to evaluate depression: Patient Health Questionnaire (two versions: PHQ-2 and PHQ-9), Beck Depression Inventory (BDI), Minnesota Multiphasic Personality Inventory-2 (MMPI-2),

Symptom Checklist-90-Revised (SCL-90-R), and the Depression subscale of the Calgary Symptoms of Stress Inventory (C-SOSI).

Three studies (2 in the United States and 1 in Germany) reported depression prevalence data (Figure 4). Kindermann 2020 used the PHQ-2 and reported a 15.5 percent prevalence of **any depression** in Germany.[45] Blalock 2023 used the PHQ-9 and reported a 26.2 percent prevalence of **mild depression** in the United States.[46] Two studies in the United States (Blalock 2023[46] and Lilly 2015[47]), which used the PHQ-9 and the BDI, respectively, reported on the prevalence of **moderate depression** (Blalock 2023: 13.3% and Lilly 2015: 14.9%) and **severe depression** (Blalock 2023: 6.3% and 9.0%).

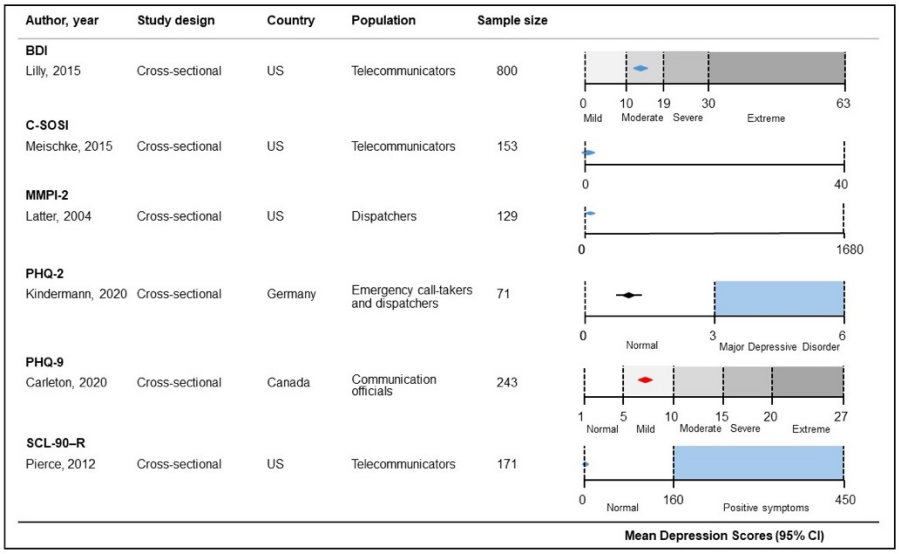
Figure 4. Prevalence of depression among telecommunicators during routine practice



Abbreviations: CI = confidence interval; US = United States.
Color legend: blue = studies in the United States; black = studies in countries other than the United States or Canada. The colors do not convey unique information.

Six studies (4 in the United States and 1 each in Canada and Germany) reported **continuous data on depression symptoms** using six different instruments (Figure 5). Among the five U.S. studies, Lily 2015 used the BDI (0 to 63; higher is worse) and reported a mean of 13.51 (SD 10.64),[47] Carleton 2020 used the PHQ-9 (0 to 27; higher is worse) and reported a mean of 7.19 (SD 5.63),[44] Pierce 2012 used the Depression subscale of the SCL-90-R (0 to 4; higher is worse) and reported a mean of 0.65 (SD 0.68),[48] Latter 2004 used the MMPI-2 (0 to 1,680; higher is worse) and reported a mean of 36.1 (SD 7.69),[49] and Meischke 2015 used the Depression subscale of the C-SOSI (0 to 40; higher is worse) and reported a mean of 0.76 (SD 0.63).[50] Kindermann 2020 used the PHQ-2 (0 to 6; higher is worse) and reported a mean of 1.2 (SD 1.5) in Germany.[45]

Figure 5. Severity of depression among telecommunicators during routine practice



Abbreviations: BDI = Beck Depression Inventory; C-SOSI = Calgary Symptoms of Stress Inventory; CI = confidence interval; MMPI-2 = Minnesota Multiphasic Personality Inventory-2; PHQ-2 = Patient Health Questionnaire-2 item; PHQ-9 = Patient Health Questionnaire-9 item; SCL-90-R = Symptom Checklist-90-Revised; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada; shades of grey refer to severity of depression as indicated below each X-axis; shades of blue refer to likelihood of diagnosis as indicated below the X-axis. The colors do not convey unique information.

3.2.2.1.2.2 Depression Among Telecommunicators After Critical Mass Incidents

No eligible studies were identified.

3.2.2.1.2.3 Modifying Factors for Depression Among Telecommunicators

Age: Two studies evaluated age as a modifying factor and reported that it was not associated with depression. One study in the United States used the MMPI-2 and reported a zero-order correlation of −0.10 ($p \geq 0.05$),[49] and one study in Germany used the PHQ-2 and reported a Pearson correlation coefficient of −0.16 ($p \geq 0.05$).[45]

Sex: Two studies evaluated sex as a modifying factor and reported that it was not associated with depression.[45, 49] One study in the United States used the MMPI-2[49] and one study in Germany used the PHQ-2;[45] both studies reported zero-order correlations of 0 ($p \geq 0.05$).

Race: One study in the United States evaluated race as a modifying factor and reported that it was not associated with MMPI-2 scores (zero-order correlation 0.03, $p \geq 0.05$).[49]

Education: Two studies evaluated education as a modifying factor and reported that it was not associated with depression. One study in the United States used the MMPI-2 and reported a zero-order correlation of −0.10 ($p \geq 0.05$),[49] and a study in Germany used the PHQ-2 and reported a Pearson correlation coefficient of 0.09 ($p \geq 0.05$).[45]

Experience: Three studies (2 in the United States and 1 in Germany) evaluated years of work experience as a modifying factor and reported that it was not associated with depression. The correlation coefficients were −0.01 in a study in the United States,[47] 0.02 in the other study in the United States,[49] and −0.12 in the study in Germany ($p \geq 0.05$ for each).[45]

Trauma Exposure: One study evaluated trauma exposure as a modifying factor and reported that higher BDI scores were associated with trauma history (Pearson correlation coefficient 0.17, p=0.001) and childhood trauma exposure (t-test statistic: −4.80, p < 0.001).[47]

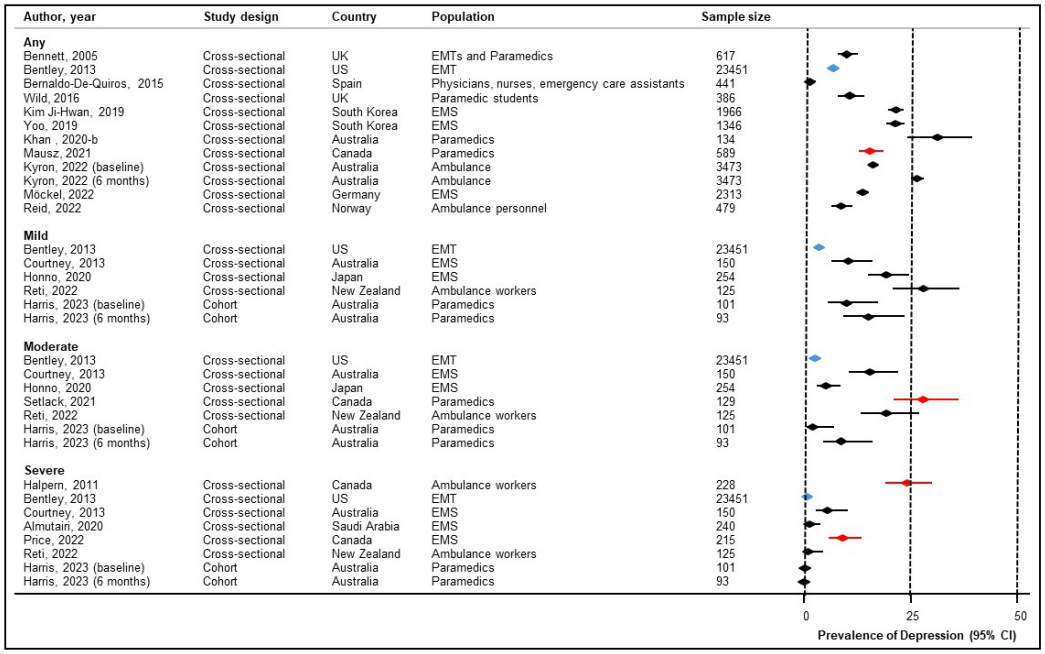
3.2.2.1.3 Depression Among EMS Clinicians

Fifty-three studies, published between 2005 and 2023, reported on the prevalence or severity of depression among EMS clinicians. Fifty studies were cross-sectional, and three were cohort studies. Thirty-eight studies were conducted in the pre-hospital setting, two in both the pre-hospital and in-hospital setting, and the setting was not reported in 13 studies. Thirty-four of the 53 studies were conducted during routine practice and 19 were conducted after critical mass incidents (aftermath of the September 11, 2001, attacks, or the COVID-19 pandemic). Studies used a variety of instruments (for measuring symptoms) and thresholds (for defining presence/severity of depression) (Appendix C, Table C-3).

3.2.2.1.3.1 Depression Among EMS Clinicians During Routine Practice

Nineteen studies reported on the prevalence of depression among EMS clinicians during routine practice (Figure 6). Eleven studies reported estimates on the prevalence of **any depression**, which ranged from 0.7 percent in Spain[51] to 26.5 percent in Australia.[52] Five studies reported on the prevalence of **mild depression**, which ranged from 3.5 percent in the United States[20] to 28.0 percent in New Zealand [53] Six studies reported on the prevalence of **moderate depression**, which ranged from 2.0 percent in Australia[54] to 27.9 percent in Canada.[55] Seven studies reported on the prevalence of **severe depression**, which ranged from 0 percent in Australia[54] to 24.1 percent in Canada.[56]

Figure 6. Prevalence of depression among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT = emergency medical technician; UK = United Kingdom; US = United States
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada. The colors do not convey unique information.

3. Results

Fifteen studies reported **continuous data on depression symptoms** using five different instruments: PHQ-9 (8 studies), Center for Epidemiological Studies-Depression (CES-D) and its variations (4 studies including CES-D [2 studies], CESD-10 [1 study], and CESD-R [1 study]), Hospital Anxiety and Depression Scale (HADS; 2 studies), Depression subscale of the Depression Anxiety Stress Scale-21 (DASS-21; 2 studies), and the General Health Questionnaire-12 (GHQ-12; 1 study) (Figure 7).

Eight studies[44, 53, 54, 57-61] used the PHQ-9 (0 to 27; higher is worse) and reported mean scores that ranged from 2.14 (SD 2.46) in Australia[54] to 9.83 (SD 9.75) in Germany.[57]

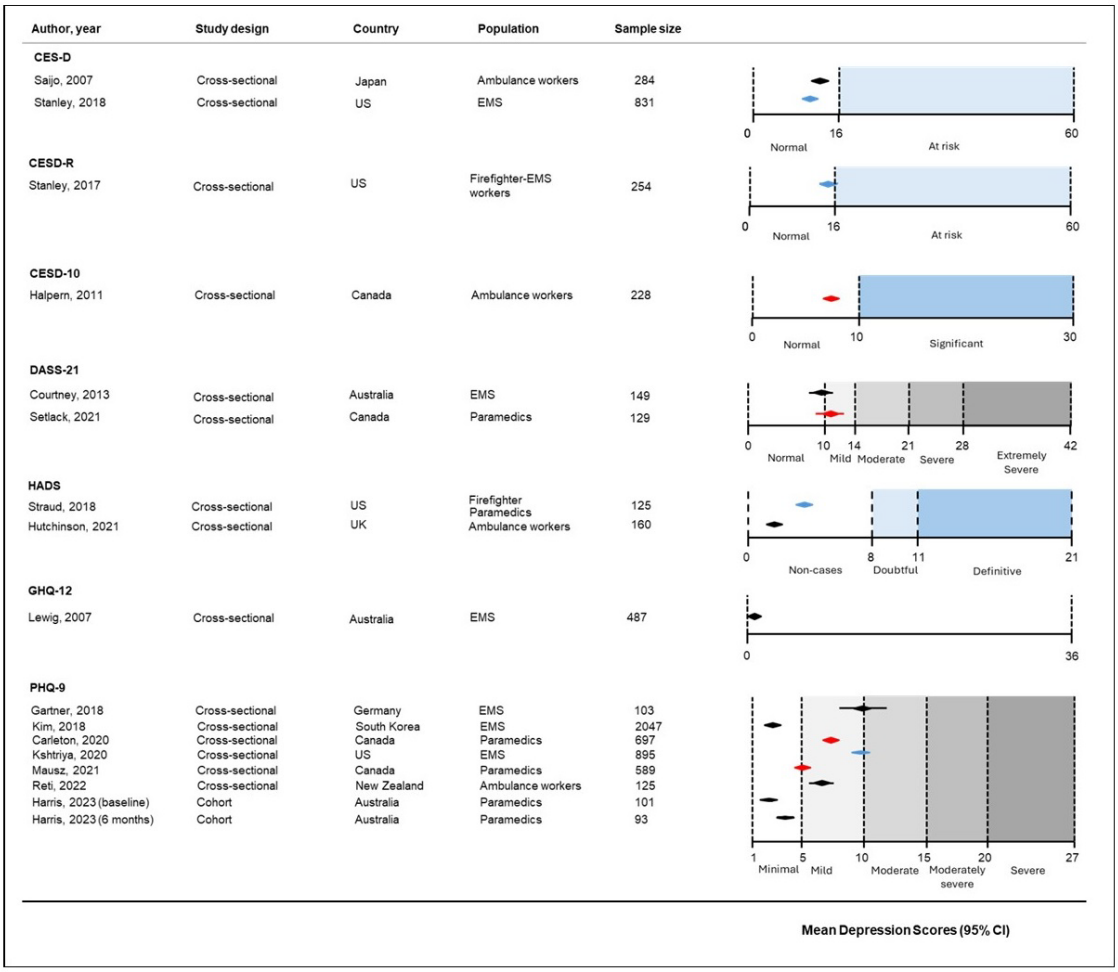
Four studies used the CES-D or its variations.[56, 62-64] The two studies that used the CES-D (0 to 60; higher is worse) reported a mean of 10.6 (SD 7.8) in the United States [62] and 12.3 (SD 8) in Japan.[63] One study used the CESD-10 (0 to 30; higher is worse) and reported a mean score of 7.4 (SD 4.5) in Canada.[56] One study used the CESD-R (0 to 60; higher is worse) and reported a mean score of 14.77 (SD 14.23) in the United States.[64]

Two studies used the HADS (0 to 21; higher is worse); the means were 3.65 (SD 2.62) in the United States[65] and 1.74 (SD 0.57) in the United Kingdom.[66]

Two studies used the DASS-21 (0 to 42; higher is worse); the means were 10.74 (SD 10.76) in Canada[55] and 9.53 (SD 9.28) in Australia.[67]

One cross-sectional study in Australia used the GHQ-12 (0 to 36; higher is worse) and reported a mean of 0.62 (SD 0.55).[68]

Figure 7. Severity of depression among Emergency Medical Services clinicians during routine practice



Abbreviations: CES-D = Center for Epidemiologic Studies-Depression; CES-D-R = Center for Epidemiologic Studies-Depression-Revised; CI = confidence interval; DASS-21 = Depression Anxiety Stress Scale-21; EMS = Emergency Medical Services; GHQ-12 = General Health Questionnaire-12; HADS = Hospital Anxiety and Depression Scale; PHQ-9 = Patient Health Questionnaire-9 item; SCL-90-R = Symptom Checklist-90-Revised; UK = United Kingdom; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada; shades of grey refer to severity of depression as indicated below each X-axis; shades of blue refer to likelihood of diagnosis as indicated below the X-axis. The colors do not convey unique information.

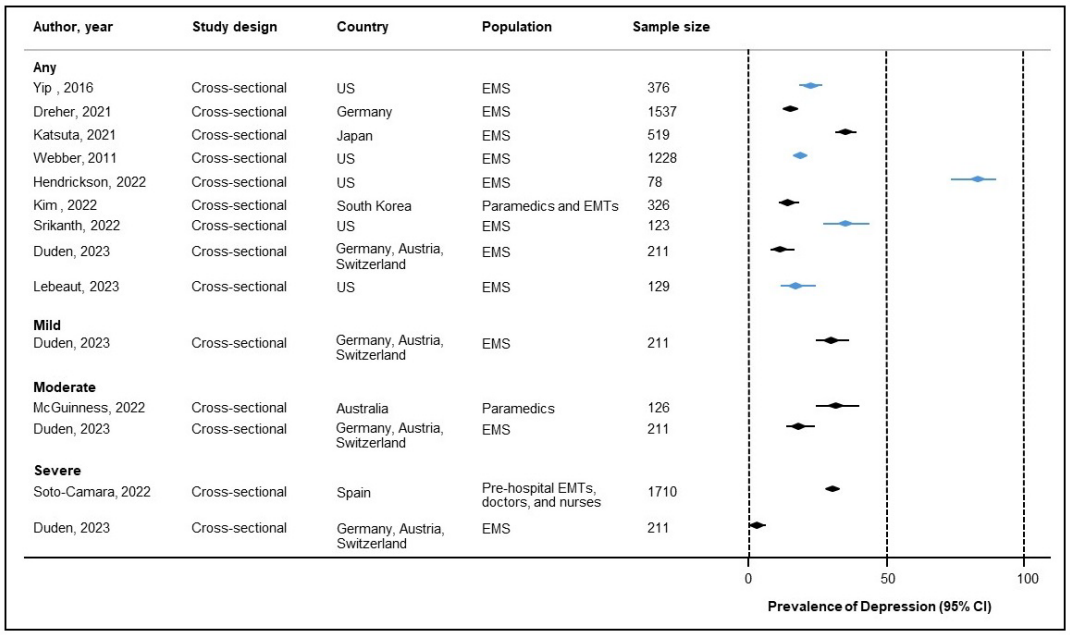
3.2.2.1.3.2 Depression Among EMS Clinicians After Critical Mass Incidents

Nineteen studies reported on the prevalence of depression among EMS clinicians after critical mass incidents (17 studies during the COVID-19 pandemic and 2 studies in the aftermath of the attacks on September 11, 2001).

Twelve studies (5 in the United States, 1 in Canada, 1 in Germany, 1 in Spain, 1 in Japan, 1 in South Korea, 1 in Australia, and 1 in Germany, Austria, and Switzerland) reported on the prevalence of depression among EMS clinicians after critical mass incidents (Figure 8). The prevalence of **any depression** ranged from 14.1 percent in South Korea[69] to 35.1 percent in Japan.[70] Duden 2023 reported a 29.9 percent prevalence of **mild depression** in Germany, Austria, and Switzerland.[71] The prevalence of **moderate depression** was 18.0 percent in

Germany, Austria, and Switzerland,[71] 30.5 percent in Spain,[72] and 31.7 percent in Australia.[73] The prevalence of **severe depression** was 2.8 percent in Germany, Austria, and Switzerland.[71] One study in Canada (Wagner 2023) reported only a p-value comparing EMS and telecommunicators and is therefore not depicted in Figure 8.

Figure 8. Prevalence of depression among Emergency Medical Services clinicians after critical mass incidents



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT = emergency medical technician; US = United States.
Color legend: blue = studies in the United States; black = studies in countries other than the United States or Canada. The colors do not convey unique information.

Eleven studies (3 in the United States, 3 in Germany, and 1 each in Australia, Japan, Poland, Spain, and Taiwan) reported **continuous data for depression** using six different instruments: DASS-21 (4 studies), PHQ variants (two versions: PHQ-2 [2 studies] and PHQ-9 [2 studies]), CES-D (1 study), HADS (1 study), and the Kroenke 2-item instrument (1 study) (Figure 9).

In the four studies that used the DASS-21 (0 to 42; higher is worse), the means ranged from 6.8 (SD 8.4) in Germany[74] to 15.74 (SD 11.11) in Spain.[72]

In the two studies that used the PHQ-2 (0 to 6; higher is worse), the means were 0.7 (SD NR) in Germany[75] and 2.13 (SD 1.86) in the United States.[76]

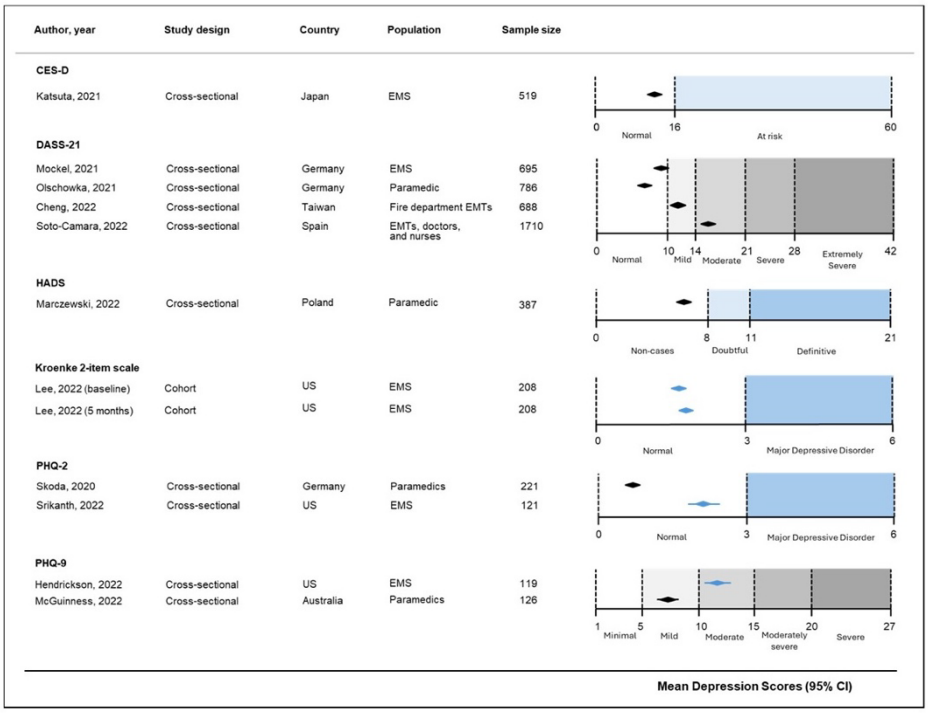
In the two studies that used the PHQ-9 (0 to 27; higher is worse), the means were 7.3 (SD 5.5) in Australia[73] and 11.7 (SD 6.7) in the United States.[77]

Katsuta 2021 used the CES-D (0 to 60; higher is worse) and reported a mean of 12 (range 7 to 19) in Japan.[70]

Marczewski 2022 used the HADS (0 to 21; higher is worse) and reported a mean of 6.35 (SD 3.48) in Poland.[70]

Lee 2022 (a cohort study) used the Kroenke 2-item instrument (0 to 6; higher is worse) and reported means of 1.66 (SD 0.77) at baseline and 1.81 (SD 0.97) at 5 months in the United States.[78]

Figure 9. Severity of depression among Emergency Medical Services clinicians after critical mass incidents



Abbreviations: CES-D = Center for Epidemiologic Studies-Depression; CI = confidence interval; DASS-21 = Depression Anxiety Stress Scale-21; EMS = Emergency Medical Services; HADS = Hospital Anxiety and Depression Scale; PHQ-2 = Patient Health Questionnaire-2 item; PHQ-9 = Patient Health Questionnaire-9 item; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada; shades of grey refer to severity of depression as indicated below each X-axis; shades of blue refer to likelihood of diagnosis as indicated below the X-axis. The colors do not convey unique information.

3.2.2.1.3.3 Modifying Factors for Depression Among EMS Clinicians

Age: Five studies evaluated age as a modifying factor and reported inconsistent results.[79-83] Three studies reported that higher ages were associated with more depression. One study in Taiwan reported that, compared with EMS clinicians 20 to 30 years old, those aged 31 to 40 and more than 40 years old were more likely to have DASS-21 scores of 14 or higher: odds ratio (OR) 1.56 (95% confidence interval [CI] 0.88 to 2.77) and OR 1.96 (95% CI 0.9 to 4.27), respectively.[81] Similarly, although no subgroup effect sizes were reported, two studies in South Korea reported that older participants had higher prevalence of depression (based on CES-D ≥9).[79, 80] On the other hand, a study in Poland reported a negative correlation between age and depression (Pearson correlation coefficient −0.14, p-value not reported).[83] However, a different study in Poland reported that age was not associated with depression.[82]

Sex: Ten studies evaluated sex as a modifying factor and reported inconsistent results.[20, 59, 61, 72, 79-81, 84-86] Five studies[20, 59, 81, 84, 85] (2 in Norway and 1 each in the United States, the United Kingdom, and Taiwan) reported higher prevalence of depression or depressive symptoms among male participants, but only two of these studies reported between-subgroup effect sizes: one study in the United States reported that those of female sex were less likely than those of male sex to have DASS-21 scores or 9 or higher (adjusted OR 0.84, 95% CI 0.74 to 0.95)[20] and one study in Taiwan reported that those of female sex were less likely than those of male sex to have DASS-21 scores or 14 or higher (OR 0.64, 95% CI 0.29 to 1.42).[81] On the other hand, five

studies (2 in South Korea and 1 each in Germany, Canada, and Spain) reported a higher prevalence of depression or depressive symptoms among female participants than male participants but did not report between-subgroup effect sizes[61, 72, 79, 80, 86]

Sexual Minority Status: One study in the United States evaluated sexual minority status as a modifying factor and reported that it was not associated with PHQ-9 scores (mean difference comparing those belonging vs. not belonging to a sexual minority 1.06, 95% CI −1.45 to 3.58).[87]

Race: One study in the United States evaluated race as a modifying factor and reported that EMS clinicians belonging to racial minorities were less likely than those belonging to non-minority groups to have a DASS-21 score of 9 or higher (adjusted OR 0.82, 95% CI 0.69 to 0.97).[20]

Work Experience: Six studies evaluated work experience as a modifying factor and reported inconsistent results.[20, 76, 79-81, 83] Four studies reported that more experience was associated with more depression. One study in the United States reported that, compared with those with less than 2 years of work experience, those with 16 or more years of experience were more likely to have DASS-21 scores of 9 or more (OR 1.28, 95% CI 1.01 to 1.62).[20] Similarly, one study in Taiwan reported that, compared with EMS clinicians with less than 5 years of experience, those with 10 to 15 and more than 15 years of experience were more likely to have DASS-21 scores of 14 or higher: OR 3.01 (95% CI 1.53 to 5.93) and OR 1.76 (95% CI 0.81 to 3.84), respectively.[81] Two studies in South Korea also reported higher mean depression scores with more years of experience.[79, 80] On the other hand, a study in Poland reported a negative correlation between years of experience and depression (Pearson correlation coefficient −0.17, p-value not reported).[83] However, one study in the United States reported a comparable likelihood of having depression between those with less than 3 years versus 3 or more years of work experience (OR 1.05, 95% CI 0.85 to 1.3).[76]

Education: Four studies evaluated education as a modifying factor and reported inconsistent results.[20, 61, 81, 88] Two studies in the United States reported that more education was associated with more depression: one study simply reported a p-value of 0.006 for this association,[88] but the other study reported that, compared with those with less than a college education, those with a college degree or higher were more likely to have a DASS-21 score of 9 or more (adjusted OR 1.15, 95% CI 1.02 to 1.28).[20] On the other hand, two studies (1 in Canada[61] and 1 in Taiwan[81]) reported that those with versus without a college education had comparable depressive symptoms.

Role: Four studies examined job role as a modifying factor and reported that role was not associated with depression.[20, 59, 72, 85] One study in the United States reported the prevalence as 9.3 percent among paramedics and 4.4 percent among EMT-Basics.[20] A study in the United Kingdom reported the prevalence as 7.9 percent among paramedics and 9.8 percent among EMTs.[85] One study in Norway reported the prevalence as 10.9 percent, 5 percent, and 5.4 percent among EMTs, nurses, and paramedics, respectively.[59] A study in Spain reported mean DASS-21 scores as 14.6 (SD 11.4), 14.4 (SD 11.1), 17.3 (SD 11), and 11.1 (SD 7.6) among physicians, nurses, EMTs, and other personnel, respectively.[72]

Income: One study in the United States evaluated income as a modifying factor and reported that it was not associated with depression. EMS clinicians earning less than $50,000 annually and those earning $50,000 or more annually had comparable likelihood of having PHQ-2 scores of 3 or higher (OR 1.06, 95% CI 0.87 to 1.29).[76]

Peer Support: Two studies evaluated peer support as a modifying factor and reported that it was not associated with depression.[76, 89] One study in the United States reported that the

prevalence of depression was similar when comparing those who had versus had not perceived access to managerial support (OR 1.0, 95% CI 0.86 to 1.16) and coworker support (OR 0.9, 95% CI 0.8 to 1.0).[76] One study in Canada reported comparable prevalence of depression between those used versus did not use structured peer support resources (11.0% vs. 10.9%, p-value not reported).[89]

Trauma Exposure: Six studies evaluated trauma exposure as a modifying factor and reported that it was generally associated with depression.[51, 55, 56, 74, 79, 81] One study in Canada reported significant correlations between depression and workplace violence (zero-order correlation 0.23, $p < 0.001$) and between depression and threat to life (zero-order correlation 0.24, $p < 0.001$).[55] One study in South Korea reported that, compared with those who did not experience verbal or physical abuse, those who did experience these traumas had a higher likelihood of a CES-D score of 9 or more: prevalence ratio for verbal abuse 1.66 (95% CI 1.36 to 2.02) and for physical abuse 1.73 (95% CI 1.45 to 2.06).[79] Similarly, a study in Taiwan reported that those who experienced violence at work had a higher likelihood of depression than those who had not (OR 1.42, 95% CI 0.87 to 2.33).[81] The three other studies (1 each in Spain, Canada, and Germany) did not report between-subgroup effect sizes but reported higher prevalence of depression or higher severity of depressive symptoms among those who experienced trauma (e.g., aggression at work, child abuse, aggressive behavior) than those who did not experience trauma.[51, 56, 74]

Shift Characteristics: One study in Taiwan evaluated number of hours worked per week as a modifying factor and reported that more hours was associated with depression.[81] Compared with EMS personnel working fewer than 72 hours per week, those working 72 to 96 hours and those working more than 96 hours were more likely to have DASS-21 scores of 14 or higher: OR 1.76 (95% CI 1.00 to 3.07) and OR 1.66 (95% CI 0.9 to 3.06), respectively.

