

Appendix A. Methods

Search Strategies for Published Literature

We built upon the PubMed search strategy used in a previous review¹ by tailoring the search terms to our review. An experienced systematic review/medical librarian developed the PubMed search with input from the investigators. The librarian translated the PubMed strategy for use in the other electronic databases. We applied the following limits or filters to the database searches:

- Publication Date. We restricted to the last 22 years because older studies likely have little relevance to modern EMS practices. A 22-year cut-off corresponds to the September 11, 2001, terrorist attacks in the United States.
- Language. Publications were excluded if they were written in a language other than English.

Table A-1. PubMed search strategy

#	Search terms
1	"emergency medical services"[tiab] OR EMS[tiab] OR ("emergency medical services"[mh] NOT ("emergency service, hospital"[mh] OR "advanced trauma life support care"[mh] OR "poison control centers"[mh] OR triage[mh]))
2	"emergency medical responder" [tiab] OR "emergency medical responders" [tiab] OR "emergency medical technician" [tiab] OR "emergency medical technicians"[tiab] OR EMT[tiab] OR "emergency medical technicians"[mh]
3	"advanced EMT"[tiab] OR "advanced EMTs"[tiab] OR AEMT[tiab]
4	paramedic[tiab] OR paramedics[tiab]
5	"first responder"[tiab] OR "first responders"[tiab] OR "emergency responder"[tiab] OR "emergency responders"[tiab]
6	"field responder" [tiab:~1] OR "field responders"[tiab] OR "field response" [tiab] OR "field director" [tiab] OR "field directors" [tiab:~1]
7	firefighter[tiab] OR firefighters[tiab] OR firefighters[mh] OR "fire fighter"[tiab] OR "fire fighters"[tiab] OR "fireman"[tiab] OR "firemen"[tiab] OR "fire man"[tiab] OR "fire men"[tiab]
8	"fire department"[tiab] OR "fire departments"[tiab] OR "fire brigade"[tiab] OR "fire brigades"[tiab] OR "fire rescue"[tiab] OR "fire rescues"[tiab]
9	dispatcher[tiab] OR dispatchers[tiab] OR "emergency medical dispatcher"[mh]
10	((911[tiab] OR "9-1-1" [tiab] OR "9 1 1" [tiab]) AND (emergency[tiab] OR emergencies[tiab]))
11	ambulance[tiab] OR ambulances[tiab] OR ambulances[mh] OR "emergency mobile unit"[tiab]
12	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11
13	depression[tiab] OR depressed[tiab] OR depression[mh]
14	anxiety[tiab] OR anxious[tiab] OR (anxiety[mh:noexp] OR catastrophization[mh] OR "performance anxiety"[mh:noexp]) OR "anxiety disorders"[mh]
15	"post traumatic stress disorder"[tiab] OR "post traumatic stress disorders"[tiab] OR "post-traumatic stress disorder"[tiab] OR "post-traumatic stress disorders"[tiab] OR PTSD[tiab] OR "posttraumatic stress disorder"[tiab] OR "posttraumatic stress disorders"[tiab]
16	"post traumatic stress injury"[tiab] OR "post-traumatic stress injury"[tiab] OR PTSI[tiab] OR "Stress Disorders, Post-Traumatic"[mh]
17	"stress disorders"[tiab]
18	suicidality[tiab] OR suicide[tiab] OR suicide[mh] OR suicidal[tiab]
19	"substance abuse"[tiab] OR "substance use"[tiab] OR "drug use disorder"[tiab] OR "drug use disorders"[tiab] OR "drug abuse"[tiab] OR "Substance-Related Disorders"[mh] OR "alcoholism" [tiab] OR "alcohol use disorder"[tiab] OR "alcohol use disorders"[tiab] OR "alcohol abuse"[tiab] OR "alcohol abuser"[tiab] OR "alcohol abusers"[tiab] OR "abusing alcohol"[tiab] OR "marijuana use disorder"[tiab] OR "marijuana abuse"[tiab] OR "marijuana abuser"[tiab] OR "marijuana abuser"[tiab] OR "abusing marijuana"[tiab]
20	"mental health"[tiab] OR "mental health"[mh]
21	"mental illness"[tiab] OR "mental illnesses"[tiab]
22	"psychological effects"[tiab]

#	Search terms
23	burnout[tiab] OR "burn out"[tiab] OR "Burnout, Psychological"[mh] OR "Burnout, Professional"[mh]
24	"moral injury"[tiab] OR "moral injuries"[tiab]
25	resilience[tiab] OR resiliency[tiab] OR "Resilience, Psychological"[mh]
26	debriefing[tiab] OR "crisis intervention"[mh] OR "critical incident stress debriefing" [tiab:~1] OR "critical incident stress management"[tiab]
27	"psychological first aid"[tiab]
28	"secondary traumatization"[tiab] OR "secondary traumatisation"[tiab] OR "secondary trauma"[tiab] OR "compassion fatigue"[tiab] OR "compassion fatigue"[mh] OR "vicarious trauma"[tiab]
29	#13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29
30	#12 AND #29
31	2001/09/11 to current [dp] AND Eng [la]

Table A-2. Embase search strategy

#	Search term
1	'emergency health service'/exp NOT ('emergency ward'/exp OR 'hospital emergency service'/exp OR 'patient triage'/exp OR 'emergency outpatient clinic'/exp)
2	'emergency medical services':ti,ab OR ems:ti,ab
3	#1 OR #2
4	'emergency medical responder':ti,ab OR 'emergency medical responders':ti,ab OR 'emergency medical technician':ti,ab OR 'emergency medical technicians':ti,ab OR emt:ti,ab
5	'rescue personnel'/exp
6	'emergency medical responder':ti,ab OR 'emergency medical responders':ti,ab OR 'emergency medical technician':ti,ab OR 'emergency medical technicians':ti,ab OR emt:ti,ab
7	'advanced emt':ti,ab OR 'advanced emts':ti,ab OR aemt:ti,ab
8	paramedic:ti,ab OR paramedics:ti,ab
9	'first responder (person)'/exp
10	'first responder':ti,ab OR 'first responders':ti,ab OR 'emergency responder':ti,ab OR 'emergency responders':ti,ab
11	'field responder':ti,ab OR 'field responders':ti,ab OR 'field response':ti,ab OR 'field director':ti,ab OR 'field directors':ti,ab
12	'fire fighter'/exp
13	firefighter:ti,ab OR firefighters:ti,ab OR 'fire fighter':ti,ab OR 'fire fighters':ti,ab OR 'fireman':ti,ab OR 'firemen':ti,ab OR 'fire man':ti,ab OR 'fire men':ti,ab
14	'fire department':ti,ab OR 'fire departments':ti,ab OR 'fire brigade':ti,ab OR 'fire brigades':ti,ab OR 'fire rescue':ti,ab OR 'fire rescues':ti,ab
15	'emergency medical dispatcher'/exp
16	dispatcher:ti,ab OR dispatchers:ti,ab
17	(911:ti,ab OR '9-1-1':ti,ab OR '9 1 1':ti,ab) AND (emergency:ti,ab OR emergencies:ti,ab)
18	'ambulance'/exp
19	ambulance:ti,ab OR ambulances:ti,