Type of shift: Two studies evaluated type of shift as a modifying factor and reported that it was not associated with depression.[76, 80] One study in the United States reported that night and day shift workers had comparable likelihood of depression (OR 0.93, 95% CI 0.75 to 1.14). One study in South Korea reported a comparable prevalence of depression among night and day shift workers (29.0% vs. 21.1%, p=0.29).[80]

Call Volumes: One study in the United States evaluated call volumes as a modifying factor and reported that higher call volumes were associated with depression.[20] The prevalence of depression (DASS-21 ≥9) among EMS clinicians with low, moderate, and high call volumes were 5.47 percent, 8.11 percent, and 7.88 percent, respectively.

Downtime: One study in Canada evaluated having downtime as a modifying factor and reported that EMS clinicians who had downtime had a lower mean CESD-10 score than those who did not have downtime (6.9 vs. 8.9, p-value not reported).[90]

3.2.2.2 Anxiety

Overall, 39 studies reported on the prevalence or severity of anxiety. These studies included 35 conducted exclusively among EMS clinicians, two exclusively among telecommunicators, and two among both EMS clinicians and telecommunicators. See Appendix D, Evidence Tables D-47 through D-81 for details.

3.2.2.2.1 Key Points for Anxiety

- The evidence is insufficient regarding the prevalence and severity of anxiety among telecommunicators.

- Among prehospital EMS clinicians during routine practice, there is considerable variation in the prevalence of any (2.9% to 26.1%), mild (2.5% to 5.4%), and moderate (2.7% to 27.1%) anxiety (low SoE).
- Among EMS clinicians in unspecified settings after critical mass incidents, the prevalence of any anxiety varies considerably (16.1% to 79.7%) (low SoE).
- Among prehospital EMS clinicians, the mean levels of anxiety symptoms tend to be of mild to moderate severity during routine practice (low SoE) and after critical mass incidents (moderate SoE).
- No eligible studies reported on the incidence of anxiety among telecommunicators or EMS clinicians.
- Modifying factors: Among EMS clinicians, being a certified paramedic and having more trauma exposure may each be associated with higher anxiety, and access to and use of peer support may be associated with lower anxiety.

3.2.2.2.2 Anxiety Among Telecommunicators

3.2.2.2.2.1 Anxiety Among Telecommunicators During Routine Practice

Two cross-sectional studies reported anxiety prevalence data among telecommunicators during routine practice. Blalock 2023 used the Generalized Anxiety Disorder-7 (GAD-7) and reported that 26.6 percent, 14.8 percent, and 15.2 percent of telecommunicators in the United States had **mild anxiety**, **moderate anxiety**, and **severe anxiety**, respectively (GAD-7 thresholds not specified).[46] Kindermann 2020 used the GAD-2 and reported that, among telecommunicators in Germany, the prevalence of **any anxiety** was 7 percent.[45]

Two cross-sectional studies reported **continuous data on anxiety**: Carleton 2020 reported that the mean GAD-7 score (0 to 21; higher is worse) was 5.32 (SD 4.81) among telecommunicators in Canada,[44] and Kindermann 2020 reported that the mean GAD-2 score (0 to 6; higher is worse) was 0.75 (SD 1.27) among telecommunicators in Germany.[45] Carleton 2020 also reported that the mean **panic disorder severity** (using the Panic Disorder Severity Scale; 0 to 28; higher is worse) was 2.8 (SD 4.4).[44]

3.2.2.2.2.2 Anxiety Among Telecommunicators After Critical Mass Incidents

Wagner 2023 reported that telecommunicators and EMS clinicians in the context of the COVID-19 pandemic in Canada had comparable prevalence of **any anxiety** ($p \geq 0.05$, prevalence not reported).[91]

3.2.2.2.2.3 Modifying Factors for Anxiety Among Telecommunicators

Age: One study in Germany evaluated age as a modifying factor and reported that anxiety levels among telecommunicators were not statistically significantly correlated with age (Pearson's correlation coefficient −0.07), sex (0.18), education level (−0.06), or work experience (−0.07) ($p \geq 0.05$ for each).[45]

3.2.2.2.3 Anxiety Among EMS Clinicians

Overall, 37 studies, published between 2005 and 2023, reported on the prevalence or severity of **anxiety** among EMS clinicians. Most studies were cross-sectional, except for one prospective cohort study conducted in Australia (Harris 2023).[54]

Among the 37 studies, 27 were conducted among pre-hospital EMS clinicians, and one among both pre-hospital and in-hospital EMS clinicians. Nine studies did not report on whether the EMS clinicians were in pre-hospital or in-hospital settings. Fourteen (38%) of the 37 studies were conducted after a critical mass incident (the aftermath of COVID-19); the rest were conducted during routine practice.

Studies used a variety of instruments for measuring symptoms and a variety of thresholds for defining presence/severity of anxiety. Populations within studies also varied, such as ambulance personnel, EMTs, paramedics, and integrated firefighters and paramedics.

3.2.2.3.1 Anxiety Among Pre-Hospital EMS Clinicians

3.2.2.3.1.1 Anxiety Among Pre-Hospital EMS Clinicians During Routine Practice

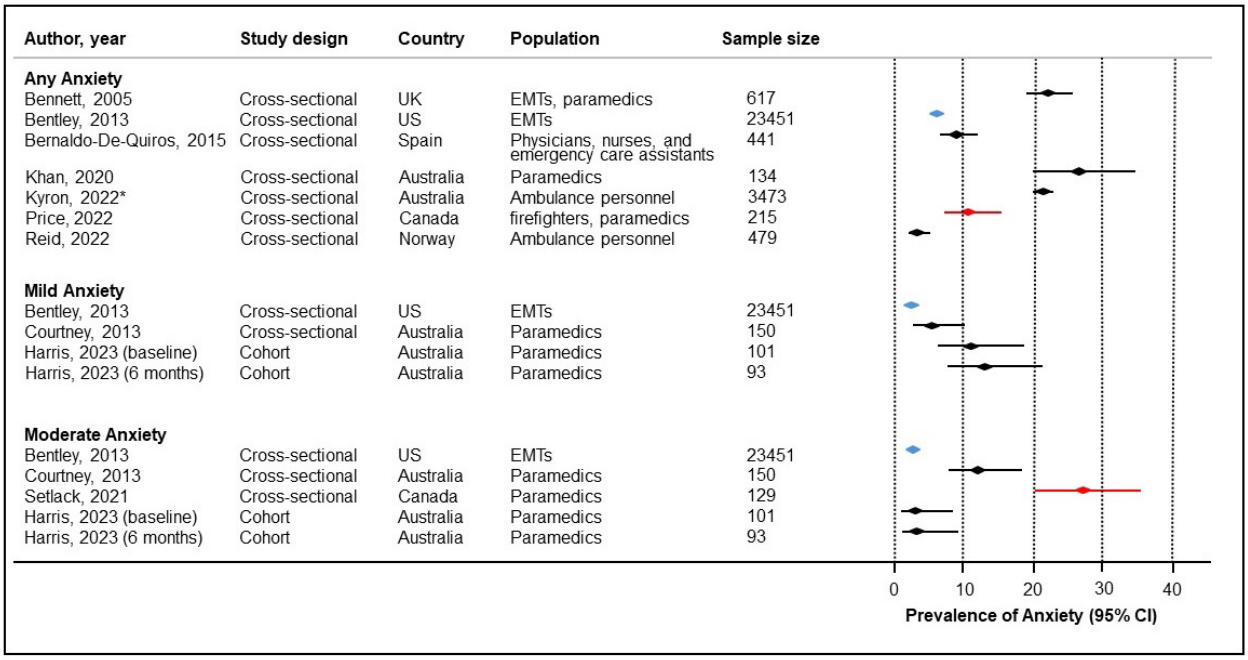
Seven studies (2 in Australia and 1 each in the United States, Canada, the United Kingdom, Norway, and Spain), published between 2005 and 2023, reported estimates of the prevalence of **any anxiety**, which ranged from 2.9 percent in Norway[59] to 26.1 percent in Australia[92] (Figure 10). An eighth study (Wagner 2023) reported that EMS clinicians and telecommunicators in Canada had comparable prevalence of anxiety ($p \geq 0.05$, effect size not reported).[91]

Three studies reported on the prevalence of **mild anxiety**. The prevalence ranged from 2.5 percent in the United States[20] to 5.4 percent in Australia[67] in the cross-sectional studies (Figure 10). The prevalence was higher in the Australian cohort study: increasing from 10.9 percent at baseline to 12.9 percent at 6 months.[54]

Four studies reported on the prevalence of **moderate anxiety**. The prevalence ranged from 2.7 percent in the United States[20] to 27.1 percent in Canada [55] in the cross-sectional studies. In the cohort study in Australia, the prevalence of moderate anxiety was 3.0 percent at baseline and 3.2 percent at 6 months (Figure 10).[54]

3. Results

Figure 10. Prevalence of anxiety among pre-hospital Emergency Medical Services clinicians during routine practice

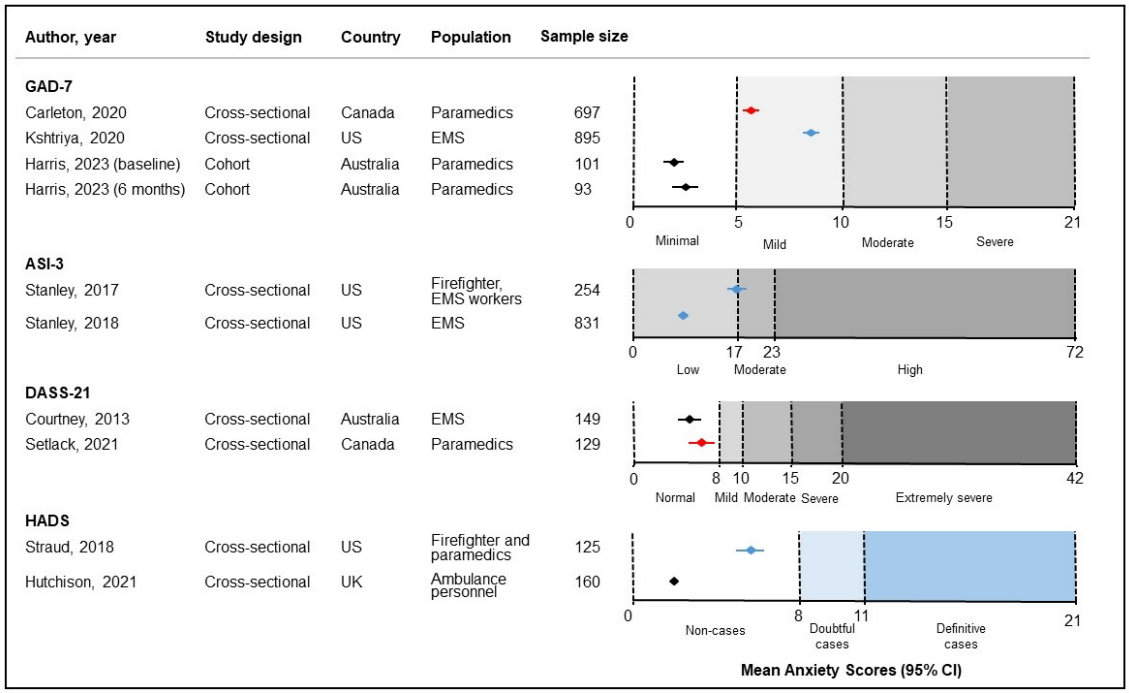


Abbreviations: CI = confidence interval; EMT = emergency medical technician; UK = United Kingdom; US = United States.
Color legend: blue = studies in the U.S.; red = studies in Canada; black = studies in other countries. The colors do not convey unique information.
*Kyron 2022 data are for prevalence of anxiety diagnosis.

Nine studies reported **continuous data for anxiety** using four scales: GAD-7 (3 studies), Anxiety Sensitivity Index-3 (ASI-3; 2 studies), Anxiety Subscale of the Depression Anxiety Stress Scale (DASS-21; 2 studies), and Anxiety Subscale of the Hospital Anxiety and Depression Scale (HADS; 2 studies) (Figure 11).

3. Results

Figure 11. Severity of anxiety among pre-hospital Emergency Medical Services clinicians during routine practice



Abbreviations: ASI-3 = Anxiety Sensitivity Index-3; CI = confidence interval; DASS-21 = Depression, Anxiety, and Stress Scale-21; EMS = Emergency Medical Services; GAD-7 = Generalized Anxiety Disorder-7; HADS = Hospital Anxiety and Depression Scale; UK = United Kingdom; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in other countries; shades of grey refer to severity of anxiety as indicated below each X-axis; shades of blue refer to likelihood of diagnosis as indicated below the X-axis. The colors do not convey unique information.

Among the four studies that used the GAD-7 (0 to 21; higher is worse), three were cross-sectional: Kshtriya 2020 reported a mean of 8.55 (SD 6.35) in the United States;[58] Carleton 2020 reported a mean of 5.71 (SD 4.99) in Canada;[44] and Reid 2022 reported a median of 2 (interquartile range [IQR] 1 to 4) in Norway.[59] The fourth study, the cohort study (Harris 2023), reported that the mean GAD-7 scores were comparable between baseline and 6-month followup (mean difference 0.12, 95% CI −0.3 to 2.01) in Australia.[54]

Mean ASI-3 scores (0 to 17; higher is worse) were 8.10 (SD 10.5) in one U.S. study (Stanley 2018)[62] and 16.90 (SD 13.4) in another U.S. study (Stanley 2017).[64]

Mean DASS-21 scores (0 to 42; higher is worse) were 6.51 (SD 7.3) in a Canadian study (Setlack 2021)[55] and 5.28 (SD 6.97) in an Australian study (Courtney 2013).[67]

Mean HADS scores (0 to 21; higher is worse) were 5.70 (SD 3.63) in a U.S. study (Straud 2018)[65] and 2.10 (SD 0.69) in a U.K. study (Hutchison 2021).[66]

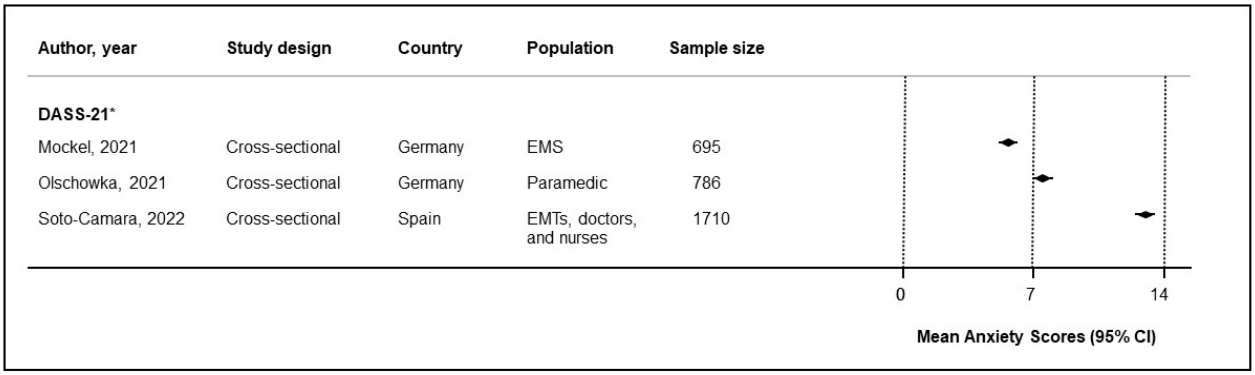
One cross-sectional study (Carleton 2020) reported that the mean **panic disorder severity** score (using the Panic Disorder Severity Scale; 0 to 28; higher is worse) among EMS clinicians in Canada was 2.81 (SD 4.51).[44]

3.2.2.3.1.2 Anxiety Among Pre-Hospital EMS Clinicians After Critical Mass Incidents

One study in South Korea (Kim 2022) reported a 19.6 percent prevalence of **any anxiety** among pre-hospital EMS clinicians in the aftermath of COVID-19.[69] One study in Germany, Austria, and Switzerland (Duden 2023) reported a 17.1 percent prevalence of **light anxiety**, a 5.2 percent prevalence of **medium anxiety**, and a 0.5 percent prevalence of **severe anxiety**.[71] One study in Spain (Soto-Cámara 2022) reported a considerably higher prevalence of **severe or extremely severe anxiety** (39.4%).[72]

Four studies reported **continuous data for anxiety** using three instruments: DASS-21 (3 studies), GAD-7 (1 study), and HADS (1 study). Among the three studies that used the DASS-21, mean scores ranged from 5.72 (standard error 0.25) in Germany in 2021[93] to 13.08 (SD 11.7) in Spain in 2022 (Figure 12).[72] The mean GAD-7 score was 8.28 (SD 5.75), and the mean HADS score was 8.88 (SD 3.39) in Poland in 2022.[83]

Figure 12. Severity of anxiety among pre-hospital Emergency Medical Services clinicians after critical mass incidents



Abbreviations: CI = confidence interval; DASS-21 = Depression, Anxiety, and Stress Scale-21; EMS = Emergency Medical Services; EMT = emergency medical technician.
*DASS-21 thresholds: 0 to 7 normal; 8 to 9 mild; 10 to 14 moderate; 15 to 19 severe; 20 to 42 extremely severe.

3.2.2.3.2 Anxiety Among Pre-Hospital and In-Hospital EMS Clinicians

3.2.2.3.2.1 Anxiety Among Pre-Hospital and In-Hospital EMS Clinicians During Routine Practice

No eligible studies were identified.

3.2.2.3.2.2 Anxiety Among Pre-Hospital and In-Hospital EMS Clinicians After Critical Mass Incidents

One cross-sectional study in Australia (McGuiness 2022) reported categorical and continuous data using the GAD-7 in a population of both pre-hospital and in-hospital EMS clinicians in the aftermath of COVID-19.[73] The prevalence of **moderate-to-severe anxiety** was 16.7 percent, and the **mean anxiety score** was 5.1 (SD 4.6).

3.2.2.3.3 Anxiety Among EMS Clinicians in Unspecified Settings

3.2.2.3.3.1 Anxiety Among EMS Clinicians in Unspecified Settings During Routine Practice

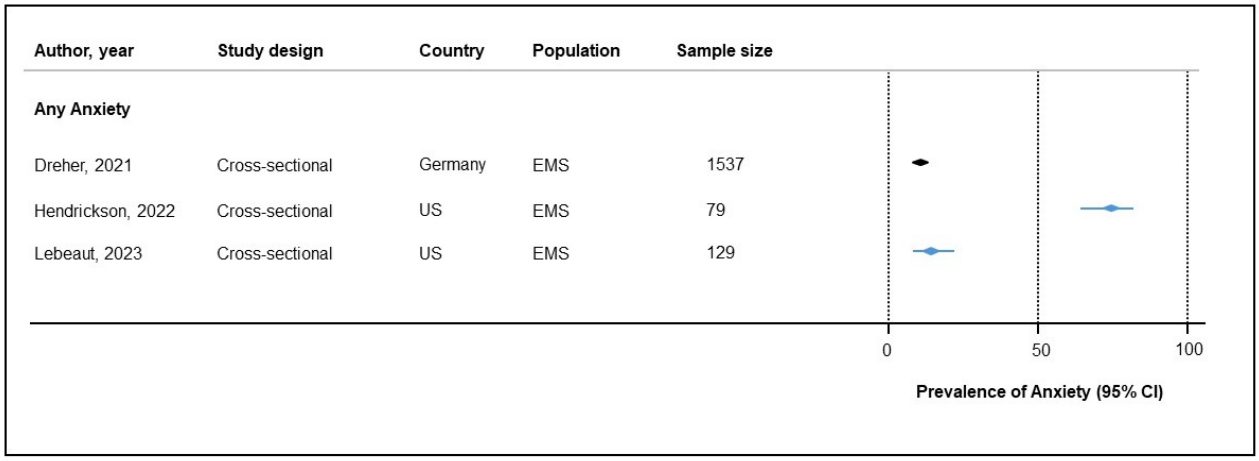
One cross-sectional study in Canada (Mausz 2021) used the GAD-7 and reported that the prevalence of **any anxiety** was 14.8 percent among EMS clinicians (setting unspecified) during routine practice.[61]

Two studies reported **continuous data for anxiety** using two instruments: GAD-7 and the State-Trait Anxiety Inventory-Short Form (STAI-SF). Mausz 2021 (in Canada) reported a mean GAD-7 score of 4.46 (SD 4.76).[61] Khan 2020-b reported mean STAI-S scores (20 to 80; higher is worse) of 44.1 (SD 18.5) and 38.9 (SD 12.7) among paramedics in Australia and Saudi Arabia, respectively.[94]

3.2.2.3.3.2 Anxiety Among EMS Clinicians in Unspecified Settings After Critical Mass Incidents

Three cross-sectional studies, two in the United States and one in Germany, reported on the prevalence of **any anxiety** among EMS clinicians during the COVID-19 pandemic (Figure 13).[77, 95, 96] Prevalence estimates ranged from 16.1 percent in Germany[95] to 79.7 percent in the United States.[77]

Figure 13. Prevalence of any anxiety among Emergency Medical Services clinicians in unspecified settings after critical mass incidents



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; US = United States.
Color legend: blue = studies in the U.S.; black = studies in countries other than the U.S. or Canada. The colors do not convey unique information.

Three studies reported **continuous data for anxiety** using two instruments: GAD-7 (2 studies) and DASS-21 (1 study). Mean GAD-7 scores were 9.7 (SD 6.2) in a U.S. study (Hendrickson 2022)[77] and 2.8 (95% CI 2.4 to 3.3) in a German study (Skoda 2020).[75] A study in Taiwan (Cheng 2022) reported a mean DASS-21 score of 9.5 (SD 12).[81]

3.2.2.3.4 Modifying Factors for Anxiety Among EMS Clinicians

Age: Three studies evaluated age as a modifying factor and reported inconsistent results.[81-83] One study in Taiwan reported that DASS-21 scores increased with age and, compared with EMS clinicians who were 20 to 30 years of age, those who were 31 to 40 and more than 40 years of

age were more likely to have DASS-21 scores of at least 10: OR 1.77 (95% CI 1.01 to 3.10) and 2.00 (95% CI 0.93 to 4.28), respectively.[81] However, in two Polish studies, age was not associated with anxiety.[82, 83]

Sex: Four studies evaluated sex as a modifying factor and reported inconsistent results.[81, 84, 85, 97] In three studies (1 each in Canada, Norway, and Taiwan), although no between-subgroup effect sizes were reported, female participants had higher anxiety levels than male participants.[81, 84, 97] However, in one study in the United Kingdom anxiety levels were comparable between the sexes.[85]

Sexual Minority Status: One study in the United States evaluated sexual minority status as a modifying factor.[87] Sexual minority status was not associated with anxiety GAD-7 scores (mean difference 1.04, 95% CI −1.56 to 2.57).

Race: One study in the United States evaluated race as a modifying factor.[20] Although no between-subgroup effect sizes were reported, belonging to minority groups was not associated with prevalence of anxiety.

Education: Four studies evaluated education as a modifying factor and reported inconsistent results.[20, 61, 81, 88] One study in the United States reported that education was inversely associated with both state anxiety (Pearson correlation coefficient −0.27, p=0.001) and trait anxiety (Pearson correlation coefficient −0.21, p=0.014).[88] However, in three studies (1 in the United States,[20] 1 in Canada,[61] and 1 in Taiwan[81]), education was not associated with anxiety.

Certification: One study in the United States evaluated certification as a modifying factor.[20] Certified paramedics were more likely than EMTs with basic certification to have DASS-21 scores of at least 7 (adjusted odds ratio 1.15, 95% CI 1.08 to 1.22).

Experience: Three studies evaluated experience as a modifying factor and reported inconsistent results.[20, 81, 83] In one study in Poland, Pearson correlation coefficients between experience and HADS and GAD-7 scores were −0.18 and −0.25, respectively, suggesting lower anxiety with greater experience.[83] However, in two studies (1 in the United States[20] and 1 in Taiwan[81]) experience was not associated with anxiety.

Peer Support: One study in Norway evaluated peer support as a modifying factor.[59] Although no between-subgroup effect sizes were reported, those with access to peer support had lower prevalence of anxiety than those without access. Similarly, those who used peer support had a somewhat lower prevalence of anxiety than those who did not use it.[59]

Role: One study in the United Kingdom evaluated role as a modifying factor.[85] Although no between-subgroup effect sizes were reported, EMTs and paramedics had comparable HADS scores.

Shift Characteristics: One study in Taiwan evaluated hours worked per week as a modifying factor.[81] Although no between-subgroup effect sizes were reported, those working up to 72 hours/week, 73 to 96 hours/week, and more than 96 hours/week had comparable HADS scores.

Trauma exposure: Four studies evaluated trauma exposure as a modifying factor and reported that it was generally associated with greater anxiety.[51, 55, 81,74] In one study, in Taiwan, those who experienced violence at work were more likely to have anxiety (OR 1.57, 95% CI 0.96 to 2.55).[81] In a Canadian study, anxiety correlated with workplace violence (Pearson correlation coefficient 0.32, $p < 0.01$) and past-year threat to life or injury (coefficient 0.30, $p < 0.01$).[55] Although no between-subgroup effect sizes were reported, those who experienced violence at work, in Taiwan,[81] or verbal violence or verbal and physical violence, in Spain,[51] experienced high anxiety scores. One study, in Germany, reported that correlations between

exposure to aggression/violence and anxiety were either not relevant (defined as rho < 0.1) or small (rho 0.1 to 0.29) for each of the examined factors: verbal aggression/threats, aggressive behavior (humiliating/provocative/destructive), and physical violence (mild/severe).[74]

3.2.2.3 Posttraumatic Stress Disorder

Sixty studies reported on the prevalence or severity of posttraumatic stress order (PTSD). Of the 60 studies, 10 studies were exclusively among telecommunicators, 47 studies were exclusively among EMS clinicians, and three studies among both telecommunicators and EMS clinicians. See Appendix D, Evidence Tables D-82 through D-120 for details.

3.2.2.3.1 Key Points for Posttraumatic Stress Disorder

- Among telecommunicators during routine practice, there is considerable variation in the prevalence of any (3.5% to 74.6%) and severe (17.6% to 69.6%) PTSD (low SoE).
- No eligible studies reported on PTSD among telecommunicators after critical mass incidents.
- Among EMS clinicians during routine practice, there is considerable variation in the prevalence of any (1.3% to 44.4%) and severe (9.7% to 30%) PTSD (low SoE). Similarly, among EMS clinicians after critical mass incidents, there is considerable variation in the prevalence of any (1.3% to 36%) and severe (8.6%) PTSD (low SoE).
- Among telecommunicators during routine practice and among EMS clinicians during routine practice and after critical mass incidents, the evidence regarding the severity of PTSD is insufficient.
- No eligible studies reported on the incidence of PTSD among telecommunicators or EMS clinicians.
- Modifying factors: Among telecommunicators, having more trauma exposure may be associated with PTSD. Among EMS clinicians, having more trauma exposure, not having psychological help, and working more hours per week may be associated with PTSD.

3.2.2.3.2 Posttraumatic Stress Disorder Among Telecommunicators

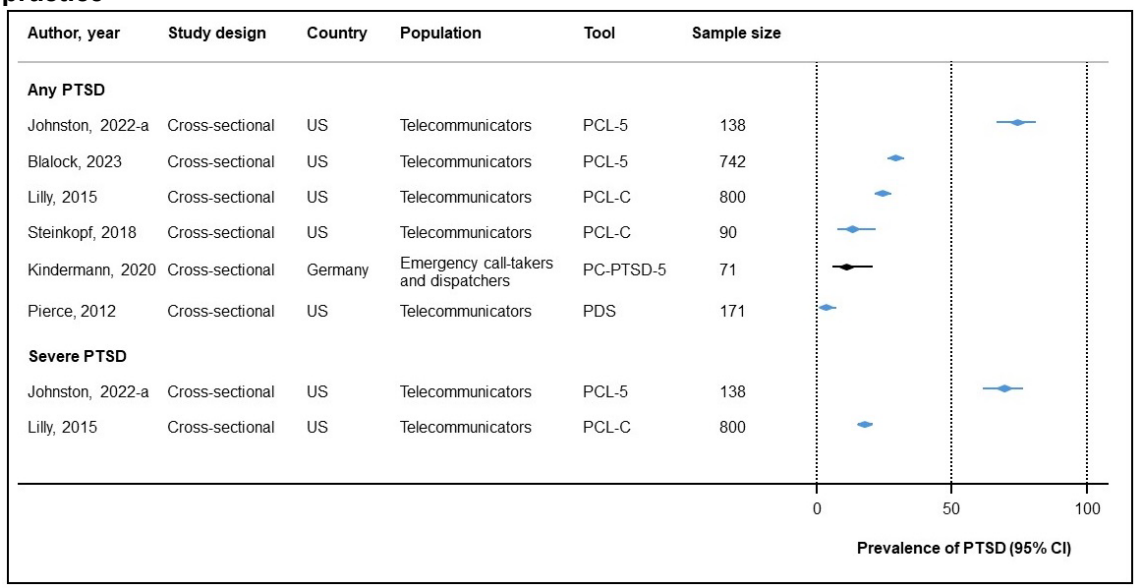
3.2.2.3.2.1 Posttraumatic Stress Disorder Among Telecommunicators During Routine Practice

Seven cross-sectional studies (6 in the United States and 1 in Germany), published between 2012 and 2023, reported on PTSD or posttraumatic stress syndrome (PTSS) prevalence among telecommunicators during routine practice.[45-48, 98-100] Among the six studies that reported on PTSD, four studies used variations of the PTSD Checklist: the PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5 (PCL-5; 2 studies),[46, 98] the PTSD Checklist-Civilian Version (PCL-C; 2 studies),[47, 100] the Primary Care PTSD Screen for DSM-5 (PC-PTSD-5; 1 study),[45] and the Posttraumatic Stress Diagnostic Scale (PDS; 1 study).[48] The study that reported on the prevalence of PTSS used the Impact of Event Scale–Revised (IES-R).[99]

Six studies reported on the prevalence of **any PTSD** (Figure 14). Blalock 2023 and Johnston 2022-a used a PCL-5 threshold of 30 or more and reported the U.S. prevalence as 29.3 percent[46] and 74.6 percent,[98] respectively. Lilly 2015 and Steinkopf 2018 used a PCL-C threshold of 44 and reported the U.S. prevalence as 24.6 percent[47] and 13.3 percent,[101] respectively. Pierce 2012

used a PDS threshold of 28 and reported a U.S. prevalence of 3.5 percent.[48] Kindermann 2020 used a PC-PTSD threshold of 3 and reported a prevalence of 11.3 percent in Germany.[45]

Figure 14. Prevalence of posttraumatic stress disorder among telecommunicators during routine practice



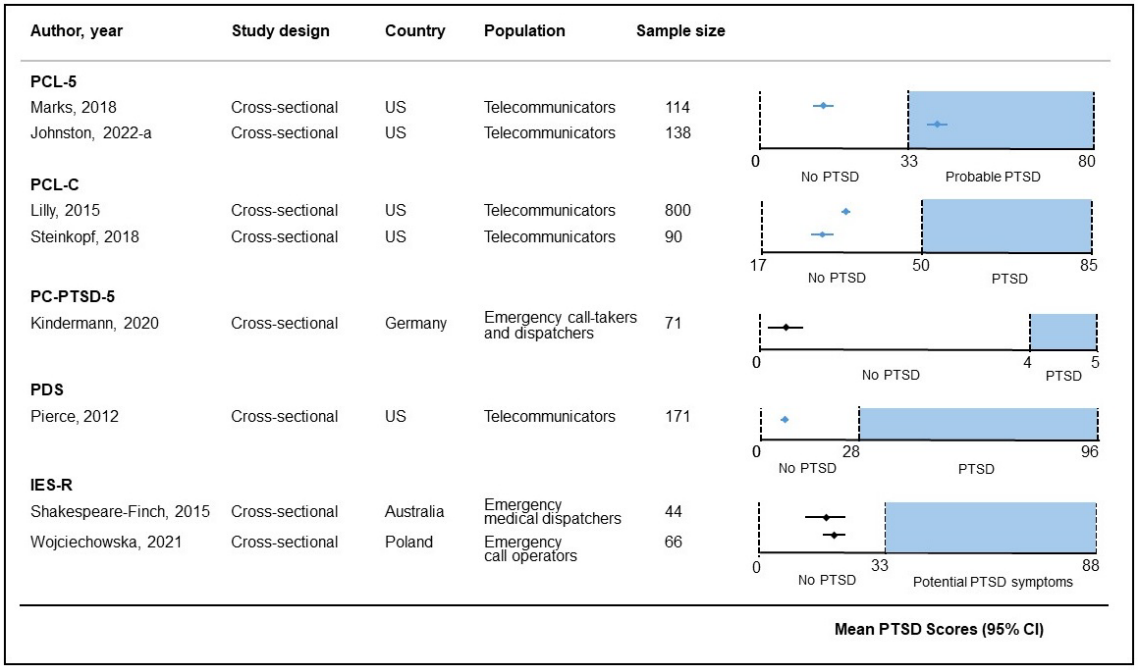
Abbreviations: CI = confidence interval; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PCL-C = PTSD Checklist-Civilian Version; PC-PTSD-5 = Primary Care PTSD Screen for DSM-5; PDS = Posttraumatic Stress Diagnostic Scale; PTSD = posttraumatic stress disorder, US = United States.
Color legend: blue = studies in the United States; black = studies in other countries. The colors do not convey unique information.

Two studies reported on the prevalence of severe PTSD (Figure 14). Johnston 2022-a used a PCL-5 threshold of 50 and reported a U.S. prevalence of 69.6 percent.[98] Lilly 2015 used a PCL-C threshold of 50 and reported a U.S. prevalence of 17.6 percent.[47]

One study reported on the prevalence of any PTSS. Dillard 2019 reported that in the United States, based on the IES-R subscales, 6.8 percent, 1.9 percent, and 3.9 percent of telecommunicators had severe intrusion, avoidance, and hyperarousal, respectively.[99]

Eight cross-sectional studies (5 in the United States, 1 in Germany, 1 in Poland, and 1 in Australia), published between 2012 and 2022, reported PTSD mean scores among telecommunicators during routine practice (Figure 15).[45, 47, 48, 98, 100, 102, 103] Among these studies, two used the PCL-5, two used the PCL-C, one used the PDS, one used the PC-PTSD-5, and two used the IES-R. None of these instruments allowed gradations of severity of PTSD.

Figure 15. Severity of posttraumatic stress disorder among telecommunicators during routine practice



Abbreviations: CI = confidence interval; IES-R = Impact of Event Scale–Revised; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PCL-C = PTSD Checklist-Civilian Version; PC-PTSD-5 = Primary Care PTSD Screen for DSM-5; PDS = Posttraumatic Stress Diagnostic Scale; PTSD = posttraumatic stress disorder, US = United States.
Color legend: blue = studies in the United States; black = studies in other countries; shades of blue refer to severity of PTSD as indicated below each X-axis. The colors do not convey unique information.

Johnston 2022-a and Marks 2018 used the PCL-5 (0 to 80; higher is worse) and reported means of 42.5 (SD 15.2)[98] and 15.04 (SD 13.62),[103] respectively, in the United States. Lilly 2015 and Steinkopf 2018 used the PCL-C (17 to 85; higher is worse) and reported means of 34.36 (SD 14.73)[47] and 29.47 (SD 11.64),[100] respectively, in the United States. Pierce 2012 used the PDS (0 to 96; higher is worse) and reported a mean of 7.07 (SD 8.13) in the United States.[48] Kindermann 2020 used the PC-PTSD-5 (0 to 5; higher is worse) and reported a mean of 0.38 (SD 1.13) in Germany.[45]

Wojciechowska 2021 reported separate scores for subscales of the IES-R in Poland: intrusion (0 to 28; higher is worse) mean 5.06 (SD 3.93), avoidance (0 to 32; higher is worse) mean 8.21 (SD 6.27), and hyperarousal (0 to 28; higher is worse) mean 6.42 (SD 4.72).[102] Shakespeare-Finch 2015 selectively enrolled telecommunicators who previously experienced trauma in Australia. The authors used the IES-R and reported mean scores overall (17.44, SD 18.05) and separately for subscale scores: intrusion 7.37 (SD 8.16), avoidance 6.19 (SD 6.12), and hyperarousal 3.88 (SD 5.59).[104]

3.2.2.3.2.2 Posttraumatic Stress Disorder Among Telecommunicators After Critical Mass Incidents

No eligible studies were identified.

3.2.2.3.2.3 Modifying Factors for Posttraumatic Stress Disorder Among Telecommunicators

Sex: Two studies evaluated sex as a modifying factor and reported inconsistent results. One study in the United States used the reported that mean PCL-C scores comparable between those of male sex and those of female sex (29.64 vs. 28.1, p-value not reported).[100] However, a study in Germany reported a higher prevalence of PTSD (PC-PTSD-5 ≥3) among those of female sex than those of male sex (30% vs. 8.2%, p-value not reported).[45]

Experience: One study in the United States evaluated years of experience as a modifying factor and reported that it was not associated with PCL-C scores (correlation coefficient 0.07, p-value not reported).[47]

Trauma Exposure: One study evaluated trauma exposure as a modifying factor and reported that higher PCL-C scores were associated with trauma history (correlation coefficient 0.28; $p < 0.001$) and childhood trauma exposure (t-test statistic: −5.01, $p < 0.001$).[47]

3.2.2.3.3 Posttraumatic Stress Disorder Among EMS Clinicians

Forty-eight studies (45 cross-sectional studies and 3 cohort studies) reported on the prevalence or severity of PTSD among EMS clinicians. Forty studies were conducted routine practice, and eight studies were conducted after critical mass incidents.

3.2.2.3.3.1 Posttraumatic Stress Disorder Among EMS Clinicians During Routine Practice

Twenty-eight studies, published between 2001 and 2022, reported on the prevalence of PTSD among EMS clinicians during routine practice.

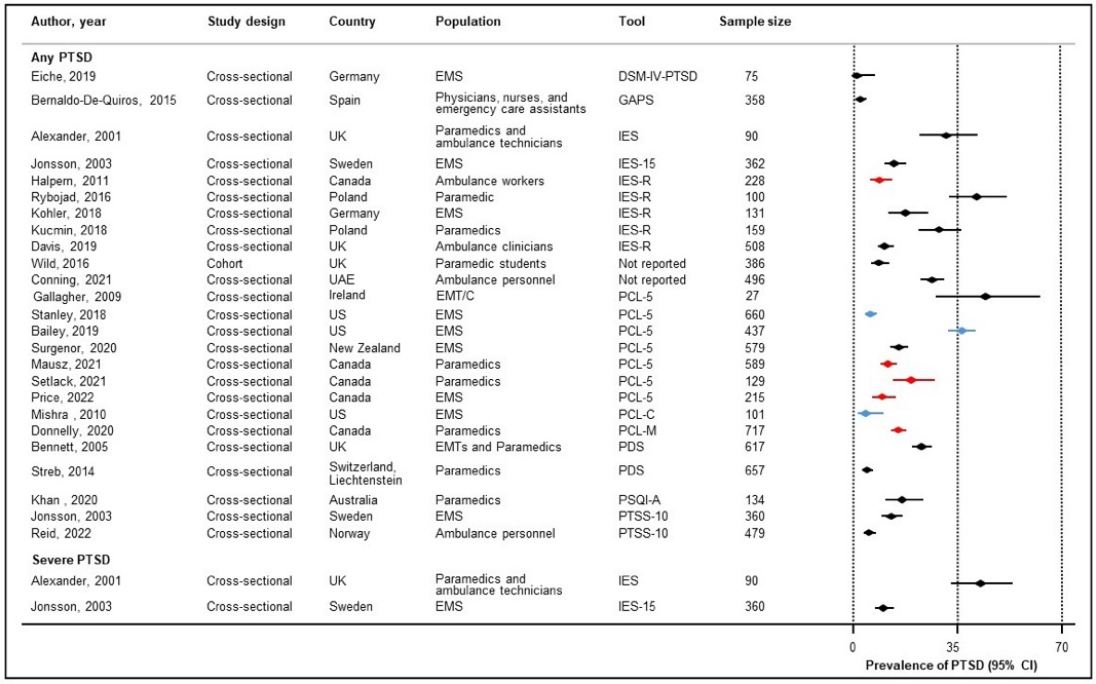
Twenty-seven studies reported on the prevalence of **any PTSD** using a range of instruments and thresholds (Figure 16):

- PTSD Checklist and its variations (12 studies)
  - PCL-5 (9 studies): Six of the nine studies (3 in the United States,[62, 105] 3 in Canada,[55, 61, 89] 1 in Ireland, 1 in Australia, and 1 in New Zealand.[106]) used a threshold of 33 and reported prevalence that ranged from 5.5 to 35 percent. Morrison 2015 used two thresholds in the United States: 25 percent when using a threshold of 40 and 16 percent when using a threshold of 44.[107] Gallagher 2009 also used a threshold of 44 and reported a 44.4 percent prevalence specifically among EMS clinicians in Ireland who had experienced a critical incident in the past year.[108] Kyron 2022 did not report the threshold used but reported an 8.2 percent prevalence in Australia.[52]
  - PCL-C (1 study): Mishra 2010 reported a 4 percent prevalence of PTSD (defined as exposure to trauma, ≥1 re-experiencing item, ≥3 avoidant items, ≥2 hyperarousal items, and impairment on PCL-C) in the United States.[109]
  - PTSD Checklist-Military Version (PCL-M) (1 study): Donnelly 2020 used a threshold of 50 and reported a prevalence of 14.5 percent in Canada.[110]
  - Primary Care PTSD (PC-PTSD; 1 study): Luftman 2017 used the PC-PTSD and reported a prevalence of 32 percent in the United States.[111]
- IES and its variations (7 studies)
  - IES (1 study): Alexander 2001 reported a 30 percent prevalence in the United Kingdom (threshold not reported).[112]

  - IES-R (5 studies): Five studies (2 in Poland[113, 114] and 1 each in Canada,[56] the United Kingdom,[115] and Germany[116]) reported prevalence that ranged from 8.3 to 40 percent.
  - IES-15 (1 study): Jonsson 2003 used a threshold of 26 and reported a 13.3 percent prevalence in Sweden.[117]
- PDS (2 studies): Bennett 2005 reported a 22 percent prevalence in the United Kingdom,[85] and Streb 2014 reported a 4.3 percent prevalence in Switzerland.[118] Neither study reported the threshold used to define PTSD.
- Posttraumatic Symptoms Scale (PTSS-10) (2 studies): Jonsson 2003 used a threshold of 5 and reported a 12.1 percent prevalence among EMS clinicians in Sweden who had experienced a traumatic event.[117] Reid 2022 used a threshold of 35 for the total score and reported a PTSD prevalence of 5 percent in Norway.[59]
- Pittsburgh Sleep Quality Index-Addendum (PSQI-A) (1 study): Khan 2020-b used a threshold of 3 and reported a 15.7 percent prevalence in Australia.[92]
- Global Assessment of Posttraumatic Stress (GAPS) (1 study): Bernaldo-De-Quiros 2015 reported a 2.2 percent prevalence in Spain (threshold not reported).[51]
- Short Screening Scale for Diagnostic and Statistical Manual-IV PTSD (DSM-IV-PTSD) (1 study): Eiche 2019 used a threshold of 4 and reported a 1.3 percent prevalence in Germany.[119]
- Diagnosis of PTSD (1 study): Kyron 2022 reported an 8.9 percent prevalence of current PTSD and 12.4 percent prevalence of lifetime PTSD in Australia.[52]
- Measurement instrument not reported (2 studies): Wild 2016 reported an 8.3 percent prevalence in the United Kingdom,[120] and Conning 2021 reported a 25.4 percent prevalence in the United Arab Emirates.[121]

Two studies reported on the prevalence of **severe PTSD** (Figure 16). Alexander 2001 used the IES (threshold not reported) and reported a 30 percent prevalence in the United Kingdom.[112] Jonsson 2003 used the IES-15 threshold of 31 and reported a 9.7 percent prevalence in Sweden.[117]

Figure 16. Prevalence of posttraumatic stress disorder among Emergency Medical Services clinicians during routine practice



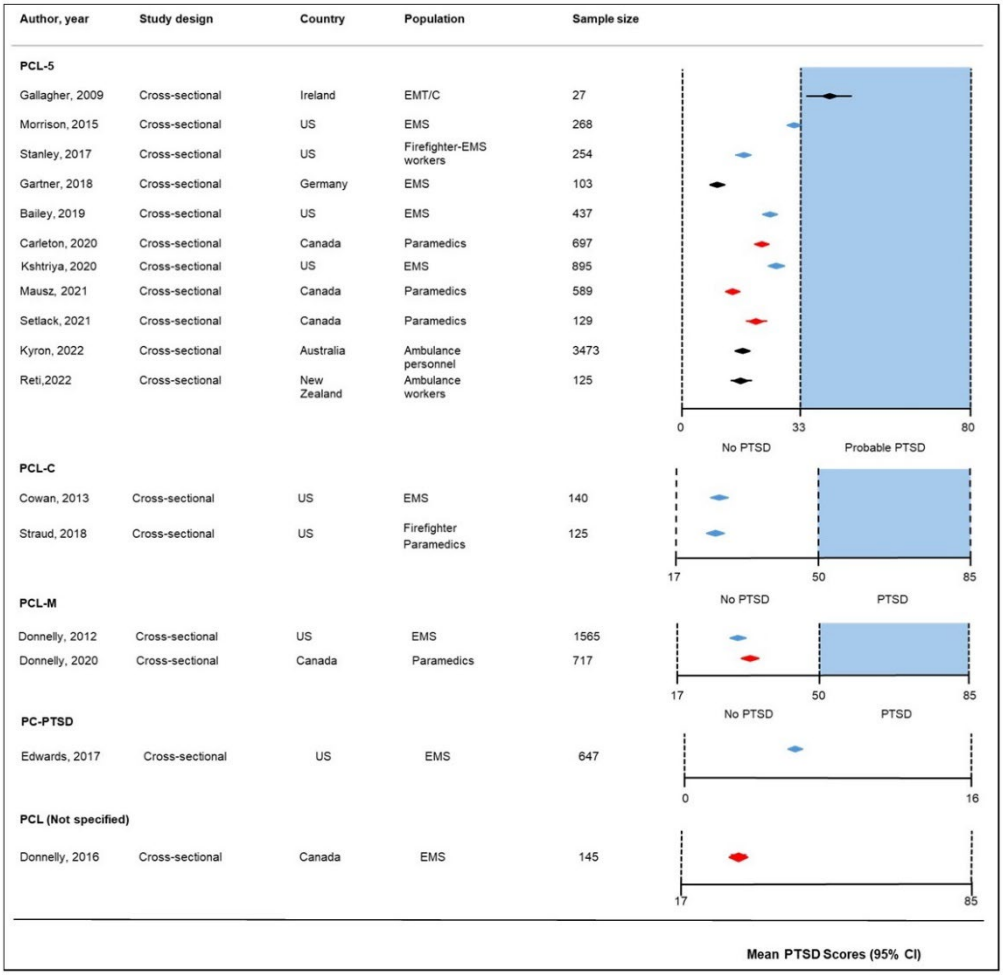
Abbreviations: CI = confidence interval; DSM-IV-PTSD = Short Screening Scale for Diagnostic and Statistical Manual-IV PTSD; EMS = Emergency Medical Services; GAPS = Global Assessment of Posttraumatic Stress; IES = Impact of Event Scale; IES-R = Impact of Event Scale–Revised; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PCL-C = PTSD Checklist-Civilian Version; PCL-M = PTSD Checklist-Military Version; PDS = Posttraumatic Stress Diagnostic Scale; PSQI-A = Pittsburgh Sleep Quality Index-Addendum; PTSD = posttraumatic stress disorder; PTSS-10 = Posttraumatic Symptoms Scale; UAE = United Arab Emirates; UK= United Kingdom; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in other countries. The colors do not convey unique information.

Twenty-six studies, published between 2003 and 2022, reported **PTSD mean scores** based on a range of instruments among EMS clinicians during routine practice. PTSD Checklist and its variations are depicted in Figure 17, and the other instruments are depicted in Figure 18. None of these instruments allowed gradations of severity of PTSD.

- PTSD Checklist and its variations (15 studies)
  - PCL-5 (0 to 80; higher is worse) (11 studies): Eleven studies (4 in the United States,[58, 64, 105, 107] 3 in Canada,[44, 55, 61] and 1 each in Germany,[57] Australia,[52], Ireland,[108] and New Zealand[53]) reported means that ranged from 9.83 (SD 9.75) in Germany[57] to 402.89 (SD 16.50) in Ireland.[108] The estimate from Ireland was specifically among EMS clinicians who had experienced a critical incident in the past year.[108]
  - PCL-C (17 to 85; higher is worse) (2 studies): Cowan 2013 and Straud 201 reported similar means of 27.1 (SD 9.8)[122] and 26.17 (SD 9.47),[65] respectively, in the United States.
  - PTSD Checklist-Military Version (PCL-M) (17 to 85; higher is worse) (2 studies): Donnelly 2020 reported a mean of 34.1 (SD 14.6) in Canada.[110] Donnelly 2012 reported a mean of 29.67 (SD 11.23) in the United States.[123]
  - PC-PTSD (0 to 16; higher is worse) (1 study): Edward 2017 used their own version of the Primary Care PTSD Screen (PC-PTSD) and reported a mean of 6.21 (SD not reported).[124]

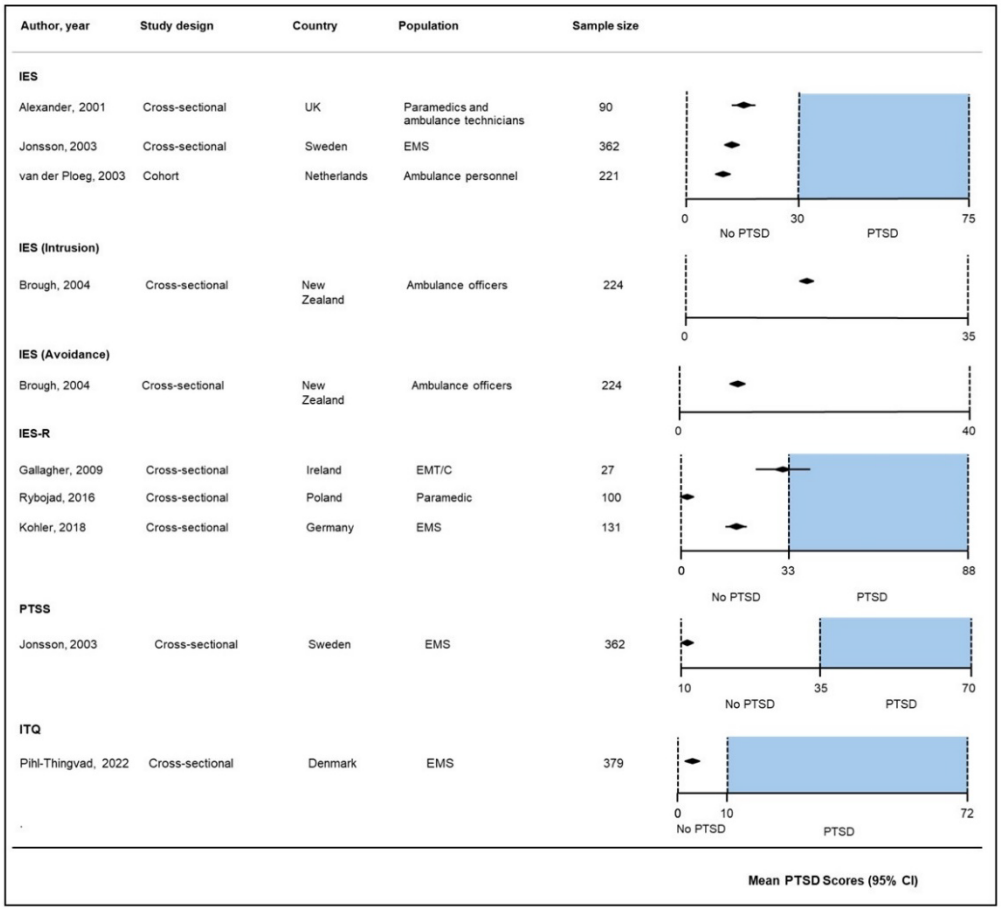
  - PCL Version Unspecified (17 to 85; higher is worse) (1 study): One study reported a mean of 30.5 (SD 11.3) in Canada.[125]
- IES and its variations (8 studies)
  - IES (0 to 75; higher is worse) (4 studies): Alexander 2001 reported a mean of 15.5 (SD 15.7) specifically among EMS clinicians in the United Kingdom who had experienced a personally disturbing incident in the past 6 months.[112] Jonsson 2003 reported a mean of 12.25 (SD 11.14) in Sweden.[117] Brough 2004 reported mean intrusion and avoidance scores of 15 (SD 4.6) and 8 (SD 3.3), respectively, in New Zealand.[126] van der Ploeg 2003, which was a 6-month cohort study among EMS clinicians in The Netherlands, reported comparable baseline and 6-month data for PTSD overall scores (means 10.1 and 11.8) as well as for intrusion (means 6.5 and 7.4) and avoidance scores (means 3.5 and 4.4).[127]
  - IES-R (0 to 88; higher is worse) (4 studies): Four studies (1 each in Canada,[56] Germany,[116] Poland,[114] and Ireland[108]) reported data that ranged from a median of 0.7 (IQR 0.3 to 10) in Canada[56] to 31.33 (SD 22.02) in Ireland.[108] The estimate from Ireland was specifically among EMS clinicians who had experienced a critical incident in the past year.[108]
- PTSS (2 studies that used their own versions of the PTSS; higher is worse): Jonsson 2003 used a version that ranged from 0 to 10 and reported a mean of 0.91 (SD 1.82) in Sweden.[117] Reid 2022 used a version that ranged from 1 to 70 and reported a median of 14 (IQR 11 to 20) in Norway.[59]
- International Trauma Questionnaire (ITQ) (0 to 72; higher is worse) (1 study): Pihl-Thingvad 2022 reported a mean of 3.9 (SD 4.7) in Denmark.[128]

Figure 17. Severity of posttraumatic stress disorder (based on the Posttraumatic Stress Disorder Checklist and its variations) among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT/C = emergency medical technicians and emergency medical controllers; PCL = PTSD Checklist; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PCL-C = PTSD Checklist-Civilian Version; PCL-M = PTSD Checklist-Military Version; PC-PTSD = Primary Care PTSD Screen; PTSD = posttraumatic stress disorder, US = United States.
Color legend: blue = studies in the United States; black = studies in other countries; shades of blue refer to severity of PTSD as indicated below each X-axis. The colors do not convey unique information.

Figure 18. Severity of posttraumatic stress disorder (based on instruments other than the Posttraumatic Stress Disorder Checklist) among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT/C = emergency medical technicians and emergency medical controllers; IES = Impact of Event Scale; IES-R = Impact of Event Scale–Revised; ITQ = International Trauma Questionnaire; PTSD = posttraumatic stress disorder; PTSS = Posttraumatic Symptoms Scale; UK = United Kingdom.
Color legend: black = studies in countries other than the United States or Canada; shades of blue refer to severity of PTSD as indicated below each X-axis. The colors do not convey unique information.

3.2.2.3.3.2 Posttraumatic Stress Disorder Among EMS Clinicians After Critical Mass Incidents

Eight studies, published between 2007 and 2022, were conducted in the context of critical mass incidents: three cross-sectional studies in the United States after the September 11, 2001, attacks,[129-131] four cross-sectional studies in the aftermath of the COVID-19 pandemic in the United States, Spain, Australia, and South Korea,[69, 73, 77, 132] and one cohort study after an earthquake in Taiwan.[133]

Eight studies reported on the prevalence of **any/moderate PTSD** using a range of instruments and thresholds (Figure 19):

- PTSD Checklist and its variations (6 studies)
  - PCL-5 (2 studies): Hendrickson 2022 used a threshold of 31 and reported a 36 percent prevalence during the COVID-19 pandemic in the United States.[77] Ma 2020 defined PTSD as a serious condition in all three PTSD symptoms (re-experiencing, avoidance,

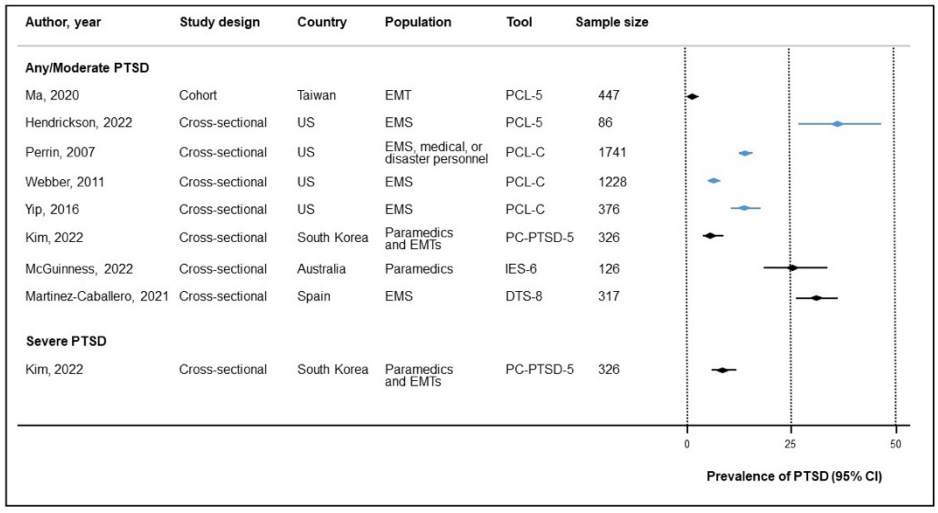
and hyperarousal) and reported a 1.3 percent prevalence after the 2016 earthquake in Taiwan.[133]

- PCL-C (3 studies): All three studies were conducted to evaluate the impact of the September 11, 2001, attacks in the United States and used a threshold of 44 to defined PTSD. Webber 2011 and Perrin 2017 reported prevalence of 6.5 percent and 14.1 percent, respectively.[129, 131] Yip 2016 reported the 2012/2013 prevalence stratified by EMS clinicians' time of arrival at the World Trade Center. The prevalence was 13.8 percent among those who arrived the morning of September 11, 8.3 percent among those who arrived the afternoon of September 11, 8.8 percent among those who arrived on September 12, 4.1 percent among those who arrived between September 13 and 24, 5.2 percent among those who arrived on September 25 or later, and 2.4 percent among EMS clinicians who never worked at the World Trade Center in the aftermath of September 11, 2001.[130]
- PC-PTSD-5 (1 study): Kim 2022 defined moderate PTSD as a PC-PTSD-5 score of 2 and reported a 5.8 percent prevalence during the COVID-19 pandemic in South Korea.[69]

- IES-6 (1 study): McGuinness 2022 used a threshold of 9 and reported a 25.4 percent prevalence during the COVID-19 pandemic in Australia.[73]
- Davidson Trauma Scale-8 (DTS-8) (1 study): Martinez-Caballero 2021 used a threshold of 12 and reported a 34.2 percent prevalence during the COVID-19 pandemic in Spain.[132]

One study reported on the prevalence of **severe PTSD** (Figure 19). Kim 2022 used a PC-PTSD-5 threshold of 3 and reported an 8.6 percent prevalence during the COVID-19 pandemic in South Korea.[69]

Figure 19. Prevalence of posttraumatic stress disorder among Emergency Medical Services clinicians after critical mass incidents

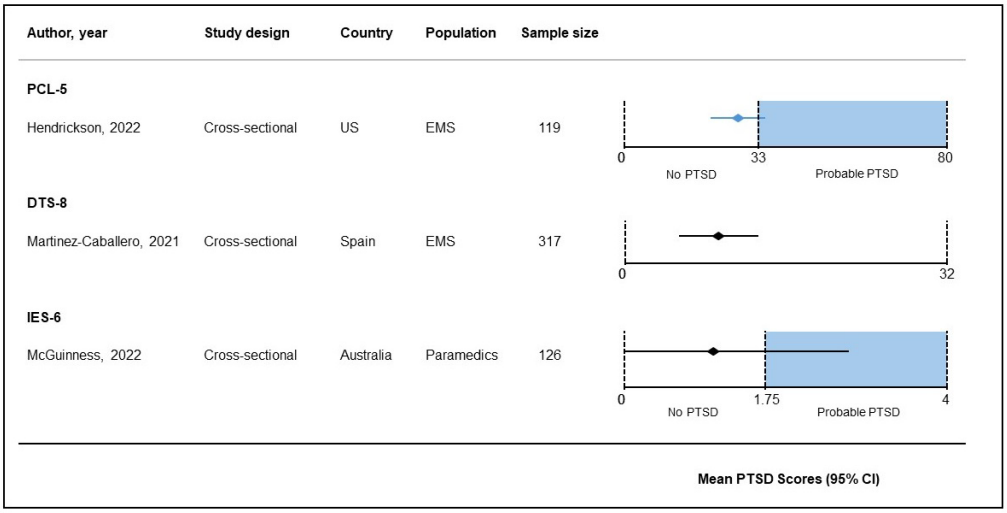


Abbreviations: CI = confidence interval; DTS-8 = Davidson Trauma Scale-8; EMS = Emergency Medical Services; EMT = emergency medical technician; IES-6 = Impact of Event Scale 6-item; PC-PTSD-5 = Primary Care PTSD Screen for DSM-5; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PCL-C = PTSD Checklist-Civilian Version; PTSD = posttraumatic stress disorder; US = United States.

Color legend: blue = studies in the United States; black = studies in other countries other than the United States or Canada. The colors do not convey unique information.

Three studies reported **PTSD mean scores** using three different instruments (Figure 20).[73, 77, 132] None of these instruments allowed gradations of severity of PTSD. All three studies were conducted in the context of the COVID-19 pandemic. Hendrickson 2022 used the PCL-5 (0 to 80; higher is worse) and reported a mean of 28.1 (SD 18.9) in the United States.[77] Martinez-Caballero 2021 used the DTS (0 to 32; higher is worse) and reported a mean of 9.26 (SD 6.04) in Spain.[132] McGuinness 2022 reported used the IES-6 (0 to 4; higher is worse) and reported a mean of 1.1 (SD 0.9) in Australia.[73]

Figure 20. Severity of posttraumatic stress disorder among Emergency Medical Services clinicians after critical mass incidents



Abbreviations: CI = confidence interval; DTS-8 = Davidson Trauma Scale-8; EMS = Emergency Medical Services; IES-6 = Impact of Event Scale-6 item; PCL-5 = PTSD Checklist for Diagnostic and Statistical Manual for Mental Disorders-5; PTSD = posttraumatic stress disorder; US = United States.
Color legend: black = studies in countries other than the United States or Canada; shades of blue refer to severity of PTSD as indicated below each X-axis. The colors do not convey unique information.

3.2.2.3.3.3 Modifying Factors for PTSD Among EMS Clinicians

Age: Six studies evaluated age as a modifying factor and reported conflicting results.[52, 117, 133] In two studies, was associated with prevalence of PTSD. A study in Australia reported that, compared with those 35 years of age or younger, PTSD was more likely with increasing age: 35 to 44 years (OR 1.38, 95% CI 0.9 to 2.0), 45 to 54 years (OR 1.95, 95% CI 1.36 to 2.81), and 55 years or older (OR 1.54, 95% CI 1.0 to 2.4).[52] One study in Sweden did not report effect sizes but reported higher prevalence with increasing age: 25 to 34 years (7.7%), 35 to 49 years (14.3%), and 50 to 65 years (25.4%).[117]

However, in four studies, age was not associated with PTSD. A study in Taiwan reported the PTSD prevalence by age group as: 20 to 33 years (12.5%), 34 to 41 years (15%), and 42 to 61 years (8.6%).[133] Three studies reported no or weak correlations with PTSD severity: Pearson correlation coefficients of 0.02 (p-value not reported)[62] and −0.21 ($p < 0.001$)[124] in the United States and −0.09 ($p < 0.05$) in Switzerland and Liechtenstein.[118]

Sex: Thirteen studies evaluated sex or gender as modifying factors and reported conflicting results. One study in Australia reported that those of female sex were less likely than those of male sex to have probable PTSD (OR 0.69, 95% CI 0.50 to 0.90).[52] On the other hand, although no p-values were reported, three studies reported that those of female sex were more likely than those of male sex to have PTSD: 64.3 versus 36.1 percent in Poland,[114] 35.4 versus 25.7 percent

in Spain,[132] and 20.8 versus 12.0 percent in Taiwan.[133] Nine studies, however, reported that sex was not associated PTSD. These included studies four studies (1 in the United Kingdom,[85] 1 in Spain,[51]1 in Norway,[59] and 1 in Switzerland and Liechtenstein[118]) that reported comparable prevalence of PTSD between those of male or female sex, four studies (1 in Canada[61], 1 in the United Kingdom,[85] 1 in Switzerland,[118] and 1 in Norway[59]) that reported comparable mean or median scores between those of male or female sex, and one study (in the United States[105]) that reported comparable mean scores between men, women, and other genders.

Education: Four studies evaluated education as a modifying factor and reported that it was generally not associated with PTSD. Among these, three studies (1 in Sweden,[117] 1 in Poland,[114] and 1 in Taiwan[133]) reported PTSD comparable prevalence data for different levels of education. The fourth study, in Canada, reported comparable mean PCL-5 scores (0 to 80; higher is worse) between college-educated and university-educated EMS clinicians (14.33 vs. 12.98, p-value not reported).[61]

Downtime: One study in Canada evaluated downtime as a modifying factor. Having or not having downtime were associated with comparable IES-R (0 to 4; higher is worse) scores (0.71 vs. 0.78, p-value not reported).[56]

Work Experience: Five studies evaluated work experience as a modifying factor and reported inconsistent results. In three studies, more experience was associated with more PTSD. A study in Australia reported that, compared with those with less than 2 years of experience, PTSD was more likely with more experience: 2 to 5 years (OR 2.94, 95% CI 1.2 to 8.7), 6 to 10 years (OR 3.37, 95% CI 1.1 to 9.8), and more than 10 years (OR 4.66, 95% CI 1.7 to 13.1).[52] One study in Sweden did not report effect sizes but reported higher prevalence with more experience: 0 to 9 years (9.1%), 10 to 19 years (15.7%), and 20 or more years (16.5%).[117] A study in Spain reported higher prevalence with more experience: 0 to 9 years (22.2%) and 10 to 20 years (32.2%) (prevalence not reported for those with more than 20 years of experience).[132] On the other hand, in a study in Taiwan, the prevalence of PTSD appeared to decrease with more experience: 1 to 7 years (15%), 8 to 16 years (11.4%), and 17 to 33 years (9.5%).[133] A study in Switzerland and Liechtenstein reported no correlation between years of experience and PTSD severity (Pearson correlation coefficient 0.01, p-value not reported).[118]

Peer support: Two studies evaluated peer support as a context factor and reported conflicting results. One study in The Netherlands used Pearson's correlation coefficients to report correlations between PTSD and lack of social support from supervisors (0.31, $p < 0.01$) and lack of social support from colleagues (0.19, p-value not reported).[127] On the other hand, one study in Norway, reported comparable PTSS median scores between those with versus without access to peer support as well as between those who used versus did not use peer support.[59]

Psychosocial help: One study in Switzerland and Liechtenstein evaluated receipt of psychological help at work as a modifying factor. Those who did not receive psychological help had higher mean PDS scores (range not reported; higher is worse) than those who did (4.73 vs. 2.00, p-value not reported).[118]

Shift characteristics: Three studies evaluated shift characteristics as a modifying factor and reported inconsistent results. A study in Australia reported that, compared with a regular daytime schedule, the ORs for PTSD for shifts that were mostly daytime, regular and on-call at other times, rotating, and other types were all not statistically significant.[52] A study in Sweden reported comparable prevalence of PTSD among those with daytime versus 24-hour shifts.[117] A study in the United States reported a weak correlation (0.12) between hours worked per week and PTSD severity (p=0.003).[124]

Role: Four studies evaluated role as a modifying factor and reported comparable prevalence and severity of PTSD across roles. One study in the United States reported prevalence in a variety of roles: paramedics (44%), EMTs (36%), pre-hospital providers (42%), in-hospital providers (21%), flight nurses (43%), and flight paramedics (50%).[111] One study in Norway also reported prevalence by role: EMT (5.9%), nurse (0.2%), and paramedic (2.6%).[59] Median PTSS scores were 15 (IQR 11 to 21.5) for EMTs, 14 (IQR 10 to 18) for nurses, and 14 (IQR 11 to 20) for paramedics.[59] One study in Sweden reported a 12.2 percent prevalence among ambulance technicians and a 15.3 percent prevalence among nurses.[117] One study in Poland reported a 38.1 percent prevalence among ambulance workers and a 53.3 percent prevalence among all others.[114]

Financing: One study in the United States evaluated financing as a modifying factor. Based on the study's own version of the PC-PTSD (0 to 16; higher is worse), the mean scores among volunteer and career EMS clinicians were comparable (4.7 vs. 5.6, p-value not reported).[124]

Trauma exposure: Four studies reported on trauma exposure as a modifying factor and reported that it was generally associated with PTSD. One study in the United States reported increased associations between exposure to the World Trade Center collapse and PTSD in 2003-2004 (OR 2.2, 95% CI 1.1 to 4.7) and between sustained injury while working in the aftermath of September 11, 2001, and PTSD in 2003-2004 (OR 4.0, 95% CI 2.8 to 5.7).[131] One study in Canada reported a correlation between workplace violence and PTSD (zero-order correlation coefficient 0.31, $p < 0.01$) and between past-year threat to life or injury and PTSD (zero-order correlation coefficient 0.35, $p < 0.01$).[55] One study in Sweden reported that EMS clinicians who reported experiencing a traumatic event had higher prevalence than those who did not report experiencing a traumatic event, based on the IES-15 (15.5% vs. 0.7%) and based on the PTSS-10 (12.1% vs. 0.7%).[117] The authors also reported mean scores comparing those who reported experiencing a traumatic event and those who did not for IES-15 (16.09 vs. 15.10) and for PTSS-10 (2.68 vs. 1.19).[117] One study in Poland similarly reported higher PTSD prevalence among EMS clinicians who had versus had not been exposed to victims of various potentially traumatic events: mass casualty (56.1 vs. 18.6%), severe burns (48 vs. 32%), sudden cardiac arrest (44.4 vs. 28.6%), brutal rape (66.7 vs. 29.2%), body fragmentation (42.6 vs. 37.7%), child abuse (53.5 vs. 29.8%), and own friends and family in fatal health state (56.9 vs. 22.4%).[114]

3.2.2.3.4 Posttraumatic Stress Disorder in Studies Among Both Telecommunicators and EMS Clinicians

Two cross-sectional studies enrolled both telecommunicators and EMS clinicians but did not report separate data for the two populations.[91, 134] We report the combined data here but do not consider these studies when making conclusions for either telecommunicators or EMS clinicians.

Wagner 2023 conducted a cross-sectional study, used the PCL-5, and found no significant difference in mean scores between telecommunicators and EMS clinicians in Canada during the COVID-19 pandemic (no data were reported).[91] Johnston 2022-b enrolled a combined population that comprised telecommunicators (15.6%), EMS clinicians (56.9%), and non-clinical and other roles (27.5%) and used the IES-R avoidance (0 to 32; higher is worse).[134] Participants with a stressful life event in the past 6 months had a mean of 14.24 (SD 6.38), and those with a stressful life event in the past 5 years had a mean of 11.57 (SD 7.14).

3.2.2.4 Suicidality

The American Psychological Association (APA) defines suicidality as "the risk of suicide as indicated by suicidal ideation, intention, plans, gestures, or attempts."[135] Eleven cross-sectional studies[43, 46, 52, 62, 64, 73, 77, 136-139] and one cohort study[84] reported on the prevalence or severity of suicidality, although the cohort study (Sterud 2008) reported suicidality data only at baseline. Among the 12 studies, one study enrolled telecommunicators (Blalock 2023)[46] and the other 11 studies enrolled EMS clinicians. See Appendix D, Evidence Tables D-121 through D-135.

3.2.2.4.1 Key Points for Suicidality

- Among telecommunicators during routine practice, the prevalence of suicidal ideation, suicide plans, and suicide attempts are 12.4 percent, 5.7 percent, and 0.7 percent, respectively (low SoE).
- No eligible studies reported on suicidality among telecommunicators after critical mass incidents.
- Among EMS clinicians during routine practice, the prevalence of suicidal ideation is 33 percent (95% CI 32 to 34; 4 studies), the prevalence of suicide plans ranges from 8.7 to 10.9 percent, and the prevalence of suicide attempts ranges from 2.8 to 5.6 percent (moderate SoE).
- Among EMS clinicians during routine practice, the mean Suicide Behaviors Questionnaire-Revised (SBQ-R) score for EMS clinicians is 4.92 (95% CI 2.44 to 7.39, 4 studies) (moderate SoE). A score of 7 or higher indicates being at risk of suicide.
- Among EMS clinicians after critical mass incidents, the prevalence of considering suicide/self-harm varies considerably (9.5% to 24.4%) (low SoE).
- No eligible studies reported on the incidence of suicidality among telecommunicators or EMS clinicians.
- Modifying factors: Among EMS clinicians, more work experience, more trauma exposure, more burnout, and urban settings may be associated with higher suicidality.

3.2.2.4.2 Suicidality Among Telecommunicators

3.2.2.4.2.1 Suicidality Among Telecommunicators During Routine Practice

Blalock 2023 reported that, among 742 telecommunicators during routine practice, the prevalence of **suicidal ideation**, **suicide plans**, and **suicide attempts** were 12.4 percent, 5.7 percent, and 0.7 percent, respectively, in the United States.[46]

3.2.2.4.2.2 Suicidality Among Telecommunicators After Critical Mass Incidents

No eligible studies were identified.

3.2.2.4.2.3 Modifying Factors for Suicidality Among Telecommunicators

No studies reported data for modifying factors for suicidality among telecommunicators.

3.2.2.4.3 Suicidality Among EMS Clinicians

Among the 11 EMS clinician studies, six studies (Stanley 2018, Stanley 2017, Sterud 2008, Renkiewicz 2021, Kyron 2022, and Bayani 2021) enrolled prehospital EMS clinicians,[52, 62, 64, 84, 136, 137] one study (McGuinness 2022) enrolled both prehospital and in-hospital EMS clinicians,[73] and four studies (Edwards 2020, Newland 2015, Hendrickson 2022, and Kaki 2021) did not report the setting.[43, 77, 138, 139]

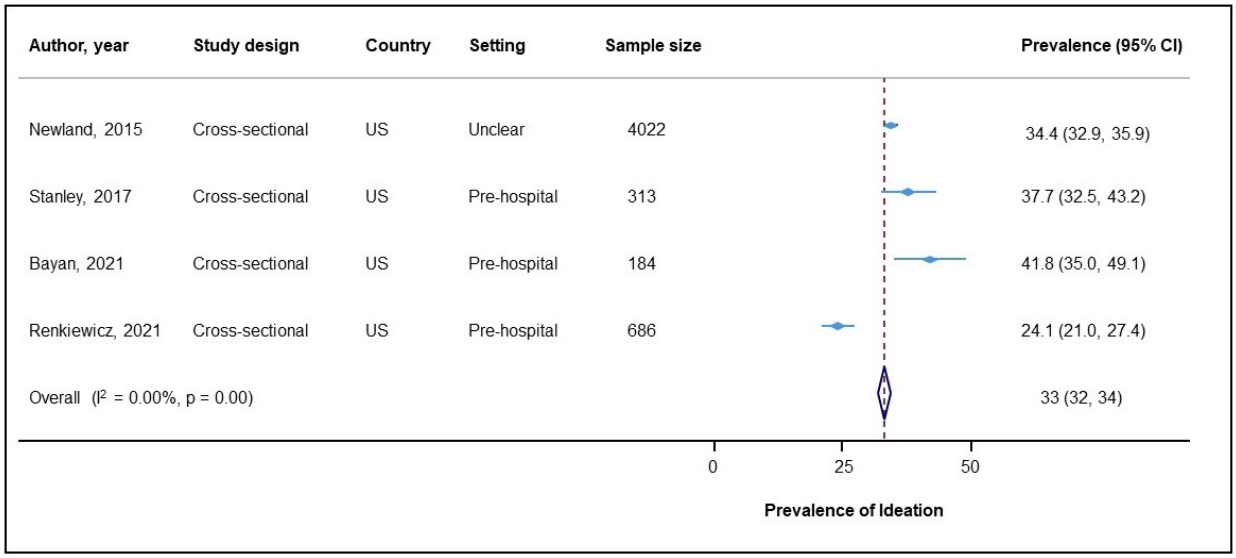
3.2.2.4.3.1 Suicidality Among EMS Clinicians During Routine Practice

Nine EMS clinician studies were conducted during routine practice. The studies reported prevalence of the following suicidality-related constructs, in increasing order of severity: suicide-related negative feelings (1 study), suicidal ideation/thoughts (6 studies), being at risk for suicide (1 study), suicide plans (2 studies), suicide attempts (4 studies), and suicides (1 study).

One study (Sterud 2008) reported **suicide-related negative feelings** among 1,158 ambulance workers in Norway.[84] The lifetime prevalence of feeling that life was not worth living was 28.0 percent, and the lifetime prevalence of wishing that they were dead was 20.7 percent.[84]

Six studies reported on **suicidal ideation**. Based on our meta-analysis of four studies among 5,205 EMS clinicians in the United States,[64, 136, 137, 139] the prevalence was 33 percent (95% CI, 32 to 34, I^2=0%) (Figure 21). Not included in the meta-analysis of U.S. studies, Sterud 2008 reported a prevalence of 22.8 percent in Norway[64] and Kyron 2022 reported a prevalence of 17.1 percent in Australia.[52]

Figure 21. Prevalence of suicidal ideation among pre-hospital Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; I^2 = measure of statistical heterogeneity (% of total variability that is due to between-study variability), US = United States.
Color legend: blue = studies in the United States.

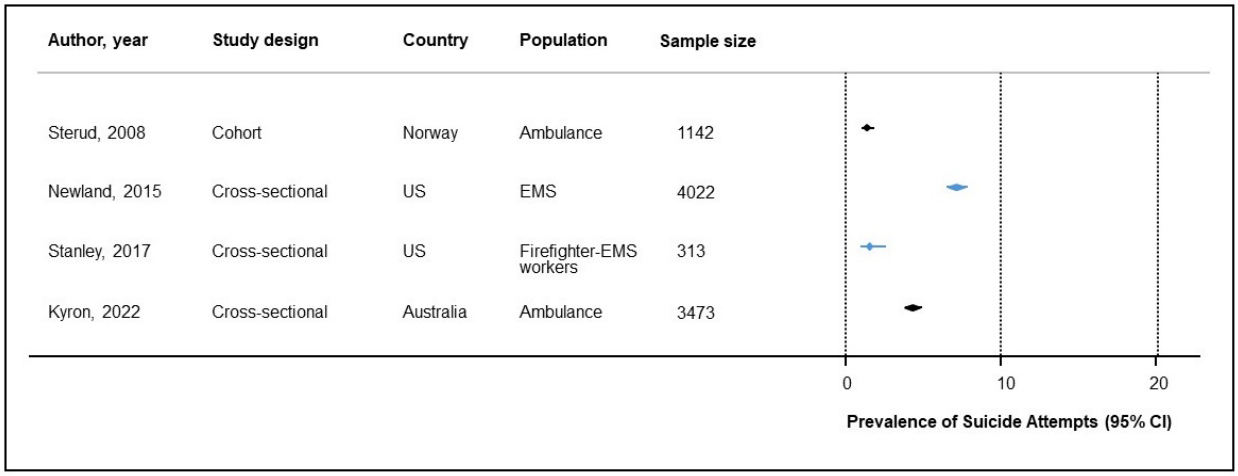
One study (Bayan 2021) of 184 EMS clinicians in the United States reported that 35.9 percent were **at risk for suicide** based on SBQ-R (0 to 18; higher is worse) scores of 7 or higher.[137]

3. Results

Two studies reported data on whether EMS clinicians had had **suicide plans**. Stanley 2017 reported that 10.9 percent of the 313 EMS clinicians in the United States had planned suicide,[64] and Kyron 2022 reported that 8.7 percent of the 3,473 EMS clinicians in Australia had done so.[52]

Four studies reported on **suicide attempts** (Figure 22). Stanley 2017[64] and Newland 2015[139] reported the prevalence as 3.5 percent and 5.6 percent, respectively, in the United States. Sterud 2008 reported a prevalence of 3.1 percent in Norway,[84] and Kyron 2022 reported a prevalence of 2.8 percent in Australia.[52]

Figure 22. Prevalence of suicide attempts among Emergency Medical Services clinicians during routine practice

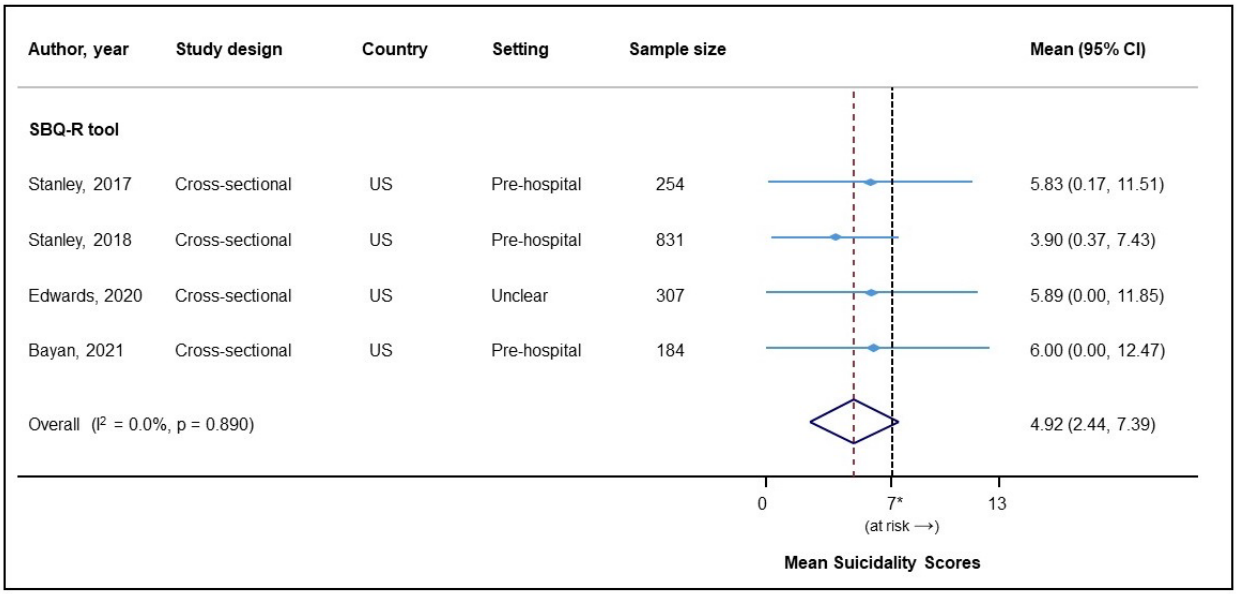


Abbreviations: CI = confidence interval; EMS = emergency medical service, US = United States.
Color legend: blue = studies in the United States; black = studies in countries other than the United States and Canada.

One study (Kaki 2021) reported that EMS clinicians and non-EMS clinicians in the United States had comparable rates of **suicide** (mortality rate ratio 1.32, 95% CI 0.42 to 4.13).[43]

Four of the nine EMS clinician studies reported continuous data on **mean suicidality scores** based on the SBQ-R (0 to 18; higher is worse) among 28,085 EMS clinicians in the United States.[62, 64, 137, 138] Based on our meta-analysis, the mean score was 4.92 (95% CI 2.44 to 7.39; I^2=0%) (Figure 23).

Figure 23. Severity of suicidality (based on the Suicidal Behaviors Questionnaire-Revised) among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; I^2 = measure of statistical heterogeneity (% of total variability that is due to between-study variability); SBQ-R = Suicidal Behaviors Questionnaire-Revised; US = United States.

Color legend: blue = studies in the United States.

* SBQ-R thresholds: 0 to 6 not at risk; 7 to 18 at risk

3.2.2.4.3.2 Suicidality Among EMS Clinicians After Critical Mass Incidents

Two EMS clinician studies were conducted in the context of a critical mass event (COVID-19 pandemic). Hendrickson 2022 reported that 24.4 percent of EMS clinicians in the United States had **considered suicide or self-harm**.[77] McGuinness 2022 reported that 9.5 percent of EMS clinicians in Australia had considered suicide or self-harm.[73]

3.2.2.4.3.3 Modifying Factors for Suicidality Among EMS Clinicians

Age: Two studies reported that the risk of suicidality among EMS clinicians was not associated with age. One study reported a correlation of 0 between age and **suicide risk** (based on the SBQ-R) in the United States.[62] Another study reported various non-statistically significant ORs for **suicidal ideation** in the past 12 months and **suicidal behaviors** in the past 12 months comparing EMS clinicians in Australia aged up to 35 years (reference group) with those in the 35 to 44 years, 45 to 54 years, and 55 years and older age groups.[52]

Sex: Two studies reported that the risk of suicidality among EMS clinicians was not associated with sex. One study reported that comparable proportions of male and female EMS clinicians in Norway reported suicidal feelings based on the Paykel's Suicidal Feelings in the General Population questionnaire.[84] Similarly, a study reported non-statistically significant ORs for **suicidal ideation** in the past 12 months and **suicidal behaviors** in the past 12 months comparing male and female EMS clinicians in Australia.[52]

Setting: One study in Australia reported that, compared with EMS clinicians in rural locations, EMS clinicians in urban locations were more likely to have **suicidal ideation** in the

past 12 months (OR 1.2, 95% CI 1.0 to 1.7) and **suicidal behavior** in the past 12 months (OR 1.6, 95% CI 1.1 to 2.4).[52]

Work Experience: One study in Australia reported that **suicidal ideation** in the past 12 months increased in a dose-response manner with years of EMS experience.[52] Compared with those with less than 2 years of experience (reference group), the odds of suicidal ideation were higher for those with 2 to 5 years (OR 4.2, 95% CI 1.4 to 12.6), 5 to 10 years (OR 4.8, 95% CI 1.6 to 14.0), and more than 10 years of experience (OR 5.2, 95% CI 1.9 to 14.7). Similarly, **suicidal behaviors** in the past 12 months increased when compared with those with less than 2 years of service (reference group): 2 to 5 years of service (OR 6.8, 95% CI 0.9 to 51.8), 5 to 10 years (OR 5.8, 95% CI 0.8 to 44.4), and more than 10 years of experience (OR 7.8, 95% CI 1.1 to 56.3).

Burnout: One study in the United States reported that burnout (emotional exhaustion) was associated with greater **suicide risk** (as measured by SBQ-R scores): mean 4.61 (SD: 2.26) for those with low emotional exhaustion, mean 5.73 (SD: 272) for medium emotional exhaustion, and mean 7.01 (SD 3.32) for high emotional exhaustion.[138]

Trauma Exposure: One study in the United States reported that, compared with EMS clinicians without vicarious exposure to a potentially traumatic event, those with the exposure were more likely to have **considered suicide** (OR 1.40, 95% CI 0.9 to 2.18).[136]

3.2.2.5 Substance Use

Overall, 15 studies reported on the prevalence or severity of substance use. These included 12 studies exclusively among EMS clinicians, two studies exclusively among telecommunicators, and one study among both EMS clinicians and telecommunicators. See Appendix D, Evidence Tables D-136 through D-145 for details.

3.2.2.5.1 Key Points for Substance Use

- Among telecommunicators during routine practice, the prevalence of alcohol abuse is 15.5% (low SoE).
- Among telecommunicators during routine practice, the evidence regarding mean levels of alcohol consumption is insufficient.
- No eligible studies reported on substance use among telecommunicators after critical mass incidents.
- Among EMS clinicians during routine practice and after critical mass incidents, the evidence regarding the prevalence of heavy alcohol consumption is insufficient.
- Among EMS clinicians during routine practice, the mean levels of alcohol consumption tend to be of low risk (low SoE).
- No eligible studies reported on the incidence of substance use among either telecommunicators or EMS clinicians.
- Modifying factors: Among EMS clinicians, older age and more years of service may be associated with less alcohol use.

3.2.2.5.2 Substance Use Among Telecommunicators

3.2.2.5.2.1 Substance Use Among Telecommunicators During Routine Practice

Two cross-sectional studies reported on alcohol use among 1,500 telecommunicators in the United States.[46, 47] Blalock 2023 reported that 15.5 percent of participants screened positive for **alcohol abuse** based on the Cut, Annoyed, Guilty, and Eye (CAGE) questionnaire.[46] Lily 2015 reported that the **mean alcohol use score** based on the Alcohol Use Disorders Identification Test (AUDIT; 0 to 40; higher is worse) was 3.67 (SD 4.02).[47]

3.2.2.5.2.2 Modifying Factors for Substance Use Telecommunicators

No eligible studies were identified.

3.2.2.5.3 Substance Use Among EMS Clinicians

Overall, 13 studies, published between 2016 and 2023, reported on the prevalence or severity of substance use among EMS clinicians. Most studies were cross-sectional, except for one prospective cohort study (Harris 2023) in Australia.[54]

Among the 13 studies, 10 were conducted among pre-hospital EMS clinicians, and for three the setting was not reported. Five of the 13 studies were conducted in the context of critical mass incidents; the rest were conducted during routine practice. Seven studies reported on alcohol use, one study reported on inhaled nicotine use, and three studies reported on other drug use.

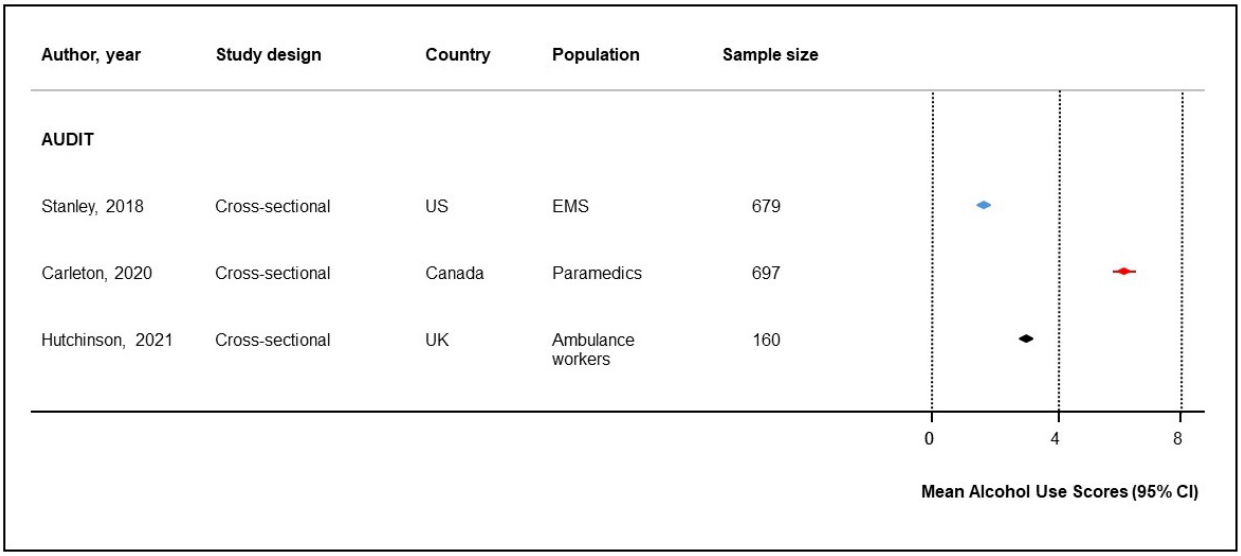
3.2.2.5.3.1 Alcohol Use Among EMS Clinicians During Routine Practice

Seven studies (1 prospective cohort study and 6 cross-sectional studies) reported on alcohol use among 5,477 prehospital EMS clinicians during routine practice.[44, 52, 54, 62, 66, 89, 140] Two studies were conducted in the United States, two in Canada, two in Australia, and one in the United Kingdom. Four studies used the AUDIT (0 to 40; higher is worse),[44, 62, 66, 89] one used the Alcohol Use Disorders Identification Test-Consumption (AUDIT-C; 0 to 12; higher is worse),[54] and the others asked single-item questions that assessed the frequency of alcohol use generally,[62] frequency of alcohol use to relieve stress symptoms,[140] frequency of binge drinking,[52] and quantity of alcohol use.[52]

Four studies reported on the prevalence of heavy alcohol consumption among EMS clinicians but used different definitions and terminology. Harris 2023 reported on **highly hazardous alcohol use** (AUDIT-C >4 for those of male sex and >3 for those of female sex); 56 percent and 43.8 percent of all participants had highly hazardous alcohol use at baseline and at 6 months, respectively.[54] Stanley 2018 reported a 23.3 percent prevalence of **hazardous alcohol use** (AUDIT >8) and a 5.3 percent prevalence of **alcohol use disorder (AUD)** (AUDIT ≥15) in the United States.[62] Stanley 2018 also reported that 45.1 percent of participants drank more than the recommended limit of two alcoholic drinks per day, with 16.6 percent drinking more than 5 to 6 drinks per day.[62] Price 2022 reported a 17.2 percent prevalence of AUD (AUDIT ≥15) in Canada.[89] Kyron 2022 reported on the following prevalence related to **binge drinking** among ambulance workers in Australia: heavy binge drinking (≥10 standard drinks on a single occasion) 13.9 percent, binge drinking (≥5 standard drinks on a single occasion) almost weekly 13.5 percent, and binge drinking almost daily 3.0 percent.[52]

Three studies reported **mean alcohol use scores** (based on AUDIT) of 1.66 (SD 0.64) in the United States, 6.15 (SD 5.16) in Canada, and 3.01 (SD 1.16) in the United Kingdom (Figure 24).[44, 62, 66]

Figure 24. Severity of alcohol use among Emergency Medical Services clinicians during routine practice



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; EMS = emergency medical services; UK = United Kingdom; US = United States.
Color legend: blue = studies in the U.S.; red = studies in Canada; black = studies in other countries. The colors do not convey unique information.

3.2.2.5.3.2 Alcohol Use Among EMS Clinicians After Critical Mass Incidents

Five cross-sectional studies conducted after critical mass incidents (2 studies in Taiwan and 1 each in the United States, South Korea, and Poland) reported on alcohol use among 3,869 EMS clinicians.[69, 81, 83, 130, 141] Four studies were conducted during the COVID-19 pandemic[69, 81, 83, 141] and one in the aftermath of the U.S. September 11, 2001, attacks.[130]

All five studies reported on heavy drinking using different definitions and terminology. Yip 2016 reported the 2012/2013 prevalence of **AUD** (AUDIT ≥8) stratified by EMS clinicians' time of arrival at the World Trade Center on/after September 11, 2001.[130] The prevalence of AUD was 3.7 percent among those who arrived the morning of September 11, 3.8 percent among those who arrived the afternoon of September 11, 4.2 percent among those who arrived on September 12, 1.6 percent among those who arrived between September 13 and 24, 4 percent among those who arrived on September 25 or later, and 1.4 percent among EMS clinicians who never worked at the World Trade Center in the aftermath of September 11, 2001.

The other four studies reported data in the aftermath of the COVID-19 pandemic. Cheng 2022 reported a 25.7 percent prevalence of AUD (AUDIT ≥8) in Taiwan.[81] Marczewski 2022 reported that the prevalence of **alcohol use 2-3 times a week** increased from 17.2 percent before the pandemic to 30.6 percent during the pandemic in Poland.[83] Chang 2022 reported a 5.9 percent prevalence of **alcohol use ≥3 times a week** in Taiwan.[141] Kim 2022 reported a 5.2 percent prevalence of **aggravation or development of excessive drinking** in South Korea.[69]

3.2.2.5.3.3 Nicotine Use Among EMS Clinicians During Routing Practice

One cross-sectional study (Swab 2020) reported the prevalence of **inhaled nicotine use** among 153 EMS clinicians in the United States.[140] The prevalence was 13.1 percent for daily use, 1.3 percent for weekly use, 0.7 percent for monthly use, and 1.3 percent for use every 3 months.

3.2.2.5.3.4 Nicotine Use Among EMS Clinicians After Critical Mass Incidents

No eligible studies were identified.

3.2.2.5.3.5 Other Drug Use Among EMS Clinicians During Routine Practice

Three cross-sectional studies reported on the use of other drugs among at least 3,623 EMS clinicians (one study did not report its sample size).[43, 52, 140] Two studies were conducted in the United States and one in Australia. Two studies reported the frequency of use based on single questions,[52, 140] and one study compared the opioid-related mortality rates of EMS and various non-EMS workers (medical assistants, nursing aids, registered nurses, respiratory therapists, physicians, surgeons, pharmacists, and others).[43]

Swab 2020 reported the prevalence of **illicit or non-prescription drug use** among 153 EMS clinicians in the United States.[140] The prevalence was 3.9 percent for daily use, 2.2 percent for weekly, 2.6 percent for monthly, and 2.0 percent for every 3 months. Kyron 2022 reported a 9.3 percent prevalence of **illicit drug use** among 3,473 EMS clinicians in Australia.[52]

Swab 2020 reported that the **opioid-related mortality rate ratio** comparing EMS and Non-EMS clinicians in the United States was 2.82 (95% CI 1.54, 5.16).[140]

3.2.2.5.3.6 Other Drug Use Among EMS Clinicians After Critical Mass Incidents

No eligible studies were identified.

3.2.2.5.3.7 Modifying Factors for Substance Use Among EMS Clinicians

One study in the United States reported weak correlations between **age** and AUD (−0.08, $p < 0.05$) and between **years of service** and AUD (−0.03, p-value not reported).[62]

3.2.3 Incidence, Prevalence, and Severity of Occupational Stress Issues (Burnout, Stress, and Moral Injury)

3.2.3.1 Burnout

Sixty-three studies reported on the prevalence or severity of burnout. These included nine studies exclusively among telecommunicators, 51 studies exclusively among EMS clinicians, and three studies among both telecommunicators and EMS clinicians. The most frequently used instruments were a version of the Maslach Burnout Inventory (MBI), the Copenhagen Burnout Inventory (CBI), the Professional Quality of Life (ProQOL), Burnout Assessment Tool-12

(BAT-12), and the Oldenburg Burnout Inventory (OBI). See Appendix D, Evidence Tables D-146 through D-197 for details.

3.2.3.1.1 Key Points for Burnout

- Among telecommunicators during routine practice, evidence regarding the prevalence of burnout is insufficient.
- Among telecommunicators, the mean levels of burnout tend to be of mild to moderate severity during routine practice (moderate SoE) and of moderate severity after critical mass incidents (low SoE).
- Among EMS clinicians during routine practice, there is considerable variation in the prevalence of any burnout (13.9% to 87.7%), high depersonalization (13.3% to 99.3%), high emotional exhaustion (9.2% to 92%), and low personal achievement (1% to 36.4%) (low SoE). Similarly, among EMS clinicians after critical mass incidents, there is considerable variation in the prevalence of any burnout (18.3% to 38.3%), high depersonalization (32% to 60.7%), high emotional exhaustion (35% to 68%), and low personal achievement (48% to 61.2%) (low SoE).
- Among EMS clinicians during routine practice, the mean levels of burnout tend to be of mild to severe severity (moderate SoE).
- Among EMS clinicians after critical mass incidents, evidence regarding the severity of burnout is insufficient.
- No eligible studies reported on the incidence of burnout among telecommunicators or EMS clinicians.
- Modifying factors: Among telecommunicators, full-time work and mandatory overtime may be associated with more burnout, and staffing adequacy may be associated with less burnout. Among EMS clinicians, more trauma exposure, and urban settings may be associated with more burnout, and volunteer EMS financing may be associated with less burnout. Burnout was generally found to improve with age or not be associated with age.

3.2.3.1.2 Burnout Among Telecommunicators

3.2.3.1.2.1 Burnout Among Telecommunicators During Routine Practice

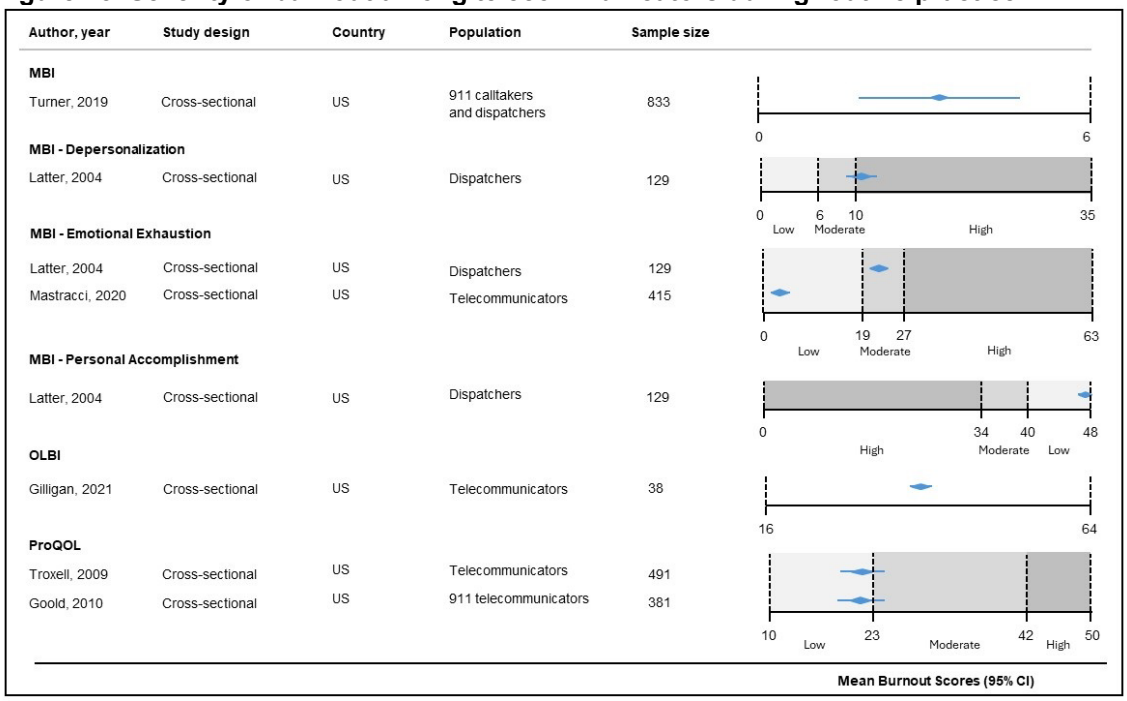
Seven cross-sectional studies reported on the prevalence or severity of burnout among telecommunicators during routine practice.[40, 41, 49, 142-145] Six studies were conducted in the United States, and one study was conducted in France.

One study (Troxell 2009) used a threshold score of 27 on the ProQOL and reported a 14.7 percent prevalence of **any burnout** in the United States.[144]

Seven studies reported on **burnout scores** using a range of instruments: Maslach Burnout Inventory or its variations (MBI; 3 studies), ProQOL (2 studies), Borg Scale (1 study), and Oldenburg Burnout Inventory (OLBI; 1 study) (Figure 25). Among the three studies (in the United States) that used the MBI or its variations, Latter 2004 reported separate means for depersonalization (0 to 35; higher is worse), emotional exhaustion (0 to 63; higher is worse), and personal accomplishment (0 to 48; higher is better) as 13.46 (SD 8.09), 21.91 (SD 12.30), and 47.9 (SD 7.79), respectively;[49] Mastracci 2020 reported a mean emotional exhaustion score (0 to 63; higher is worse) of 4.22 (SD 1.74);[145] and Turner 2019 reported a mean overall score of 3.26

(SD 1.34).[41] Two studies in the United States (Goold 2010 and Troxell 2009) used the ProQOL (10 to 50; higher is worse) and reported means of 21.37 (SD 7.1)[143] and 21.57 (6.56), respectively.[144] One study (Gilligan 2021) used the OLBI (16 to 64; higher is worse) and reported a mean of 33.2 (SD 5.9) in the United States.[142] One study (Weibel 2003) used the Borg Scale (0 to 10; higher is worse) and reported a median of 6 (IQR 4 to 8) in France.[40]

Figure 25. Severity of burnout among telecommunicators during routine practice



Abbreviations: CI = confidence interval; MBI = Maslach Burnout Inventory; OLBI = Oldenburg Burnout Inventory; ProQOL = Professional Quality of Life; US = United States.
Color legend: blue = studies in the United States; shades of grey refer to severity of burnout as indicated below each X-axis. The colors do not convey unique information.
One study (Weibel 2003) is not depicted on this figure because it reported only median and interquartile range.

3.2.3.1.2.2 Burnout Among Telecommunicators After Critical Mass Incidents

One study (Makara-Studzinska 2021) used the Link Burnout Inventory (24 to 144; higher is worse) and reported **a mean burnout score** of 82.67 (SD 9.30) during the COVID-19 pandemic in Poland.[146] No prevalence data were reported.

3.2.3.1.2.3 Modifying Factors for Burnout Among Telecommunicators

Age: One study in the United States evaluated age as a modifying factor and reported inconsistent results regarding the correlation between age and different types of burnout.[49] Age was associated with depersonalization (zero-order correlation 0.31, $p < 0.01$) but not with emotional exhaustion (zero-order correlation 0.02, $p \geq 0.05$) or personal accomplishment (zero-order correlation −0.08, $p \geq 0.05$).

Sex: Three studies in the United States evaluated sex as a modifying factor and reported that it was not associated with burnout.[49, 143, 144]

Race: One study in the United States evaluated race as a modifying factor and reported that it was not associated with burnout.[49]

Education: Two studies in the United States evaluated education level as a modifying factor and reported that it was not associated with burnout.[49, 143]

Experience: Three studies evaluated work experience as a modifying factor and reported inconsistent results. One study in the United States, reported a weak correlation between more work experience and burnout (r=0.10, p=0.027).[144] However, another study in the United States reported that correlations between experience and emotional exhaustion, depersonalization, and personal achievement were each not statistically significant.[49] A study in Poland reported that work experience was inversely associated with psychophysical exhaustion (β coefficient −0.18, $p < 0.05$) and relationship deterioration (β coefficient −0.11, $p < 0.05$) but not with sense of professional inefficacy or disillusion.[146]

Staffing Adequacy: One study in the United States evaluated staffing adequacy as a modifying factor and reported that it was inversely correlated with burnout (r=−0.25, $p < 0.001$).[144]

Employment practices: One study in the United States evaluated full-time work as a modifying factor and reported that mean ProQOL scores were higher among those working full time than those working part time (21.89 vs. 17.83, $p < 0.05$).[144] The same study also reported that working at centers with mandatory overtime was associated with higher ProQOL scores (r=0.11, p=0.014).

Number of shifts per month: A study in Poland evaluated number of shifts per month as a modifying factor and reported that it was associated with psychophysical exhaustion (β coefficient 0.11, $p < 0.05$) but not with relationship deterioration, sense of professional inefficacy, or disillusion.[146]

3.2.3.1.3 Burnout Among EMS Clinicians

Fifty-one studies reported on the prevalence or severity of burnout among a total of 31,040 EMS clinicians. Thirty-six studies were conducted during routine practice, and 15 studies were conducted after a critical mass incident (the COVID-19 pandemic).

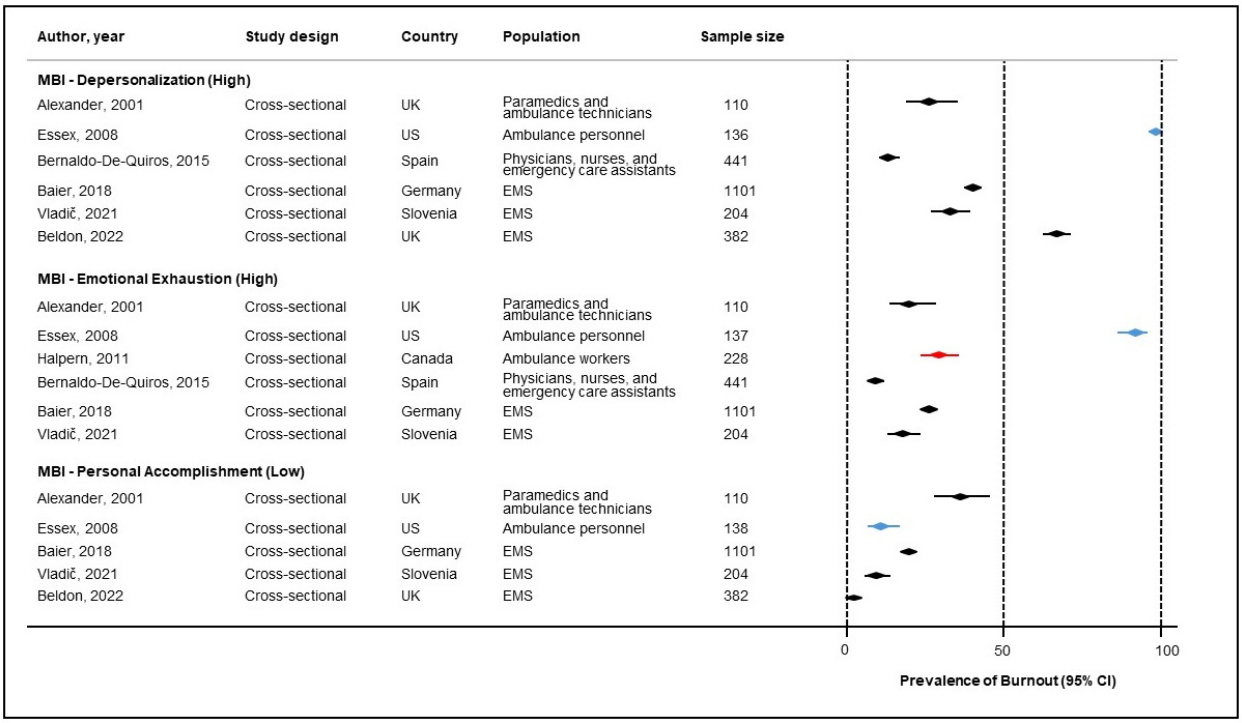
The most frequently used instruments were versions of the Maslach Burnout Inventory (MBI; 21 studies), followed by the Copenhagen Burnout Inventory (CBI; 5 studies) and the ProQOL (4 studies). Therefore, for each of the subsections on burnout among EMS clinicians during routine practice and after critical mass incident that follow, we include further subsections by instrument (MBI first and then all other instruments together).

3.2.3.1.3.1 Burnout Among EMS Clinicians During Routine Practice

3.2.3.1.3.1.1 Burnout (Measured Using the Maslach Burnout Inventory) Among EMS Clinicians During Routine Practice

Six studies reported on the prevalence of **high depersonalization**, which ranged from 13.3 percent in Spain[51] to 99.3 percent in the United States (Figure 26).[147] Six studies reported on the prevalence of **high emotional exhaustion**, which ranged from 9.2 percent in Spain[51] to 92 percent in the United States.[147] Five studies reported on the prevalence of **low personal accomplishment**, which ranged from 1 percent in the United Kingdom[148] to 36.4 percent in the United Kingdom (Figure 26).[112]

Figure 26. Prevalence of burnout (based on the Maslach Burnout Inventory) among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; MBI = Maslach Burnout Inventory; UK = United Kingdom; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada. The colors do not convey unique information.

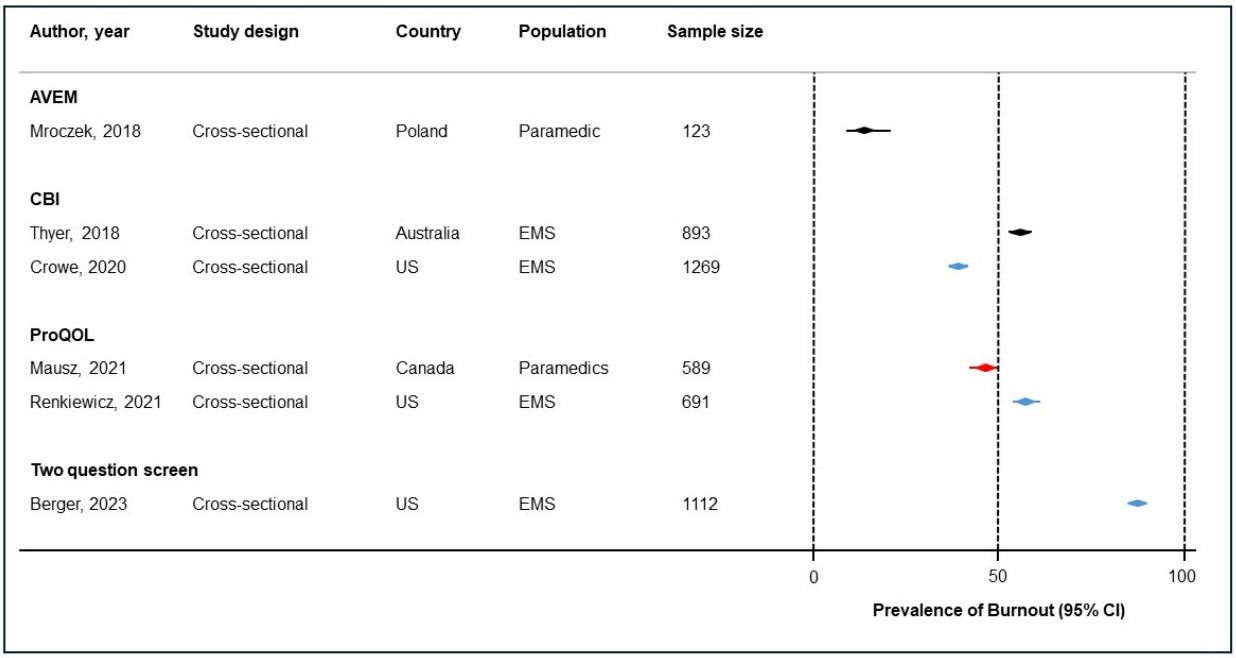
Twelve studies reported **continuous data** on burnout for the MBI subscales addressing depersonalization (4 studies[112, 127, 147, 149]), emotional exhaustion (9 studies[56, 84, 112, 127, 138, 147, 149-151]), and personal accomplishment (5 studies[112, 147, 148, 152, 153]). The studies frequently used their own versions of the MBI, which precludes synthesis of the continuous data.

3.2.3.1.3.1.2 Burnout (Measured Using Instruments Other Than the Maslach Burnout Inventory) Among EMS Clinicians During Routine Practice

Eleven studies used instruments other than the MBI to evaluate burnout among EMS clinicians: ProQOL (3 studies), CBI (3 studies), Short ProQOL (1 study), OLBI (1 study), Work-Related Behavior and Experience Patterns (AVEM; 1 study), Staff Burnout Scale for Health Professionals (SBS-HP; 1 study), a study-specific 36-question screener (1 study), and a study-specific 2-question screener (1 study).

Seven studies reported on the prevalence of burnout. Of these, six studies reported on the prevalence of **any burnout**, which ranged from 13.9 percent in Poland[154] to 87.7 percent in the United States (Figure 27).[155] One of these six studies (Crowe 2020), which reported a 39.1 percent prevalence of any burnout in the United States, also reported the prevalence of **patient-related burnout**, **work-related burnout**, and **agency-related burnout** as 11.6 percent, 37.6 percent, and 35.0 percent, respectively.[156] The seventh study (Leszczynski 2019) reported a 15.7 percent prevalence of **high-risk burnout** in Poland.[157]

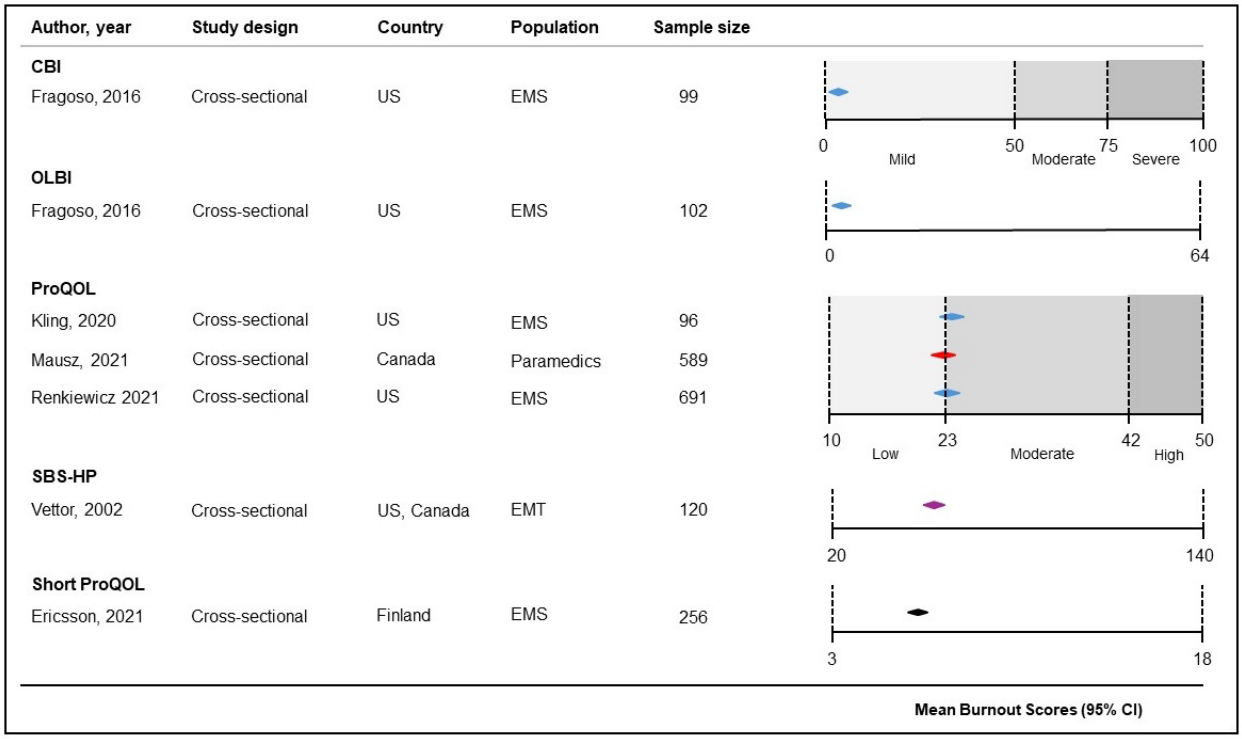
Figure 27. Prevalence of any burnout (based on instruments other than the Maslach Burnout Inventory) among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; MBI = Maslach Burnout Inventory; UK = United Kingdom; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; black = studies in countries other than the United States or Canada. The colors do not convey unique information.

Six studies reported **continuous data** on burnout (Figure 28). Three studies reported mean ProQOL scores (10 to 50; higher is worse) that ranged from 22.79 in Canada[61] to 23.68 in the United States.[158] Fragoso 2016 reported a mean OLBI (0 to 4; higher is worse) of 2.65 (SD 0.37) and a mean CBI (0 to 100; higher is worse) of 3.10 (SD 0.83) in the United States.[159] Vettor 2002 used the SBS-HP (20 to 140; higher is worse) and reported a mean of 56.72 (SD 20.79) in the United States and Canada.[160] Ericsson 2021 used the Burnout subscale of the Short ProQOL (3 to 18; higher is worse) and reported a mean of 6.0 (SD 2.3) in Finland.[161]

Figure 28. Severity of burnout (based on instruments other than the Maslach Burnout Inventory) among Emergency Medical Services clinicians during routine practice



Abbreviations: AVEM = Work-Related Behavior and Experience Patterns; CI = confidence interval; CBI = Copenhagen Burnout Inventory; OLBI = Oldenburg Burnout Inventory; ProQOL = Professional Quality of Life; SBS-HP = Staff Burnout Scale for Health Professionals; US = United States.
Color legend: blue = studies in the United States; red = studies in Canada; purple = studies in the United States and Canada; black = studies in countries other than the United States or Canada; shades of grey refer to severity of burnout as indicated below each X-axis. The colors do not convey unique information.

3.2.3.1.3.2 Burnout Among EMS Clinicians After Critical Mass Incidents

3.2.3.1.3.2.1 Burnout (Measured Using the Maslach Burnout Inventory) Among EMS Clinicians After Critical Mass Incidents

Two studies (1 in in Spain[51] and 1 in Australia[147]) during the COVID-19 pandemic reported on the following prevalence of burnout: **high depersonalization** (32% and 60.7%, respectively), **high emotional exhaustion (**35% and 68%, respectively), and **low personal accomplishment** (48% and 61.2%, respectively).

Five studies reported **continuous data** on burnout for the MBI subscales addressing depersonalization (5 studies[73, 78, 162-164]), emotional exhaustion (4 studies[73, 78, 162, 163]) and personal accomplishment (5 studies[73, 78, 162-164]). The studies frequently used their own versions of the MBI, which precludes synthesis of the continuous data.

3.2.3.1.3.2.2 Burnout (Measured Using Instruments Other Than the Maslach Burnout Inventory) Among EMS Clinicians After Critical Mass Incidents

Eight studies used instruments other than the MBI to evaluate burnout among EMS clinicians: CBI (2 studies), OLBI (1 study), Taiwan Ministry of Labor Burnout Tool (1 study), BAT-12 (1 study), and study-specific screeners (3 studies).

Four studies reported on the **prevalence** of burnout using inconsistent definitions. Two studies in Poland used study-specific screeners and reported 18.3 percent[165] and 38.3 percent prevalence of any burnout.[163] Kim 2022 reported 73.9 percent and 83.7 percent prevalence for exhaustion-related and disengagement-related burnout, respectively, in South Korea.[69] Izdebski 2023 reported that 15.0 percent and 14.4 percent of clinicians were at risk and at significant risk of burnout, respectively, in Poland.[166]

Five studies reported on the **severity** of burnout using inconsistent definitions. The studies frequently used their own versions of the tools, which precludes synthesis of the continuous data.

3.2.3.1.3.3 Modifying Factors for Burnout Among EMS Clinicians

Age: Six studies evaluated age as a modifying factor and reported inconsistent results.

One study in Poland reported that older age was associated with more burnout (p=0.005).[165] On the other hand, two studies (1 each in Spain[162] and Poland[165]) reported that older age was associated with less burnout. However, three studies (1 each in Spain,[150] Slovenia,[152] and Australia[167]) reported that age was not associated with burnout.

Sex: Nine studies evaluated sex as a modifying factor and reported inconsistent results. Two studies reported that female EMS clinicians had higher burnout. One study in Australia used the CBI and reported lower likelihood of burnout among those of male sex than those of female sex (OR 0.67, 95% CI 0.50 to 0.90).[167] One study in South Korea used the MBI and reported that those of female sex were more likely to have high burnout (OR 13.1, 95% CI 3.3 to 51.6).[168] One the other hand, one study in the United Kingdom used the MBI and reported that male EMS clinicians had higher burnout mean scores than female EMS clinicians (38 vs. 29, p-value not reported).[148] However, six studies (2 in the United States[169, 170] and 1 each in Spain,[150] Poland,[165] Slovenia,[152]and Taiwan[141]) reported inconsistent results for different aspects of burnout or reported that sex was not associated with burnout.

Role: One study in Taiwan evaluated role as a modifying factor and reported inconsistent results. The authors used the Taiwan Ministry of Labor Burnout instrument (<50 to >70, higher is worse) and reported that, compared with EMTs, paramedics had higher mean personal burnout scores (58.5 vs 52.0 $p < 0.05$) but comparable mean work-related burnout scores (53.3 vs 48.2 p=0.1).[141]

Financing: One study in the United States evaluated financing as a modifying factor and reported that volunteer emergency responders had lower mean MBI scores than career responders: depersonalization (8.1 vs. 12.2, p-value not reported) and emotional exhaustion (14.5 vs. 22.3, p-value not reported).[124]

Work Experience: Two studies evaluated work experience as a modifying factor and reported that more work experience was associated with more burnout. One study in Australia used the CBI and reported that, compared with those with less than 15 years of experience, those with 15 to 19 years were more likely to be burned out OR 3.1 (95% CI, 2.0 to 5.0) but those with 20 or more years of experience were not more likely to be burned out.[167] One study in the United Kingdom reported that the percentage of participants having high levels of burnout (definition not reported) generally increased with work experience: less than 5 years (5%), 6 to 10 years

(18%), 11 to 15 years (15%), 16 to 20 years (23%), 21 to 30 years (28%), and more than 30 years (33%).[148]

Trauma Exposure: One study in Spain reported that, compared with EMS clinicians who had not been exposed to physical and verbal violence, a higher percentage of those who had been exposed had high emotional exhaustion (2.5% vs. 17.3%), high depersonalization (7.7% vs. 15.1%), and low personal achievement (16.7% vs. 18.0%).[51]

Agency Size: Two studies evaluated agency size as a modifying factor and reported inconsistent results. One study in the United States used the CBI and reported that the number of EMS employees at the agency was not associated with the prevalence of burnout: up to 20 employees (33.%), 21 to 50 employees (40.0%), 51 to 100 employees (33.3%), and more than 100 employees (40.0%).[171] However, one study in South Korea used the MBI to evaluate burnout among paramedics working in emergency departments.[168] Paramedics working in emergency departments with fewer than 20 beds were more likely to have high burnout than those working in emergency departments with 20 or more beds (OR 9.27, 95% CI 1.75 to 53.2).

Setting: Three studies evaluated setting as a modifying factor and reported that urban settings were associated with greater burnout. One study in the United States used the CBI and reported a higher prevalence of burnout in urban than rural settings (39.4% vs. 33.3%, p-value not reported).[171] One study in the United States and Canada used the Staff Burnout Scale for Health Professionals and reported higher burnout in urban than rural settings (61.77 vs. 53.35, p-value not reported).[160] One study in Australia used the CBI and reported that those working in capital cities were more likely to be burned out (OR 3.0, 95% CI 1.6 to 5.7).[167]

Shift Characteristics: Two studies evaluated shift characteristics as a modifying factor and reported inconsistent results. One study in the United States and Canada reported that EMS clinicians who worked 24-hours shifts had less burnout than those who worked 12-hour shifts (p=0.021).[160] However, a study in Slovenia reported that 24 or more-hour shift work was associated with less personal accomplishment (i.e., more burnout) (p=0.008) but not more emotional exhaustion burnout (p=0.55) or depersonalization burnout (p=0.33).[152]

3.2.3.1.4 Burnout Among EMS Clinicians and Telecommunicators

Three cross-sectional studies in the United States enrolled both telecommunicators and EMS clinicians but did not report separate data for the two populations.[27, 172, 173] We report the burnout data here but do not consider these studies when making conclusions for either telecommunicators or EMS clinicians.

Boland 2018,[172] Boland 2019,[27] and Lu 2023[173] used the MBI and reported burnout prevalence of 18.0, 17.0 percent, and 39.2 percent, respectively.

3.2.3.2 Stress, Peritraumatic Stress, and Posttraumatic Distress

Thirty-nine studies reported on the prevalence or severity of stress, peritraumatic stress, or posttraumatic distress. These included two studies exclusively among telecommunicators, 35 exclusively among EMS clinicians, and two among both telecommunicators and EMS clinicians. See Appendix D, Evidence Tables D-198 through D-249 for details.

We have organized the stress outcomes by the following categories, defined in Table 8.

Table 8. Definition of stress, peritraumatic stress, and posttraumatic stress outcome categories

Outcome Category	Definition of Outcome Category	Specific Outcomes Reported in Included Studies
Stress	Stress is defined as the non-specific response of the body to any demand placed upon it.[174-176]	General stress, job stress, and psychological distress
Peritraumatic stress	Peritraumatic stress is defined as the emotional and physiological distress experienced during and/or immediately after a traumatic event and is associated with the development and severity of PTSD and related psychological difficulties.[177]	Peritraumatic distress and secondary traumatic stress
Posttraumatic distress	Posttraumatic distress is an umbrella term for 1) subsyndromal posttraumatic stress, 2) acute stress disorder, 3) PTSD, 4) vicarious traumatic stress, 5) compassion fatigue, and 6) secondary traumatic stress.[178]	Acute stress disorder

Abbreviations: PTSD = posttraumatic stress disorder.

3.2.3.2.1 Key Points for Stress

- Among telecommunicators during routine practice, the evidence regarding the prevalence of stress is insufficient.
- Among telecommunicators after critical mass incidents, the prevalence of high and medium general stress are 39.7 percent and 28.2 percent, respectively (low SoE).
- Among telecommunicators, the mean levels of job stress tend to be of low to moderate severity during routine practice (moderate SoE) and the mean levels of general stress tend to be moderate severity after critical mass incidents (low SoE).
- Among EMS clinicians during routine practice, there is considerable variation in the prevalence of any (32%), mild (3.1% to 26.3%), moderate (1.9% to 52.7%), severe (0% to 93%), and extremely severe (0 to 4.0%) general stress (low SoE).
- Among EMS clinicians after critical mass incidents, there is considerable variation in the prevalence of severe general stress (11.0% to 67.5%) and high psychological distress (36.0% to 73.1%) (low SoE).
- Among EMS clinicians during routine practice, the mean levels of general stress and job stress tend to be of mild to severe severity, and the mean levels of psychological distress tend to be of moderate severity (low SoE for both).
- Among EMS clinicians after critical mass incidents, the evidence regarding the severity of stress is insufficient.
- No eligible studies reported on the incidence of stress among telecommunicators or EMS clinicians.
- Modifying factors: Among telecommunicators, burnout, demanding work conditions, and number of shifts per month may be associated with general stress, and burnout and alexithymia may be associated with job stress. Among EMS clinicians, (a) female sex, non-minorities, having a college degree, being a paramedic, having more trauma exposure, overtime work, and higher call volumes may be associated with more general stress; (b) male sex, being a paramedic, and more years of experience may be associated with more job stress; and (c) being a paramedic and having more trauma exposure may be associated with more psychological distress, and having peer support may be associated with less psychological distress.

3.2.3.2.2 Key Points for Peritraumatic Stress

- The prevalence of high/extreme peritraumatic distress and high secondary traumatic stress among telecommunicators during routine practice are 5 percent and 16.3 percent, respectively (low SoE).
- Among telecommunicators during routine practice, the mean levels of peritraumatic distress tend to be of moderate severity (low SoE) and the mean levels of secondary traumatic stress tend to be of mild severity (low SoE).
- No eligible studies reported on peritraumatic stress among telecommunicators after critical mass incidents.
- Among EMS clinicians during routine practice, the mean levels of secondary traumatic stress tend to be of mild severity (low SoE).
- No eligible studies reported on the incidence of peritraumatic stress among telecommunicators or EMS clinicians.
- Modifying factors: Among telecommunicators, years of experience, trauma history, and female sex may be associated with peritraumatic distress, and female sex and burnout may be associated with secondary traumatic stress. Among EMS clinicians, more years of service and exposure to traumatic events may be associated with secondary traumatic stress.

3.2.3.2.3 Key Points for Posttraumatic Distress

- The prevalence of acute stress disorder among telecommunicators during routine practice is 17 percent (low SoE).
- No eligible studies reported on posttraumatic distress among telecommunicators after critical mass incidents.
- No eligible studies reported on the incidence of posttraumatic distress among telecommunicators.
- No eligible studies reported on posttraumatic distress among EMS clinicians.
- Modifying factors: Among telecommunicators, burnout may be associated with acute stress disorder.

3.2.3.2.4 Stress (General Stress, Job Stress, and Psychological Distress) Among Telecommunicators

3.2.3.2.4.1 General Stress Among Telecommunicators

Five cross-sectional studies reported on general stress among 1,602 telecommunicators using various measurements and thresholds: Perceived Stress Scale-10 (PSS-10), Calgary Symptoms of Stress Inventory (C-SOSI), cortisol levels, an study-specific stress assessment based on a single item.[40, 41, 50, 146, 179] Four studies were conducted during routine practice, and one was conducted in the context of the COVID-19 pandemic. See Appendix D, Evidence Tables D-198 through D-210 for details.

3.2.3.2.4.1.1 General Stress Among Telecommunicators During Routine Practice

Four studies reported data among general stress data among telecommunicators during routine practice. One study (Wahlgren 2020) reported that the prevalence of **high general stress** (PSS-10 ≥27) was 13.3 percent in the United States.[179]

Three studies reported inconsistent results for **general stress scores**. Based on the PSS-10 (0 to 40; higher is worse), Turner 2019 reported a mean score of 1.6 (SD 0.7) in the United States.[41] Meischke 2015 used their version of the C-SOSI (0 to 4; higher is worse) and reported a mean of 0.98 (SD 0.54) in the United States.[50] Weibel 2003 used a study-developed stress instrument (0 to 100; higher is better) and reported that the median emotional stress score in France was 40 (IQR 25 to 55).[40]

3.2.3.2.4.1.2 General Stress Among Telecommunicators After Critical Mass Incidents

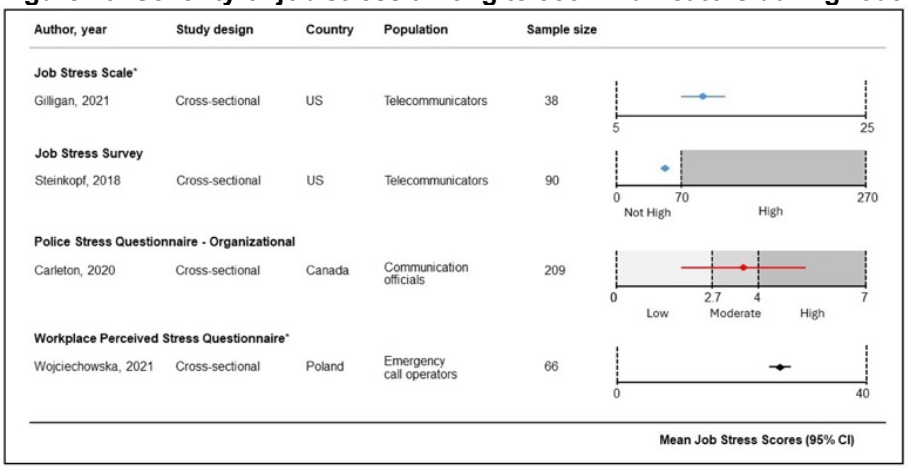
One study (Makara-Studzinska 2021) in Poland reported that the prevalence of **high general stress** (PSS-10 ≥27) was 39.7 percent in the aftermath of COVID-19, and the prevalence of **medium general stress** (PSS-10 14-26) was 28.2 percent. The PSS-10 **mean score** was 15.95 (SD 6.76).[146]

3.2.3.2.4.2 Job stress Among Telecommunicators During Routine Practice

Four cross-sectional studies reported on job stress among 403 telecommunicators during routine practice. One study (Steinkopf 2018) reported a 25.6 percent prevalence of **high job stress** (Job Stress Survey score ≥60) in the United States.[100]

The four studies reported **mean job stress scores** based on four different instruments (Figure 29).[102] Steinkopf 2018 used the Job Stress Survey (30 to 270; higher is worse) and reported a mean score of 52.69 (SD 10.37) in the United States.[100] Gilligan 2020 used their own version of the Job Stress Scale (5 to 25; higher is worse) and reported a mean score of 11.95 (SD 2.83) in the United States.[142] Wojciechowska 2021 used the Workplace Perceived Stress Questionnaire (0 to 40; higher is worse) and reported a mean score of 26.2 (SD 7.28) in Poland.[102] Carleton 2020 used the Police Stress Questionnaire (0 to 7; higher is worse) and reported separate mean scores for two subtypes of job stress in Canada: organizational stress 3.57 (SD 1.21) and operational stress 2.96 (SD 1.07).[44]

Figure 29. Severity of job stress among telecommunicators during routine practice



Abbreviations: CI = confidence interval; US = United States.
Color legend: blue = studies in the U.S.; red = studies in Canada; black = studies in other countries; shades of grey refer to severity of stress, where thresholds were available. The colors do not convey unique information.
*Studies that used these instruments did not use the standard thresholds for classifying severity.

3.2.3.2.4.3 Peritraumatic Stress (Peritraumatic Distress and Secondary Traumatic Stress) Among Telecommunicators

3.2.3.2.4.3.1 Peritraumatic Distress Among Telecommunicators During Routine Practice

Three cross-sectional studies used the Peritraumatic Distress Inventory (PDI) and reported on peritraumatic distress among 1,389 telecommunicators in the United States.[47, 48, 144] Although all three studies were conducted during routine practice, telecommunicators retrospectively were asked to report their distress at the time of or immediately after exposure to a critical incident that they considered the worst, most disturbing, or most troubling.

One study (Troxell 2008) reported a 5 percent prevalence of **high/extreme peritraumatic distress** (PDI sum score ≥40).[144]

Two studies reported **mean peritraumatic distress scores** based on the PDI (0 to 4; higher is worse), which ranged from 1.39 (SD 0.70) to 2.93 (SD not reported) (Lilly 2015 and Pierce 2012, respectively).[47, 144]

3.2.3.2.4.3.2 Secondary Traumatic Stress Among Telecommunicators During Routine Practice

Two cross-sectional studies among 918 telecommunicators reported on secondary traumatic stress during routing practice.[45, 144]

Both studies reported on the prevalence of **high secondary traumatic stress**. The prevalence was 16.3 percent in the United States based on the Professional Quality of Life (ProQOL) Secondary Traumatic Stress Subscale (Troxell 2008[144]) and 2.8 percent in Germany based on the German Questionnaire for Secondary Traumatization (Kindermann 2020).[45]

Troxell 2008 also reported a mean **secondary traumatic stress** score based on the ProQOL (10 to 50; higher is worse) of 12.13 (SD 7.89).[144]

3.2.3.2.4.5 Posttraumatic Distress Among Telecommunicators During Routine Practice

One cross-sectional study (Trachik 2015) reported a 17 percent prevalence of **acute stress disorder** among 205 telecommunicators during routine practice in the United States.[180]

3.2.3.2.4.6 Modifying Factors for Stress, Peritraumatic Stress, and Posttraumatic Distress Among Telecommunicators

3.2.3.2.4.6.1 Modifying Factors for General Stress Among Telecommunicators

One study in the United States reported statistically significant positive correlations of stress with **burnout** ($r=0.70$, $p < 0.001$) and frequency of **demanding work conditions** (i.e., working weekends, shift work, physical discomfort in the workstation, and deprivation of fresh air/natural light) ($r=0.30$, $p < 0.001$).[41] One study in Poland reported a positive association between stress and **number of shifts per month** ($\beta=0.12$, $p < 0.001$).[146]

3.2.3.2.4.6.2 Modifying Factors for Job Stress Among Telecommunicators

Statistically significant correlations were reported between job stress and **burnout** ($r=0.68$, $p < 0.001$) in a study in the United States[142] and between job stress and **alexithymia** ($r=0.30$, $p < 0.05$) in a study in Poland.[102]

3.2.3.2.4.6.3 Modifying Factors for Peritraumatic Distress Among Telecommunicators

One study in the United States reported that peritraumatic distress was correlated with **years of experience** ($r=0.12$, $p < 0.01$) and **trauma exposure** (i.e., frequency of lifetime exposure to 23 different traumatic events from never to more than 5 times) ($r=0.28$, $p < 0.01$).[47] Another study in the United States reported that those of **female sex** had higher total PDI stress scores than those of male sex (24.0 vs. 20.97, $p=0.011$).[144]

3.2.3.2.4.6.4 Modifying Factors for Secondary Traumatic Stress Among Telecommunicators

One study in the United States reported statistically significant correlations between secondary traumatic stress scores and **female sex** ($r=-0.10$), **burnout** ($r=0.62$), and the following **work-related factors**: full-time work ($r=-0.13$), work experience ($r=0.074$), mandatory overtime work ($r=0.10$), and staffing adequacy ($r=-0.19$).[144]

3.2.3.2.4.6.5 Modifying Factors for Acute Stress Disorder Among Telecommunicators

One study in the United States reported that the prevalence of acute stress disorder was statistically significantly correlated with **burnout** ($r=0.49$) but not **work experience**.[180]

3.2.3.2.5 Stress (General Stress, Job Stress, and Psychological Distress) Among EMS Clinicians

3.2.3.2.5.1 General Stress Among EMS Clinicians

Nineteen cross-sectional studies reported on general stress among EMS clinicians. Eight studies used variations of the Perceived Stress Scale (PSS-14, PSS-10, PSS-4), eight used the Stress Subscale of the Depression, Anxiety, and Stress Scale (DASS-21), and three used a range of other instruments or developed one specifically for their study. Seven of the 19 studies were conducted after a critical mass incident (the COVID-19 pandemic); the other 12 were conducted during routine practice.

3.2.3.2.5.1.1 General Stress Among EMS Clinicians During Routine Practice

Twelve studies, published between 2002 and 2022, reported on general stress among EMS clinicians during routine practice.

Seven studies reported on the prevalence of general stress (Figure 30). Of these, five studies used the DASS-21 (0 to 42; higher is worse), two studies used the PSS-14 (0 to 56; higher is worse), three used the PSS-10 (0 to 40; higher is worse), one study used the Anxiety Depression Scale (0 to 4; higher is worse), and one study used the Everly Behavioral Stress-68 (scoring ranges were not provided).

One study used the PSS and reported a 32.0 percent prevalence of **any general stress** in Australia (Figure 30).[92]

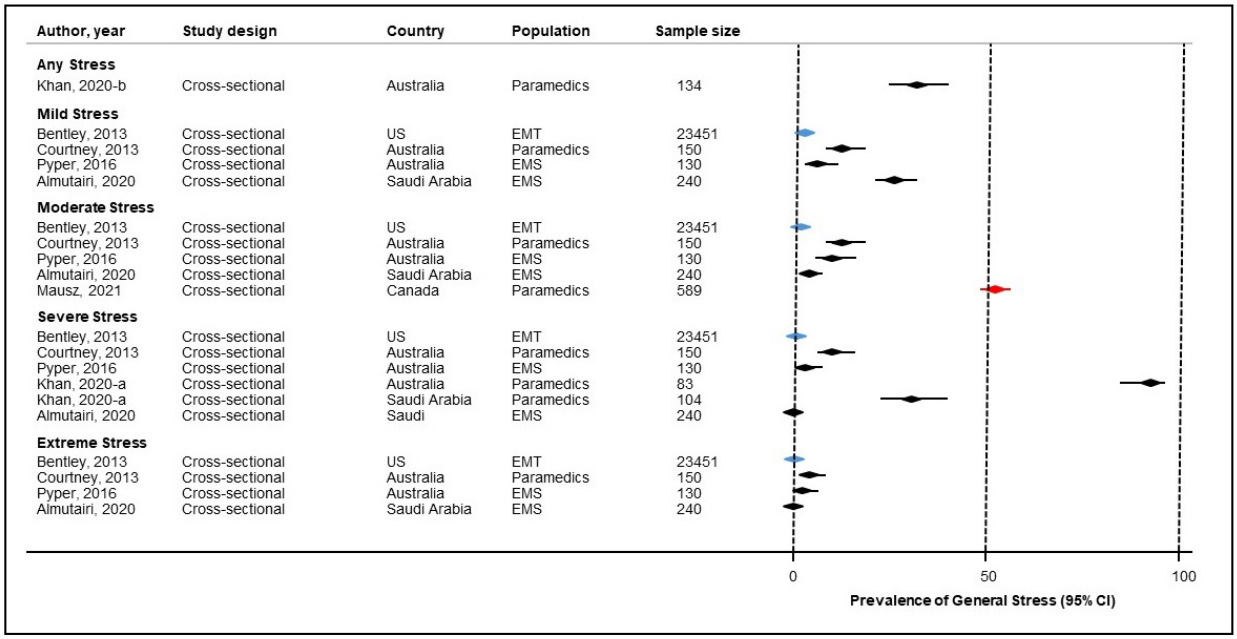
Four of the five studies that used the DASS-21 reported that the prevalence of **mild general stress** ranged from 3.1 percent in the United States[20] to 26.3 percent in Saudi Arabia.[181]

The five studies that used the DASS-21 reported that the prevalence of **moderate general stress** ranged from 1.9 percent in the United States[20] to 52.7 percent in Canada.[61]

In a study that used the PSS-14, the prevalence of **severe general stress** (PSS-14 >28) was 93 percent in Australia and 31 percent in Saudi Arabia.[94] Among the four studies that used the DASS-21, the prevalence of severe general stress (DASS-21 ≥26), the prevalence ranged from 0 percent in Saudi Arabia to 14.1 percent in Australia (Figure 30).[20, 67, 181, 182]

Among the four studies that used the DASS-21, the prevalence of **extremely severe general stress** (DASS-21 ≥40), the prevalence ranged from 0 percent in Saudi Arabia to 4.0 percent in Australia (Figure 30).[20, 67, 181, 182].

Figure 30. Prevalence of general stress among Emergency Medical Services clinicians during routine practice

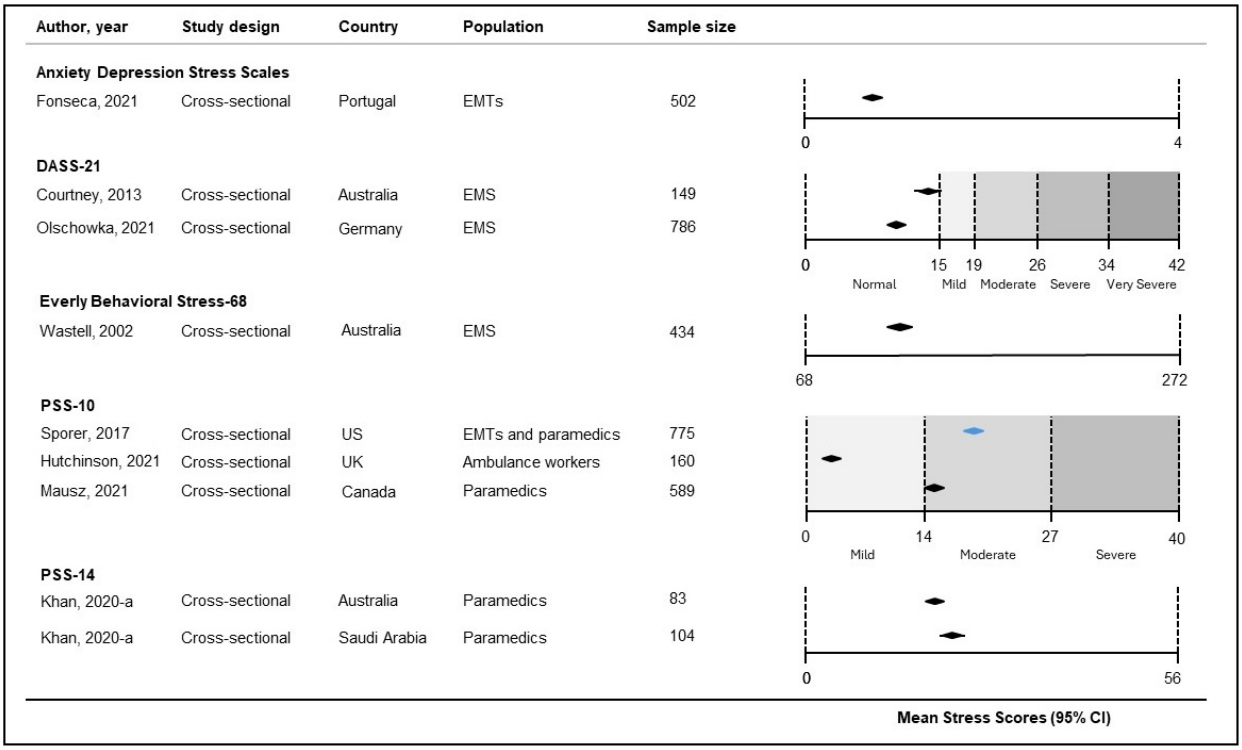


Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT = emergency medical technician; US = United States
Color legend: blue = studies in the U.S.; red = studies in Canada; black = studies in other countries. The colors do not convey unique information.

Eight studies reported on the severity of general stress using four different instruments: PSS-10 (5 studies), PSS-14 (1 study), DASS-21 (2 studies), Anxiety Depression Scale (1 study), and Everly Behavioral Stress-68 (1 study) (Figure 31). Three of the studies using the PSS-10 (0 to 40; higher is worse) provided mean scores, of which one study in the United Kingdom reported a scale mean of 2.86 (SD 0.71)[66] and the other two studies reported mean summed scores ranging from 14.93 (SD 6.26) in Canada[61] to 19.05 (SD 7.75) in the United States.[170] One study used the PSS-14 (0 to 56; higher is worse) and reported that paramedics in Australia and Saudi Arabia had means of 19.5 (SD 4.1) and 21.9 (SD 10.3), respectively.[94]

Of the two studies using the DASS-21 (0 to 42; higher is worse), the means were 10.25 (SD 7.8) in Germany[74] and 13.63 (SD 9.6) in Australia.[67] One study used the Anxiety Depression Scale (0 to 4; higher is worse) and reported a mean of 0.73 (SD 0.53) in Portugal.[183] One study using the Everly Behavioral Stress-68 (68 to 272; higher is worse) and reported a mean 119.5 (SD 31.5) in Australia (no scoring range provided).[184]

Figure 31. Severity of general stress among Emergency Medical Services clinicians during routine practice

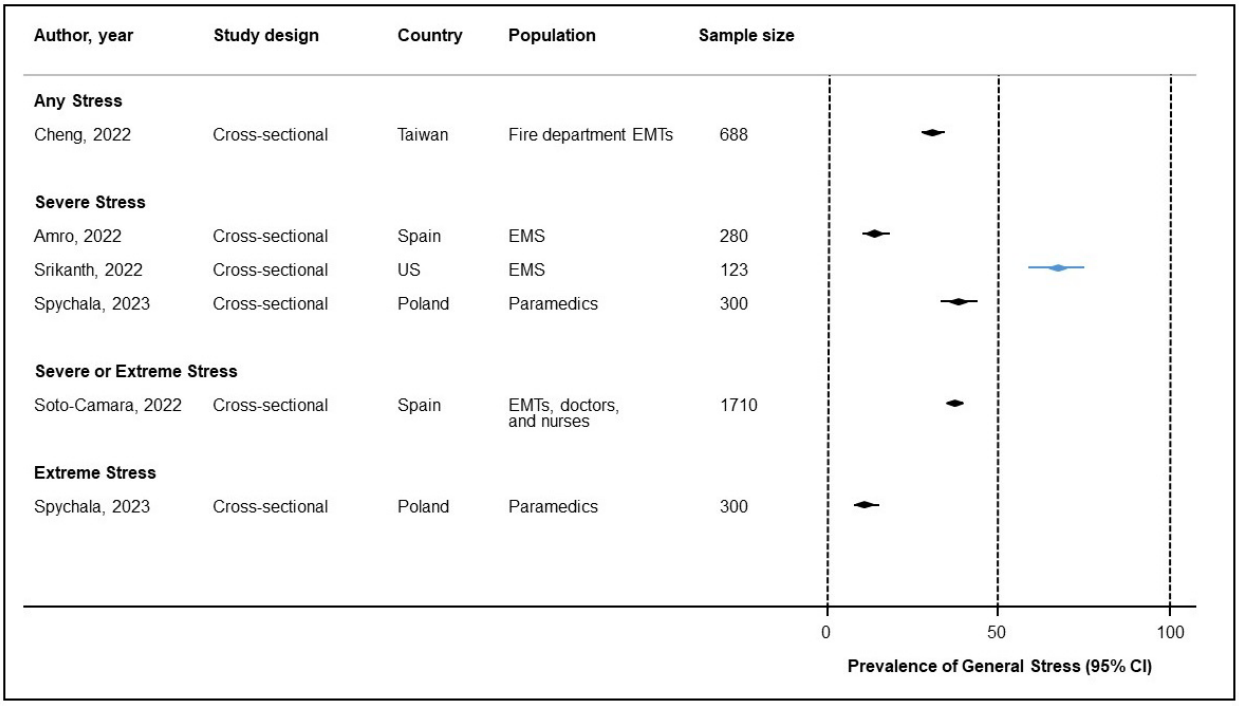


Abbreviations: CI = confidence interval; DASS-21 = Depression Anxiety and Stress Scale-21; EMS = Emergency Medical Services; EMT = emergency medical technician; PSS-10 = Perceived Stress Scale-10; PSS-14 = Perceived Stress Scale-14; UK = United Kingdom; US = United States.
Color legend: blue = studies in the U.S.; red = studies in Canada; black = studies in other countries; shades of grey refer to severity of stress, where thresholds were available. The colors do not convey unique information.

3.2.3.2.5.1.2 General Stress Among EMS Clinicians After Critical Mass Incidents

Five studies reported on the prevalence of general stress among EMS clinicians after critical mass incidents (the COVID-19 pandemic) (Figure 32). Cheng 2022 reported a 30.8 percent prevalence of **any general stress** in Taiwan.[81] Three studies reported prevalence of **severe general stress** ranging from 14 percent in Spain (PSS-10 ≥27) to 67.5 percent in the United States (PSS-4≥6).[76, 162, 165] Soto-Camara 2022 reported a 37.4 percent prevalence of **severe or extreme stress** in Spain.[72] Spychala 2023 reported a 11.0 percent prevalence of **extreme stress** in Poland.[165]

Figure 32. Prevalence of general stress among Emergency Medical Services clinicians after critical mass incidents



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; EMT = emergency medical technician; US = United States.
Color legend: blue = studies in the U.S.; black = studies in countries other than the U.S. or Canada. The colors do not convey unique information.

3.2.3.2.5.2 Job Stress Among EMS Clinicians

3.2.3.2.5.2.1 Job Stress Among EMS Clinicians During Routine Practice

Seven cross-sectional studies (2 in the United States, 2 in Canada, 1 in the United Kingdom, 1 in Germany, and 1 in New Zealand), published between 2005 and 2022, reported on **operational and organizational job stress** among 4,457 EMS clinicians during routine practice.[44, 53, 57, 58, 85, 123, 125] Each study used a different instrument to measure self-reported job stress, and no studied provided thresholds for categorizing job stress. None of the seven studies reported on the prevalence of job stress.

Four cross-sectional studies (2 in the United States, 1 in Canada, and 1 in the United Kingdom), published between 2005 and 2022, reported on **critical incident stress** among 6,652 EMS clinicians during routine practice.[85, 123, 125, 139] Each study used a different instrument that assessed stress levels in the context of variable numbers, frequencies, and/or types of critical incident exposures. Only one study (Newland 2015) reported a prevalence of critical incident stress, which was 85.7 percent in the United States.[139]

3.2.3.2.5.2.2 Job Stress Among EMS Clinicians After Critical Mass Incidents

Three studies, published between 2021 and 2023, reported on job stress within the context of COVID-19 pandemic. No study reported on the prevalence of job stress.

Each study reported **mean job stress scores** using a different instrument. Kim 2022 used the Global Assessment of Recent Stress (0 to 72; higher is worse) and reported that the mean job stress was 17.8 (SD 10.8) in South Korea.[69] Tham 2023 used the COVID-adapted version of the Perceived SARS Stress Scale (1 to 4; higher is worse) and reported that the mean job stress was 2.75 (SD 0.63) in Australia.[185] Alqahtani 2021 use a WHO questionnaire on psychological and social wellbeing of healthcare workers that had been used during the H1N1 influenza outbreak (0 to 10; higher is worse) and reported a mean of 7.13 (SD 2.19) in Saudi Arabia.[186]

3.2.3.2.5.3 Psychological Distress Among EMS Clinicians

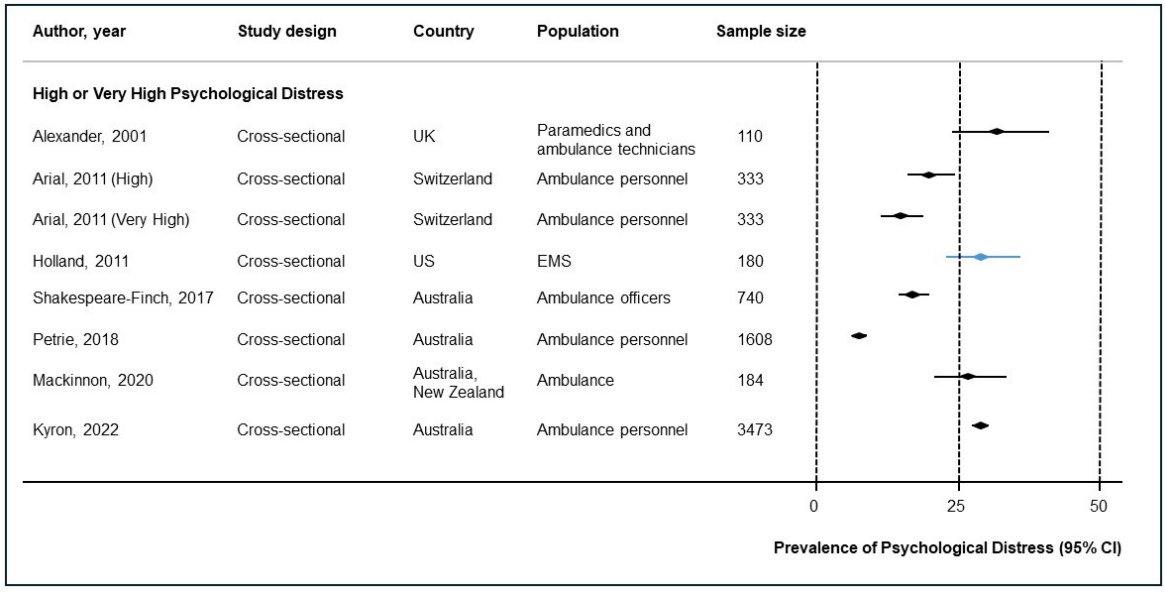
Eleven cross-sectional studies, published between 2001 and 2023, reported on psychological distress among EMS clinicians. Nine studies were conducted during routine practice, and two were conducted after critical mass incidents (COVID-19 pandemic).[132, 187]

Five of the 11 studies used the 10-item version of the Kessler Psychological Distress Scale (10 to 50; higher is worse), one study used the 6-item version of the Kessler Psychological Distress Scale (0 to 24; higher is worse), two studies used the 28-item version of the General Health Questionnaire (0 to 84; higher is worse), and three used the 12-item version of the General Health Questionnaire (0 to 36; higher is worse).

3.2.3.2.5.3.1 Psychological Distress Among EMS Clinicians During Routine Practice

Across the seven studies that reported the **prevalence of high psychological distress**, it ranged from 7.6 percent in Australia to 32 percent in the United Kingdom (Figure 33).[112, 188-193] Four of these studies used the 10-item version of the Kessler Psychological Distress Scale,[188-191] and three studies used the GHQ.[112, 192, 193]

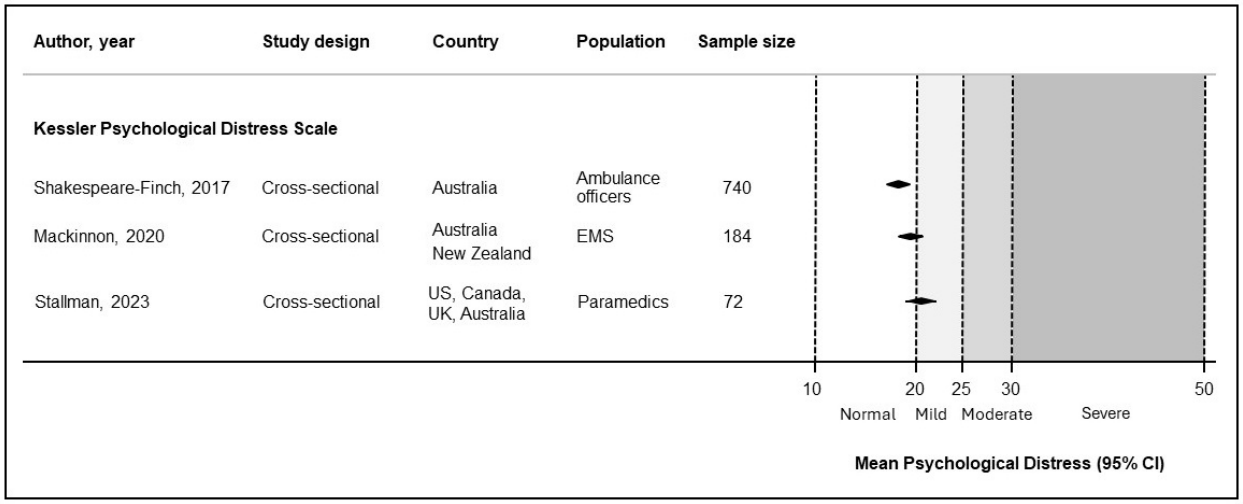
Figure 33. Prevalence of psychological distress among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; UK = United Kingdom; US = United States.
Color legend: blue = studies in the U.S.; black = studies in countries other than the U.S. or Canada. The colors do not convey unique information.

Three of the four studies (conducted across a total of five countries: in the United States, Canada, United Kingdom, Australia, and New Zealand) that used the Kessler Psychological Distress Scale with the same scoring method reported mean psychological distress scores ranging from 18.55 (SD 6.73) in Australia to 20.82 (SD 6.62) in a study conducted in the Unites States, Canada, the United Kingdom, and Australia (Figure 34).[42, 188, 191]

Figure 34. Severity of psychological distress among Emergency Medical Services clinicians during routine practice



Abbreviations: CI = confidence interval; EMS = Emergency Medical Services; UK = United Kingdom; US = United States.
Color legend: black = studies in countries other than the U.S. or Canada; shades of grey refer to severity of psychological distress. The colors do not convey unique information.

3.2.3.2.5.3.2 Psychological Distress Among EMS Clinicians After Critical Mass Incidents

Two studies reported on the prevalence of **psychological distress** among EMS clinicians after critical mass incidents (the COVID-19 pandemic). The prevalence of **high psychological distress** was 36.0 percent in Spain (GHQ-12≥24)[132] and 73.1 percent in Saudi Arabia (K10≥30).[187]

3.2.3.2.5.4 Secondary Traumatic Stress Among EMS Clinicians

Three studies, published between 2020 and 2022, reported on **secondary traumatic stress** among 999 EMS clinicians during routine practice. All three studies used either the full or modified versions of the ProQOL. Kling 2020 and Mausz 2022 used the full version (10 to 50; higher is worse) and reported mean scores of 21.94 (SD 6.11) in the United States[158] and 17.80 (SD 5.74) in Canada,[61] respectively. Ericsson 2021 used a modified version (3 to 18; higher is worse) and reported an overall mean of 4.9 (SD 2.0) in Finland.[161]. No study reported on the prevalence of secondary traumatic stress.

3.2.3.2.5.5 Modifying Factors for *Stress, Peritraumatic Stress, and Posttraumatic Distress* Among EMS Clinicians

3.2.3.2.5.5.1 Modifying Factors for *General Stress* Among EMS Clinicians

Age: Three studies evaluated age as a modifying factor and reported inconsistent results.[81, 162, 165] In one study in Spain younger clinicians had more stress ($p < 0.02$),[162] but two other studies reported the opposite: correlation coefficient 0.44 ($p=0.005$) in Poland[165] and $p < 0.001$ in Taiwan.[81]

Sex: Five studies (1 in the United States, 2 in Spain, 1 in Portugal, and 1 in Taiwan) evaluated sex as a modifying factor and reported that female EMS clinicians had statistically significant higher general stress than male EMS clinicians.[72, 81, 162, 170, 183]

Race: One study in the United States evaluated race as a modifying factor and reported that non-minorities had a higher prevalence of general stress than minorities (6.23% vs. 3.98%, p-value not reported).

Education: One study in the United States evaluated education as a modifying factor reported that those with a college degree had higher odds of general stress than those without a college degree (OR 1.22, 95% CI 1.09 to 1.37).[20]

Certification: One study in the United States evaluated certification as a modifying factor and reported that paramedics had higher odds of general stress than EMT Basic-certified clinicians (OR 1.32, 95% CI 1.23 to 1.42).[20]

Trauma Exposure: Two studies evaluated trauma exposure as a modifying factor and reported that it was associated with higher DASS-21 stress scores. One study, in Taiwan, reported that those who experienced violence because of work had higher mean DASS-21 stress scores than those who had not experienced it (mean 19.8 vs. 13.3, $p < 0.001$)[81] The other study, in Germany, reported that mean scores were positively correlated with verbal aggression (rho 0.21, $p < 0.001$), threatening verbal aggression (rho 0.20, $p < 0.001$), humiliating aggressive behavior (rho 0.21, $p < 0.001$) and provocative aggressive behavior (rho 0.27, $p < 0.001$).[74]

Work Experience: Four studies evaluated work experience as a modifying factor and reported inconsistent results. Three studies reported higher stress with more work experience,

including a study in the United States that reported that greater experience (number of years from ≤2, 3 to 7, 8 to 15, and ≥16 years) was associated with higher odds of general stress (OR 1.67, 95% CI 1.28 to 2.18),[20] a study in Taiwan reported that those with more experience (6+ years versus ≤ 5 years) had more stress ($p < 0.001$),[81] and a study in Australia reported that those with more experience (number of years of service) had more stress ($p < 0.001$),[184] However, the fourth study, in Poland, reported that those with the longest professional experience (>30 years) reported lower frequency of high/very high stress than paramedics with 1 to 5 and 6 to 10 years of experience (Cramer's V coefficient 0.45, p=0.008).[165]

Shift Characteristics: Three studies evaluated shift characteristics as a modifying factor. One study, in Poland, reported that those who worked **more overtime** were more likely to be stressed (correlation coefficient 0.37, $p < 0.001$).[165] Two other studies reported that those with **higher call volumes** in a typical week were more likely to be stressed. These included one study in the United States, that reported that the prevalence of high stress among those with high call volumes (40+ calls/week) was higher than among those with low call volumes (0 to 9 calls/week) (7.7% vs. 4.7%, p-value not reported)[20] and a study in Saudi Arabia that reported that those with higher call volumes (>4 calls/day) were more likely to be stressed than those with lower volume of calls (≤4 calls/day) (adjusted OR 2.18, 95% CI 1.02 to 4.64).[181]

3.2.3.2.5.5.2 Modifying Factors for *Job Stress* Among EMS Clinicians

Sex: Two studies (1 in the United Kingdom and 1 in New Zealand) evaluated sex as a modifying factor and reported that male EMS clinicians generally had higher job stress than female EMS clinicians.[53, 85]

Role: One study in the United States used their own version of the Police Stress Questionnaire (40 to 280; higher is worse) and evaluated role as a modifying factor. Compared with EMTs with basic training, paramedics had higher levels of chronic stress (85.7 vs. 97.0, p=0.001) and critical incident stress (19.91 vs. 32.62, $p < 0.01$).[123]

Work Experience: One study in the United States evaluated work experience as a modifying factor and reported a positive correlation between years of experience and chronic stress ($p < 0.01$) and between years of experience and critical incident stress ($p < 0.001$).[123]

3.2.3.2.5.5.3 Modifying Factors for *Psychological Distress* Among EMS Clinicians

Age: Two studies evaluated age as a modifying factor and reported inconsistent results. One study in Saudi Arabia reported that middle-aged EMS clinicians had less psychologic distress than those who were younger ($p < 0.05$),[187] but a study in Spain reported that middle-aged EMS clinicians (aged 40 to 49 years) had the highest prevalence of psychological distress.[132]

Sex: Two studies in Spain reported on differences by sex. One study reported a higher prevalence of psychological distress among those of female sex than those of male sex (46.3% versus 27.5%, $p < 0.001$).[132] Although the other study reported that sex significantly predicted psychological distress ($p < 0.01$), it did not indicate which sex had more stress.[194]

Role: One study in the United States used the GHQ-28 (0 to 84; higher is worse) and evaluated role as a modifying factor. Paramedics had higher mean psychological distress scores than firefighter/EMTs (5.41 vs. 2.10, $p < 0.01$).[192]

Work Experience: Three studies evaluated work experience as a modifying factor and reported inconsistent results. Two studies reported inverse relationships between years of service and psychologic distress: one study in Australia reported a β coefficient of 0.06 (p=0.041)[188] and

one study in Saudi Arabia did not report a coefficient but reported a p-value of less than 0.05.[187] However, a study in Spain reported that mid-career EMS clinicians (10 to 20 years' experience) had the highest prevalence of psychological distress.[132]

Trauma Exposure: Two studies evaluated trauma exposure as a modifying factor and reported that more trauma exposure was associated with psychological distress. One study in the United States used the GHQ-28 and reported statistically significant correlations between psychological distress and a variety of traumatic exposures (death of a child, care of family/friends, care of disaster patients, care of victims of crime, and care of burn victims) ($p < 0.05$ for each).[192] One study in the United Kingdom reported that the prevalence of high psychological distress (GHQ-28 ≥5 denoted caseness) was higher among EMS clinicians with trauma exposure than those without trauma exposure (37% vs. 10%, $p=0.02$).[112]

Peer Support: Two studies in Australia evaluated peer support as a modifying factor and reported that it was inversely associated with psychological distress. One study reported that being a peer support officer, having EAP access, and perceiving belongingness were inversely associated with psychological distress ($p < 0.001$ for each).[188] The other study reported a significant negative association between psychological distress and perceived manager commitment to a psychological safety climate ($p < 0.01$) and between psychological distress and perceived supportive manager behavior ($p < 0.01$).[189]

3.2.3.2.5.5.4 Modifying Factors for Secondary Traumatic Stress Among EMS Clinicians

Work Experience: One study in the United States reported a correlation between more work experience and secondary traumatic stress ($r=0.23$, $p < 0.05$).[158]

Trauma Exposure: One study in Finland reported a positive correlation between exposure to traumatic events and secondary traumatic stress ($r=0.19$, $p < 0.01$).[161]

3.2.3.3 Moral Injury

One cross-sectional study (Bayan 2021) reported on the severity of moral injury among 184 prehospital EMS clinicians in the United States.[137] See Appendix D, Evidence Table D-250\.

3.2.3.3.1 Key Points for Moral Injury

- No eligible studies reported on moral injury among telecommunicators.
- Among EMS clinicians during routine practice, the mean levels of moral injury tend to be of moderate severity (low SoE).
- No eligible studies reported on the incidence or prevalence of moral injury among EMS clinicians.
- Modifying factors: No conclusions are feasible.

3.2.3.3.2 Moral Injury Among Telecommunicators

No eligible studies were identified.

3.2.3.3.3 Moral Injury Among EMS Clinicians

Bayan 2021 used the Moral Injury Events Scale and reported **mean moral injury scores** among 184 EMS clinicians during routine practice.[137] For the perceived transgressions by self

(Self Subscale of the MIES; 2 to 12; higher is worse), the mean was 5.9 (SD 3.3). For the perceived transgressions by others (Other Subscale of the MIES; 4 to 24; higher is worse), the mean was 15.1 (SD 5.2).

3.2.3.3.4 Modifying Factors for Moral Injury Among EMS Clinicians

No eligible studies were identified.

3.3 Key Question 2. What are the effectiveness and comparative effectiveness, including benefits and harms, of interventions to promote resistance and resilience regarding mental health issues (depression, anxiety, posttraumatic stress disorder [PTSD], suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) among the EMS and 911 telecommunicator workforce?

3.3.1 Key Points

- Eight studies with a total of 721 participants addressed this Key Question (KQ), including six studies that enrolled 348 EMS clinicians and two studies that enrolled 373 telecommunicators.
- Mindfulness-building interventions targeting both resistance and resilience among EMS clinicians may be associated with reduced burnout at up to 6 months of follow-up (low SoE).
- The evidence is insufficient regarding the impacts of resistance and resilience interventions on anxiety, depression, PTSD, and alcohol use among telecommunicators.
- The evidence is insufficient regarding the impacts of resistance interventions and resilience interventions on resilience, anxiety, and depression among EMS clinicians.
- No eligible studies reported on the effectiveness of interventions in reducing hospitalizations, suicidality, and withdrawals from the workforce. No studies reported on unintended harms of interventions.

3.3.2 Description of Included Studies

Eight studies, published between 2019 and 2023, evaluated the effectiveness of interventions for mental health and occupational stress issues among telecommunicators and EMS clinicians. Two studies enrolled telecommunicators[195, 196] and six studies enrolled prehospital EMS clinicians.[197-202]

Two of the eight studies were RCTs.[196, 197] One study randomized participants to an active intervention or a waitlist control.[196] The other study randomized participants to an active intervention condition or a passive non-placebo control condition.[197]

Among the six non-randomized studies, one was a controlled trial with a waitlist control,[198] four were pre-post studies,[195, 199-201] and one was a prospective cohort (single group) study.[202]

Among the eight studies, three were conducted in the United States,[195, 201, 202] one in both the United States and Canada,[196] and one each in the United Kingdom,[200] Belgium,[197] France,[198] and Spain.[199]

Seven of the eight studies were funded by non-industry sources, with the remaining study's funding source unreported.[197] See Appendix D, Evidence Tables D-251 through D-254.

3.3.2.1 Participant Characteristics

Sample sizes for the eight studies ranged from 50[195] to 502[196] among telecommunicator studies and from 10[202] to 58[199] among EMS clinician studies. The telecommunicator studies included predominantly female participants, with a range from 76.9 percent[195] to 82 percent.[196] The female participants in the EMS clinician studies had ranged from 13.3 percent[202] to 64.3 percent.[200]

The average ages of participants ranged from 28.5[200] to 46.2 years.[202] Only three studies reported on race, with White participants comprising the majority of those studies' participants: 100 percent,[200] 90.1 percent,[196] and 77.8 percent[195]. Only two studies reported on ethnicity, with 1.9 percent[196] and 10.3 percent[195] Hispanic participants in those studies.

Five studies reported on participant advanced life support (ALS) training. Between 26.7 percent[201] and 100 percent were ALS-trained.[197, 198, 200]

Six studies[195, 196, 198-201] reported participant years of experience, and they ranged considerably (2 to 30 years).

3.3.2.2 EMS and Telecommunicator Agency Characteristics

Two studies were conducted in urban agencies,[197, 198] one in a rural agency[202], and the others did not report on location. No study reported on agency size or work or overtime restrictions. One study reported a mix of agency financing,[197] and another study identified study participants as volunteers;[202] no other study reported on financing. Only one study reported that mental health resources were available at the agency.[199] Only one study[198] was conducted after a critical incident (aftermath of the COVID-19 pandemic); the remaining seven studies were conducted during routine practice.

3.3.2.3 Intervention Characteristics

Of the eight studies, the targets of the interventions evaluated were resistance only (1 study), resilience only (1 study), and resistance and resilience (6 studies). Table 9 describes the interventions in the eight studies. The interventions were focused on acute stress/crisis management in one study,[197] subacute coping/stress management in four studies,[196, 198, 199, 202] and long-term stress management in four studies.[195, 200, 201]

Table 9. Key Question 2: Intervention characteristics

Intervention Target	Number of Studies	Description
Resistance only	1	• Training video aimed at reducing mental health stigma[200]
Resilience only	1	• Virtual reality immersion simulating a shooting[197]
Resistance and Resilience	6	• Mindfulness-based online intervention for reducing stress[196] • Mindfulness and positive psychology workshops, individual daily meditation, and heart coherence training[198] • 8-week mindfulness and stress reduction course[202] • Peer support by a team providing outreach to air medical crew members with assistance from a flight chaplain[201] • Multicomponent intervention employing an app (PTSD Coach) with modules on deep breathing, mindfulness listening, muscle relaxation, and thought stopping, with weekly assessments for 6 weeks[195] • Training using adaptive humor to maintain positive social interactions and deal with stressful situations[199]

Abbreviations: PTSD = posttraumatic stress disorder.

3.3.3 Risk of Bias

We used study design-specific tools to assess risk of bias in the eight studies. We deemed six studies to have a high risk of bias, one to have a moderate risk of bias, and one to have a low risk of bias. We assessed both RCTs[196, 197] to have an overall high risk of bias, mostly arising from risks of selection bias, detection bias, and incomplete outcome data. We deemed the non-randomized controlled trial[198] to have an overall high risk of bias owing to selective outcome reporting. One of the four longitudinal studies was deemed to have overall low risk of bias,[199] one moderate risk of bias,[195] and the other three high risk of bias,[200-202] arising from concerns around confounding and lack of clarity about the similarity of exposure ascertainment between study groups (Appendix D – Evidence Tables D-255 through D-257).

3.3.4 Organization of Results for KQ2

We present results by intervention target: resilience only (1 study), resistance only (1 study), and resistance and resilience (6 studies). Tables 10 and 11 provide our SoE assessment for telecommunicator and EMS clinician studies, respectively. See Appendix D, Evidence Tables D-258 through D-279 for details outcome results data

3. Results

Table 10. Key Question 2: Evidence profile of prioritized outcomes for interventions among telecommunicators

Outcome	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Hospitalizations	0	-	-	-	-	-	-	None
Burnout	0	-	-	-	-	-	-	None
Resilience	0	-	-	-	-	-	-	None
Anxiety	1 (117)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
Depression	1 (117)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
PTSD	1 (117)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
Substance use	1 (117)	Moderate	Unknown	Precise	Direct	Undetected	Insufficient*	None
Suicidality	0	-	-	-	-	-	-	None
Withdrawal from workforce	0	-	-	-	-	-	-	None
Unintended harms of intervention	0	-	-	-	-	-	-	None

Abbreviations: PTSD=posttraumatic stress disorder.
The colors are used only to distinguish successive outcomes. The colors do not add unique information.
*Sparse evidence because of one pre-post study.

Table 11. Key Question 2: Evidence profile of prioritized outcomes for interventions among Emergency Medical Services clinicians

Outcome	Intervention Type	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
Hospitalizations	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Burnout	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	3 (141)	High	Consistent	Precise	Direct	Undetected	Low	Mindfulness-based interventions associated with reduced burnout at up to 6 months followup. Insufficient evidence regarding peer support.
Resilience	Resistance only	1 (42)	High	Unknown	Precise	Direct	Undetected	Insufficient*	None
	Resilience only	1 (40)	High	Unknown	Precise	Direct	Undetected	Insufficient*	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Anxiety	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	1 (58)	Low	Unknown	Precise	Direct	Undetected	Insufficient*	None
Depression	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	1 (58)	Low	Unknown	Precise	Direct	Undetected	Insufficient*	None

3. Results

Outcome	Intervention Type	Number of Studies (Participants)	Risk of Bias	Consistency	Precision	Directness	Reporting Bias	Strength of Evidence	Conclusions
PTSD	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Substance use	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Suicidality	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Withdrawal from workforce	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None
Unintended harms of intervention	Resistance only	0	-	-	-	-	-	-	None
	Resilience only	0	-	-	-	-	-	-	None
	Resistance & resilience	0	-	-	-	-	-	-	None

Abbreviations: PTSD=posttraumatic stress disorder.
The colors are used only to distinguish successive outcomes. The colors do not add unique information.
*Sparse evidence because of only one (small) study.

3.3.5 Interventions Targeting Only Resistance

3.3.5.1 Training Video

One pre-post study (Hazell 2022) evaluated a training video intervention that targeted building resilience among 42 EMS clinicians in the United Kingdom.[200] The video aimed to reduce mental health stigma. The study reported that, when comparing before and after the training video intervention, participants had comparable scores of **resilience** and **social connections/support**.[200]

3.3.6 Interventions Targeting Only Resilience

3.3.6.1 Virtual Reality Exposure and Audio Immersion of a Shooting Attack Scenario

One RCT (Chaabane 2022) randomized 40 ambulance workers in Belgium to a single virtual reality exposure session or an audio immersion of a shooting attack scenario.[197] In both groups, participants experienced comparable reductions in **stress** (p=0.72, effect size not reported) and **resilience** (sense of competence) (p=0.73, effect size not reported), based on visual analog scales.

3.3.7 Interventions Targeting Resistance and Resilience

3.3.7.1 Mindfulness Building

Three studies evaluated mindfulness-building interventions to foster resilience.[196, 198, 202] Lily 2019 was a 7-week, 323-participant RCT that compared a weekly, online mindfulness intervention (Destress 9-1-1) with a wait-list control group for telecommunicators in the United States and Canada.[196] Giaume 2023 was a non-randomized interventional study in France that compared a program focused on reducing burnout among 66 prehospital EMS clinicians through a combination of mindfulness, heart coherence training, and positive psychology workshops (FIRECARE) versus 31 prehospital EMS clinicians who served as waitlist controls.[198] Ducar 2020 was a prospective cohort study of an 8-week mindfulness and stress reduction course (without a control group) among 15 prehospital EMS clinicians in the United States.[202]

Lilly 2019 reported that the mindfulness intervention significantly reduced **stress** (evaluated using the C-SOSI; 0 to 280; higher is worse) after the intervention (mean difference −10.0, 95% CI −14.9 to −5.2) and 3 months later (mean difference −6.5, 95% CI −11.9 to −1.1).[196] However, Giaume 2023 reported that those who received the mindfulness intervention and the waitlist controls had comparable **secondary traumatic stress** (assessed using the ProQOL-5).[198] Ducar 2020 reported a significant reduction in stress (using the PSS) at 8 weeks, but stress levels rebounded at 3 and 6 months post-intervention.[202]

Two studies reported on **burnout** using the ProQOL-5 (10 to 50; higher is worse).[198, 202] Giaume 2023 reported that, at the 3-month timepoint, compared with the waitlist group, the intervention group experienced greater reductions in burnout (p=0.02, effect size not reported).[198] Ducar 2020 reported that, compared with baseline, there were statistically significant lower burnout scores at the final (8 weeks) session (mean 19.5 vs. 24.0, p=0.007), at 3 months (mean 18.40 vs. 24.0, p=0.003), and at 6 months (mean 18.9 vs. 24.0, p=0.016).[202] Similarly, Ducar 2020 reported that, compared with baseline, there were statistically significant higher

compassion satisfaction mean scores (10 to 50; higher is worse) at the final (8-week) session (mean 41.3 vs. 37.3, p=0.002), at 3 months (41.6 vs. 37.3, p=0.019), and at 6 months (42.8 vs. 37.3, p=0.009).[202]

3.3.7.2 Multicomponent Interventions

One pre-post study (Willis 2020) evaluated a mobile health application (PTSD Coach) with multiple components of resilience building (deep breathing, mindfulness listening, muscle relaxation, and thought stopping) among 117 telecommunicators in the United States.[195] Compared with baseline, there were significant improvements in **depression**, based on Depression subscale of the PHQ-9 (0 to 27; higher is worse) (4.1 vs. 6.7, p=0.001); **anxiety**, based on the GAD-7 (0 to 21; higher is worse) (4.0 vs. 6.1, p=0.001); **PTSD**, based on the PCL-5 (0 to 80; higher is worse) (10.1 vs. 19.9, p < 0.001); and **alcohol use**, based on the AUDIT-C (0 to 12; higher is worse) (2.5 vs. 3.3, p=0.007).[195]

3.3.7.3 Peer Support

One pre-post study (McCall 2023) evaluated a peer support program among 60 air medical crew members in the United States.[201] A peer support team provided outreach to crew members with assistance from a flight chaplain.

For **burnout** and **compassion satisfaction**, both evaluated using the ProQOL, there were no statistically significant improvements overall or when stratified by duration of experience in the field. For **secondary traumatic stress**, there were no significant improvements overall or when stratified by sex and job role.

3.3.7.4 Adaptive Humor

One pre-post study (Leon-Perez 2021) evaluated the training of 58 EMS clinicians in Spain in adaptive humor to maintain positive social interactions and deal with stressful situations.[199] Compared with baseline, participants experienced improvements in the following outcomes, all based on the GHQ (0 to 6; higher is worse): **anxiety** (1.74 vs. 2.12, p=0.05), **depression** (1.86 vs. 3.41, p=0.001), **social dysfunction** (p=0.002, scores not reported), and **psychological distress** (p=0.001, scores not reported).[199]

3.4 Key Question 3. What are the contextual and implementation factors of studies with effective EMS/telecommunicator workforce practices to prevent, recognize, and treat mental health issues (depression, anxiety, posttraumatic stress disorder [PTSD], suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury)?

3.4.1 Key Points

- Five studies with 579 participants reported on interventions that were associated with benefits for at least one outcome of interest. These included three studies among a total of 139 EMS clinicians and two studies among a total of 440 telecommunicators.
- No eligible intervention studies among telecommunicators reported on any of the context or implementation factors associated with effective practices to prevent, recognize, and treat mental health or occupational stress issues.

- Based on the intervention studies among EMS clinicians, the evidence is insufficient regarding the effects of setting (urban/suburban/rural), shift durations, and agency financing as contextual or implementation factors. There is no evidence in the studies on interventions regarding the effects of workforce training, agency sizes, overtime restrictions, or availability of mental health resources.

3.4.2 Description of Included Studies

A total of five studies addressed this Key Question (KQ). All five studies are drawn from the pool of studies addressing KQ2. The studies chosen for this KQ are those in which the interventions were associated with benefit for at least one outcome of interest (regardless of whether we could make a conclusion for that outcome across studies in KQ2). Detailed results from these studies are in the KQ2 section.

The five studies included two studies (1 RCT[196] and 1 pre-post study[195]) among a total of 440 telecommunicators and three studies (1 non-randomized trial,[198] 1 pre-post study,[199] and 1 prospective cohort study[202]) among a total of 139 pre-hospital EMS clinicians. Two studies were conducted in the United States,[195, 202] one in the United States and Canada,[196] and one each in France[198] and Spain.[199] Only one of the five studies was conducted in the aftermath of the COVID-19 pandemic.[198]

3.4.2.1 Participant Characteristics

The sample sizes ranged from 50[195] to 323[196] among the telecommunicator studies and 15[202] to 66[198] among the EMS clinician studies. The telecommunicator studies predominantly included female participants, with a range from 76.9 percent[195] to 82 percent.[196] The EMS clinician studies had a range for female participants from 13.3 percent[202] to 46.6 percent.[199] The average ages of participants ranged from 37.4[195] to 46.4 years.[202] Only two studies reported on race, with White participants comprising the majority of those studies' participants: 90.1 percent[196] and 77.8 percent.[195] Only two studies reported on ethnicity, with 1.9 percent[196] and 10.3 percent[195] Hispanic participants in those studies.

3.4.3 Results, Context, and Implementation Factors in Telecommunicator Studies

The RCT (Lily 2019) compared a 7-week weekly, online mindfulness-based intervention (Destress 9-1-1) with a wait-list control group for telecommunicators in the United States and Canada.[196] The intervention significantly reduced stress after the intervention and 3 months later.[196] The pre-post study (Willis 2020) evaluated a mobile health application (PTSD Coach) with multiple components of resilience building (deep breathing, mindfulness listening, muscle relaxation, and thought stopping) among 117 telecommunicators in the United States.[195] Compared with baseline, there were significant improvements in depression, anxiety, PTSD, and alcohol use.[195]

Neither study reported on contextual or implementation factors, such as **workforce training**, **agency sizes**, **agency locations** (urban/suburban/rural), **shift characteristics**, **overtime restrictions**, **agency financing**, or **availability of mental health resources**.

3.4.4 Results, Context, and Implementation Factors in EMS Clinician Studies

The pre-post study (Leon-Perez 2021) evaluated the training of 58 EMS clinicians in Spain in adaptive humor to maintain positive social interactions and deal with stressful situations.[199] Compared with baseline, participants had improvements in anxiety, depression, social dysfunction, and psychological distress.[199]

The non-randomized interventional study (Giaume 2023) compared a program focused on reducing burnout among 66 prehospital EMS clinicians in France through a combination of mindfulness, heart coherence training, and positive psychology workshops (FIRECARE) with waitlist controls.[198] At the 3-month timepoint, compared with the waitlist group, the intervention group experienced greater reductions in burnout.[198]

The prospective cohort study (Ducar 2020) evaluated an 8-week mindfulness and stress reduction course (without a control group) among 15 prehospital EMS clinicians in the United States.[202] Compared with baseline, there were statistically significant lower burnout scores and higher compassion satisfaction scores at 8 weeks, 3 months, and 6 months.[202]

The non-randomized interventional study (Giaume 2023) was in an urban **setting**, and the prospective cohort study (Ducar 2020) was in a rural setting. The other study did not report on the setting.

The non-randomized interventional study (Giaume 2023) reported that **shift durations** were either 24 or 48 hours, with 120 shifts a year. Neither of the other two studies reported on shift characteristics.

All participants in the prospective cohort study (Ducar 2020) were at **volunteer agencies**; neither of the other two studies reported on agency financing.

None of the three intervention-based studies reported other contextual or implementation factors, such as **workforce training**, **agency sizes**, **overtime restrictions**, or **availability of mental health resources** to EMS clinicians.

3.5 Key Question 4. What future research is needed to close existing evidence gaps regarding prevention, recognition, and treatment of mental health issues (depression, anxiety, posttraumatic stress disorder [PTSD], suicidality, and substance use disorders) and occupational stress issues (burnout, stress, and moral injury) in the EMS and telecommunicator workforces?

3.5.1 Key Points

- Future research should evaluate mindfulness-based and other interventions. Some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) that are associated with poor outcomes likely provide valuable insights into other potential avenues for future intervention development and evaluation.
- Future studies should be either randomized controlled trials that are adequately powered and well-conducted or non-randomized studies that adequately account for important confounders.
- Future studies should consistently evaluate and report various prioritized outcomes.

- Future studies should be fully reported, including reporting various characteristics of the agencies in which the study was conducted.

3.5.2 Evidence and Research Gaps

As discussed in section *3.3 Key Question 2*, there are extensive gaps in the evidence regarding the effectiveness of interventions to prevent, recognize, and treat mental health and occupational stress issues among telecommunicators and EMS clinicians. The focus of this systematic review is on interventions targeting resistance and resilience (i.e., not recovery/treatment).

For telecommunicators, we identified only two studies, each of which evaluated an intervention targeting both resistance and resilience (Table 8). These included an RCT (Lilly 2019[196]) that evaluated a 7-week, weekly, online mindfulness intervention (Destress 9-1-1) and a pre-post study (Willis 2020[195]) that evaluated a mobile health application (PTSD Coach) with multiple components: deep breathing, mindfulness listening, muscle relaxation, and thought stopping. We were unable to make a conclusion regarding the effectiveness of these interventions among telecommunicators because the RCT did not report any of our prioritized outcomes for KQ2 and the pre-post study was small and did not involve a comparator group.

For EMS clinicians, we identified only six studies, of which one study (Hazell 2022[200]) evaluated an intervention targeting resistance only, one study (Chaabane 2022[197]) evaluated an intervention targeting resilience only, and four studies (Giaume 2023[198] Ducar 2020,[202] McCall 2023,[201] and Leon-Perez 2021[199]) evaluated interventions targeting both resistance and resilience (Table 12). The interventions evaluated in these six EMS clinician studies were diverse, including two studies (Leon-Perez 2021 and Ducar 2020) that evaluated mindfulness-based interventions and one study each that evaluated a training video aimed at reducing mental health stigma (Hazell 2022[200]), a virtual reality immersion simulating a shooting (Chaabane 2022[197]), a peer support outreach to air medical crew members with assistance from a flight chaplain (McCall 2023[201]), and a training using adaptive humor (Leon-Perez 2021[199]). Because of the diversity of the interventions as well as the sparseness of the reported data for specific outcomes that we prioritized, we were able to make only one conclusion regarding the effectiveness of these interventions among EMS clinicians (i.e., that mindfulness-based interventions that target resistance and resilience may be associated with less burnout at up to 6 months of followup; see KQ2 section *3.3.1 Key Points*).

Table 12. Key Question 4: Evidence map of designs of studies of interventions targeting resistance and/or resilience among telecommunicators and Emergency Medical Services clinicians

Population	Target	RCTs	Non-Randomized Trials	Pre-Post Studies	Cohort Studies	Total
Telecommunicators	Resistance only	-	-	-	-	-
	Resilience only	-	-	-	-	-
	Resistance & resilience	1	-	1	-	**2**
EMS clinicians	Resistance only	-	-	1	-	**1**
	Resilience only	1	-	-	-	**1**
	Resistance & resilience	-	1	2	1	**4**
Total	**Resistance &/or resilience**	**2**	**1**	**4**	**1**	**8**

Abbreviations: - = 0 studies identified, EMS = Emergency Medical Services; RCT = randomized controlled trial.

3.5.3 Studies that are Needed

Despite the sparsity of the evidence, the studies among telecommunicators and EMS clinicians (summarized above and detailed in *section 3.3 Key Question 2*) reported some promising findings that future research should explore. We summarize here the interventions, study designs and methods, outcomes, and reporting that are needed for future studies.

3.5.3.1 Interventions that Should be Evaluated in Studies that are Needed

As discussed in *section 3.2 Key Question 1*, we identified some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) that are associated with poor mental health and/or occupational stress outcomes. These modifying factors likely provide valuable insights into potential avenues that could be further evaluated for preventive and early therapeutic interventions. Among existing interventions that show promising findings, mindfulness-based interventions specifically deserve further exploration.

3.5.3.2 Designs and Methods of Studies that are Needed

It is crucial that future studies of interventions conduct randomization (to avoid selection bias). These RCTs should be adequately powered (to detect potentially small treatment effects) and well conducted. We recognize, however, that randomization may not always be possible or practical; in that context, non-randomized studies should report between-group estimates of treatment effect that adequately account for important confounders, such as work experience and other factors. Ideally, propensity scoring (or similar rigorous techniques) should be used to adequately adjust for confounders. In terms of performance and detection biases, while blinding of participants and care providers will rarely be feasible (if at all), studies should blind the assessors of outcomes that are not participant reported.

3.5.3.3 Outcomes in Studies that are Needed

Future studies should also consistently evaluate and report prioritized outcomes that have not been adequately reported in the identified evidence for KQ2, such as hospitalizations, resilience, anxiety, depression, PTSD, substance use, suicidality, withdrawal from workforce, and unintended harms of interventions.

3.5.3.4 Reporting of Studies that are Needed

Future studies should fully report the characteristics of the agencies in which the study was conducted. This includes detailed information, such as agency size, agency characteristics, shift characteristics, shift work, overtime restrictions, agency financing, and availability of mental health resources.

4. Discussion

By responding to and managing emergencies and coordinating critical services, Emergency Medical Services (EMS) clinicians and telecommunicators are vital to public health, medical infrastructure, and safety. However, the routinely demanding and traumatic nature of their work exposes them to significant mental health issues, such as depression, anxiety, posttraumatic stress disorder (PTSD), substance use, and suicidality, and occupational stress issues, such as burnout, stress, peritraumatic stress, posttraumatic distress, and moral injury. This systematic review comprehensively and critically examines the breadth and depth of available research on the incidence, prevalence, and severity of these issues among the EMS and telecommunicator workforce as well as the best ways of promoting resistance and resilience regarding these issues. Through a thorough analysis of eligible existing literature, this report presents the current state of knowledge surrounding mental health issues within these professions. The report identifies crucial modifying factors that may influence mental health outcomes, identifies interventions that have been studied, and proposes avenues for future research and intervention strategies.

4.1 Findings in Relation to the Decisional Dilemmas

We identified a total of 170 studies (2 randomized controlled trials [RCTs], 1 non-randomized controlled trial, 167 observational studies) in this systematic review. Some low or moderate strength-of-evidence (SoE) conclusions are feasible (discussed below).

For Key Question (KQ) 1 (incidence/prevalence/severity), we identified 163 observational studies. No study reported on the **incidence** of any outcome in any population. This systematic review provides a compendium of prevalence and severity estimates for various mental health and occupational stress issues in the EMS and telecommunicator workforces that are higher than in the general population.

Prevalence estimates are as follows. Among *telecommunicators during routine practice*, prevalence estimates are 15.50 percent for any depression, 12.4 percent for suicidal ideation, 5.7 percent for suicide plans, 0.7 percent for suicide attempts, 15.5 percent for alcohol abuse, 5 percent for high/extreme peritraumatic distress, 16.3 percent for high secondary traumatic stress, and 17 percent acute stress disorder (low SoE for each). Among *telecommunicators after critical mass incidents*, the prevalence of high general stress is 39.7 percent (low SoE). Among *EMS clinicians during routine practice as well as after critical mass incidents*, the prevalence of depression, anxiety, PTSD, burnout, and stress each varies considerably (low SoE for each). Among *EMS clinicians during routine practice*, the prevalence of suicidal ideation is 33 percent, suicide plans is 8.7 to 10.9 percent, and suicide attempts is 2.8 to 5.6 percent (moderate SoE).

Severity estimates (based on mean scores only) are as follows. Among *telecommunicators during routine practice,* the mean levels of depressive symptoms and stress are mild/low to moderate, and the mean levels of burnout are mild to severe (moderate SoE for each); the mean levels of peritraumatic distress are moderate and secondary traumatic stress are mild (low SoE for each). Among *telecommunicators* a*fter critical mass incidents*, the mean levels of burnout and general stress are moderate (low SoE). Among *EMS clinicians during routine practice*, the mean levels of depressive symptoms are minimal to mild; anxiety and operational and organizational job stress are each mild to moderate; burnout and general stress are mild to severe; secondary traumatic stress are mild; and alcohol use are of low risk (moderate SoE for each). The Suicide Behaviors Questionnaire-Revised (SBQ-R) mean score is 4.92 (95% CI 2.44 to 7.39; 4 studies; moderate SoE; SBQ-R ≥ 7 implies at risk of suicide). The mean level of moral

injury is moderate (low SoE). Among *EMS clinicians after critical mass incidents*, the mean levels of depressive symptoms are minimal to mild and anxiety are mild to moderate (moderate SoE for each).

Modifying factors that are associated with more than one poor outcome. *Among telecommunicators*, more trauma exposure may be associated with depression, PTSD, and peritraumatic stress; burnout may be associated with stress, peritraumatic stress, and posttraumatic distress; and mandatory overtime may be associated with burnout and peritraumatic stress. Among *EMS clinicians*, paramedic certification may be associated with anxiety, suicidality, and stress; more work experience may be associated with burnout and peritraumatic stress; more trauma exposure may be associated with depression, anxiety, PTSD, suicidality, burnout, stress, and peritraumatic stress; more hours worked per week may be associated with depression and anxiety; higher call volumes may be associated with depression and stress; and urban settings may be associated with suicidality and burnout.

For KQ2, (interventions to promote resistance and resilience regarding mental health and occupational stress issues), we identified eight studies (2 RCTs and 6 non-randomized studies). *Mindfulness-building interventions* targeting both resistance and resilience among EMS clinicians may be associated with reduced burnout at up to 6 months of follow-up (low SoE). The sparsity of evidence regarding interventions (KQ2) relative to the corpus of evidence addressing the prevalence and severity of most mental and occupational stress issues of interest (KQ1) suggests an important mismatch and an urgent research need (see section *4.5 Implications for Research*).

For KQ3 (effective EMS/telecommunicator workforce practices to improve mental health and occupational stress issues), we identified five studies (1 RCT and 4 non-randomized studies). The evidence regarding the effects of setting (urban/suburban/rural), shift durations, and agency financing as contextual or implementation factors among EMS clinicians is insufficient. There is no evidence regarding effective telecommunicator workforce practices to improve mental health and occupational stress issues.

For KQ4 (future research needed), see section *4.5 Implications for Research*.

4.2 Strengths and Limitations

4.2.1 Strengths and Limitations of the Evidence Base

The main strength of the evidence base is its applicability to the U.S. decision-making context. The evidence summarized provides insights into the prevalence and severity of various outcomes for telecommunicators and EMS clinicians during routine practice and/or after critical mass incidents. However, despite the relevance of the evidence to the U.S. decision-making context, we were unable to make any high strength-of-evidence conclusions in the entire systematic review. This inability stemmed from some important limitations to the evidence base.

For KQ1 (incidence/prevalence/severity), various factors account for the considerable variation in prevalence and/or severity estimates across studies for various specific outcomes for specific populations (telecommunicators or EMS). *First*, studies reporting prevalence or severity estimates were often conducted in different countries and settings (e.g., urban vs. rural, large vs. small agency sizes). *Second*, studies enrolled heterogenous populations in terms of demographic factors, training, work experience, and sample sizes. *Third*, studies varied considerably in terms of context (during routine practice vs. after various types of critical mass incidents, such as the September 11 terrorist attacks in the United States and the COVID-19 pandemic). *Fourth*,

studies often measured and/or categorized the same outcome using a range of measurement instruments that differed in terms of the number and types of question items (e.g., what/how stressed was defined), usage of different versions of the same instrument, and study-specific modifications made to the instrument items/subscales or scoring methodologies/thresholds. Given the considerable heterogeneity observed for most outcomes, we performed few meta-analyses relative to the numbers of outcomes and estimates documented herein. Instead, we frequently had to summarize the evidence narratively using ranges of estimates.

Another important part of the reason for the limited conclusions regarding some outcomes in KQ1 is because even though we found 163 studies, the evidence needed to be considered separately for EMS clinicians and telecommunicators. Within each of these populations, we separately analyzed studies conducted during routine practice and after critical mass incidents, and within each of those, we separately analyzed incidence, prevalence, and severity. Further, certain outcomes included distinct constructs that needed to be analyzed separately. For example, we analyzed the stress outcome constructs of general stress, job stress, and psychological distress separately. The resulting "thinning out" of the evidence is an important limitation to the evidence base.

When interpreting our finding regarding severity of a given outcome (based on mean scores), it is important to avoid doing so in isolation but rather to interpret the severity finding in concert with our findings regarding the prevalence of that outcome, including prevalence of different severities of the outcome. For example, when we concluded that an outcome's severity was mild to moderate in a given population, it refers to where the reported mean scores fell in relation to the recommended severity thresholds for that outcome (see Appendix C, Table C-3 of the measurement instruments identified across outcomes in this systematic review). Mean scores, if viewed in isolation, fail to convey that there may be a substantive percentage (i.e., prevalence) of individuals in the population who are diagnosed with the outcome, many of whom may have a severe manifestation of the outcome.

For KQs 2 and 3, many of the prioritized outcomes were either not reported in any included study for specific comparisons or were reported in an insufficient number of studies to merit conclusions. For KQ2 (interventions to promote resistance and resilience regarding mental health and occupational stress issues), we were able to make a conclusion regarding only one outcome (burnout). Unreported or rarely reported outcomes included hospitalizations, resilience, anxiety, depression, PTSD, substance use, suicidality, withdrawal from workforce, and unintended harms of interventions. For KQ3 (contextual and implementation factors of studies with effective EMS/telecommunicator workforce practices), no conclusions were feasible for any of the outcomes, including burnout.

For KQ1, data were rarely reported for the impact of certain modifying factors at the personal level (sexual identify, race, and income), interpersonal level (peer support access/use, availability of psychological help), and agency level (agency size, number of shifts per month, and regularity of shifts). Among studies that reported subgroup data, few studies reported statistical analyses that evaluated differences between subgroups. Finally, for KQ1, we did not a find a single study that reported on the incidence of any of our outcomes of interest.

4.2.2 Strengths and Limitations of the Systematic Review Process

We followed contemporary standards for systematic reviews, including (1) engagement with a multidisciplinary group of stakeholders in refining all KQs and (2) careful adherence to current systematic review standards for protocol publication and registration, literature searching,

screening, data extraction, risk of bias assessment, narrative synthesis, quantitative synthesis, and SoE assessment. These approaches helped us to characterize a considerably heterogeneous body of evidence from a range of countries, settings, and populations and to document gaps in the evidence. Another strength of this systematic review is its applicability to the U.S. decision-making context. For all KQs, we restricted to studies conducted in high-income countries. We made these decisions to maximize the applicability of the evidence to the U.S. decision-making context. Despite the country income level restriction of this systematic review, our comprehensive search yielded 170 studies.

There are some important limitations to this systematic review. *First*, all conclusions made are based on either low or moderate SoE. *Second*, to meet project timelines, we restricted full synthesis of KQ1 EMS clinician studies to those that enrolled at least 100 participants. Citation and limited study characteristic information regarding the 57 articles that described studies of EMS clinicians with fewer than 100 participants are listed in Appendix C for the interested reader. Because KQ1 is largely about epidemiology (incidence, prevalence, and severity), we determined that a sample size restriction was the most rigorous way to keep the size of the evidence manageable. *Third*, we excluded studies involving populations of firefighters, rescue workers, emergency workers, and first responders, unless the study authors specified that everyone in the study did EMS work or reported separate data for EMS clinicians. Our reasoning for this was that EMS clinicians are distinct from firefighters, notably due to their prolonged exposure to patients during transport, the performance of medical procedures, and the significant medical responsibilities they bear for patient care. Moreover, firefighters who occasionally assist with EMS work may only partially represent the unique challenges faced by clinicians dedicated to EMS work. *Fourth*, for all KQs, we restricted the evidence to English-language studies published in the year 2001 onwards. Our findings may have been somewhat different had we included non-English language articles or older studies. However, in consultation with the stakeholders, we deemed that older studies likely have little relevance to current EMS practices. Moreover, the 2001 year corresponds to the September 11 attacks in the United States, and we were therefore able to include studies that evaluated that important critical mass incident.

4.3 Applicability

Given our focus on high-income countries, a major strength of this systematic review is the applicability of our findings to the U.S. decision-making context. Thirty-nine percent of the studies were conducted in the United States. The geographic and racial diversity of participants in these studies generally mirrored that of the EMS and telecommunicator workforce in the United States. As such, the conclusions in this systematic review apply generally to the EMS and telecommunicator workforce in the United States. The extent to which the overall findings of this systematic review are broadly applicable beyond the United States is unclear.

4.4 Implications for Clinical Practice

The findings in this systematic review summarize what is known regarding the incidence, prevalence, and severity of mental health and occupational stress issues among the EMS and telecommunicator workforces, the effectiveness and harms of interventions to promote resistance and resilience regarding those issues, the contextual and implementation factors of effective EMS/telecommunicator workforce practices, and research that is needed to address the gaps. It is important to remember that studies of treatments of mental health disorders were not included in this systematic review because treatment of those disorders is not presumed to be different than

in the general population. The interventions examined in this systematic review therefore focus on resilience and resistance regarding mental health and occupational stress issues.

Depression is a significant mental health issue affecting both EMS clinicians and telecommunicators. This systematic review finds nuanced findings for depression. For telecommunicators, the prevalence of any depression is notable (15.5%), with the highest prevalence (26.2%) among studies that specifically reported on mild depression. Although the mean levels of depressive symptoms among EMS clinicians tend to be of mild to moderate severity, the wide range of prevalence of moderate to severe cases, both during routine practice and after critical mass incidents, is noteworthy and underscores the need for ongoing support and resilience-building initiatives. More trauma exposure, more hours per week, and higher call volumes are each associated with more depression.

Anxiety represents a pervasive concern among EMS clinicians and telecommunicators, with varying degrees of prevalence and severity observed across different contexts. This variance is observed during routine practice and following critical mass incidents, with prevalence ranging across any mild and moderate anxiety categories. Mean anxiety levels among EMS clinicians tend to fall within the mild to moderate range in both scenarios. Modifying factors emerge as significant influencers, with certification status (being a certified paramedic) and having more exposure to trauma being associated with higher anxiety levels among EMS clinicians. Conversely, access to and utilization of peer support may be associated with lower anxiety levels among EMS clinicians.

PTSD and **moral injury** represent profound psychological challenges faced by EMS clinicians and telecommunicators. Although the studies we included provided estimates regarding PTSD prevalence, the existing instruments that the studies used for measuring PTSD did not have available thresholds for defining gradations of severity (e.g., mild, moderate, severe). The scarcity of research on moral injury, especially among telecommunicators, is also notable.

Substance use represents a complex aspect of mental health among EMS clinicians and telecommunicators. However, the studies identified in this systematic review provide valuable insights into the prevalence and severity of substance use within these populations. Among telecommunicators, although we identified the prevalence of alcohol abuse during routine practice as 15.5 percent, the evidence regarding mean levels of alcohol consumption among telecommunicators remains inconclusive. Among EMS clinicians, mean levels of alcohol consumption suggest low risk. Although older age and years of service may be associated with less alcohol use, significant gaps persist in our understanding of the underlying modifying factors that drive the use of alcohol, nicotine, and other substances.

Suicidality represents a profound concern within the EMS and telecommunicator communities. Although the identified evidence offers valuable insights into the prevalence and severity of suicidality among EMS clinicians and telecommunicators, significant gaps persist in understanding its underlying mechanisms and risk factors. Although the prevalence of suicidal ideation, plans, and attempts during routine practice appear lower among telecommunicators than EMS clinicians, the lack of data on suicidality following critical incidents underscores the need for further research in this area. Modifying factors, such as urban settings, burnout, and exposure to potentially traumatic events, emerge as significant contributors to heightened suicidality.

For reference, we provide some estimates of prevalence of suicidal ideation among other healthcare populations. The prevalence of suicidal ideation in the past 12 months among

healthcare clinicians in the United States has been reported to be 2.5 percent.[203] Among employed adults aged 18 to 64 years in the United States, the prevalence in the past 12 months of suicidality has been reported to be 3.5 percent (3.1% had suicidal ideation only, and 0.4% had attempted suicide).[203] In other countries, the prevalence of suicidal ideation among healthcare clinicians has been reported to be 10.5 percent in Australia[204] and 11.1 percent in Malaysia.[205]**Burnout** poses a significant challenge within the EMS workforce, exerting detrimental effects on individual well-being and organizational performance.[206] Socio-demographic characteristics, workplace dynamics, and exposure to traumatic events are pivotal in shaping burnout experiences. The impact of burnout and its downstream effects extend beyond individual consequences, potentially compromising patient care quality and organizational resilience.[207] The multifaceted nature of burnout is evident from studies in this systematic review reporting varying prevalence for overall burnout as well as for its domains of depersonalization, emotional exhaustion, and (low) personal achievement. Several factors were identified as contributors to burnout, including social isolation, workplace incivility, and exposure to physical and verbal violence. Notably, the COVID-19 pandemic exacerbated burnout levels, particularly evident in higher rates of depersonalization and emotional exhaustion in studies conducted after this critical mass incident. The overall data on burnout among EMS clinicians and telecommunicators presents a significant concern within these vital emergency response professions. Across 63 studies, burnout rates varied considerably, with prevalence ranging from 13.3 to 87.7 percent. The impacts of demographic modifying factors, such as age, sex, race, and level of education, on burnout appeared inconsistent across studies.

Stress, **peritraumatic stress**, and **posttraumatic distress** constitute multifaceted, interrelated challenges among EMS clinicians and telecommunicators. Although the identified evidence offers valuable insights into the prevalence and severity of stress-related outcomes among EMS clinicians and telecommunicators, important gaps remain in our understanding of their dynamic interplay with individual, organizational, and environmental factors. EMS clinicians also experienced stress differentially based on routine practice and post-incident scenarios.

For KQ2, our analysis of studies reporting on interventions found that mindfulness-building interventions that target resistance and resilience may be associated with reduced burnout among EMS clinicians. However, no studies for KQ2 assessed potential heterogeneity of treatment effects across different subpopulations. It is possible that the various interventions evaluated may have differential impacts on specific populations, such as less experienced versus more experienced telecommunicators, or emergency medical technicians (EMTs) versus paramedics. The identified evidence does not allow a meaningful exploration of these nuances. Given the significant mental health challenges that plague the EMS and telecommunicator workforces, and insufficient evidence regarding the various interventions, giving agencies options regarding interventions may be important for improving outcomes.

4.5 Implications for Research

For KQ1, the lack of data on incidence of any outcome in either EMS clinicians or telecommunicators remains an important gap. This highlights a crucial need for future research to evaluate each mental health and occupational stress issue in terms of the extent of its onset (i.e., cumulative incidence) and speed of its onset (i.e., incidence rate) among individuals who previously did not have the issue. Such longitudinal investigations into the trajectories of mental health outcomes among EMS clinicians and telecommunicators would be of immense value.

When conducting studies that enroll mixed populations of emergency workers, it is important that future researchers stratify results in those studies by those who do versus do not perform EMS work. As discussed in section *4.2.1 Strengths and Limitations of the Evidence Base*, this will enable extraction of results and better understand the mental health of the distinct population of EMS clinicians.

Although anxiety is a prevalent concern among EMS clinicians, further research is needed to understand its impact on telecommunicators fully and to explore effective intervention strategies within both groups. Further research is warranted to explore differences in burnout reporting by age and sex and to identify effective interventions tailored to the unique challenges faced by each group. The current systematic review identifies considerable heterogeneity in outcome reporting for burnout and the lack of thresholds for defining severity of PTSD, which precluded synthesis of the severity scores for these two important outcomes. As with several other outcomes, future research on burnout and PTSD would benefit from standardized measurement instruments and thresholds for defining severity, which would allow for comparability of the outcomes and data synthesis.

Across all KQs, studies frequently did not report information regarding key characteristics of the agencies in which the study was conducted. These characteristics include agency size, agency characteristics, shift characteristics, shift work, overtime restrictions, agency financing, and availability of mental health resources. These and others are potentially important contextual factors that may impact outcomes.

In terms of study design, for KQ1, the field needs more prospective or retrospective longitudinal studies that are designed, conducted, and analyzed well. For KQ2, more randomized controlled trials that are designed, conducted, and analyzed well are also needed. These studies should also consistently evaluate and report prioritized outcomes that were not adequately reported in the identified evidence, such as hospitalizations, resilience, anxiety, depression, PTSD, substance use, suicidality, withdrawal from workforce, and unintended harms of interventions. Moreover, it is striking that only 5 percent of the identified studies evaluated intervention strategies to promote resistance and resilience regarding the mental health and occupational stress issues (KQ2). Some modifying factors (e.g., more trauma exposure, more hours per week, more burnout, higher call volumes) that are associated with poor outcomes provide valuable insights into potential avenues that could be further evaluated for preventive and early therapeutic interventions. Addressing the numerous mental health challenges facing EMS clinicians and telecommunicators will require evidence-based and comprehensive strategies that prioritize prevention, early intervention, and support initiatives tailored to the unique needs of those working in these essential frontline professions. Through a concerted effort towards improved research design and interventional deployment, the field can enhance the health and capacity of EMS clinicians and telecommunicators to fulfill their critical mission of safeguarding public health and safety. Taken together, this can help ensure the sustainability and effectiveness of emergency response systems.

4.6 Conclusions

Although we found 170 studies that were conducted in high-income countries, we were able to make only low- and moderate-SoE conclusions regarding outcomes prioritized for this systematic review. Future research, for which we have provided suggestions, should report on incidence of mental health and occupational stress issues and compare interventions to promote resistance and resilience regarding these issues. For all research questions, the outcomes we

prioritized (in collaboration with a multidisciplinary group of stakeholders) should also be reported. Such evidence could inform strategies to address the many mental health and occupational stress issues that plague the EMS and telecommunicator workforces in the United States.

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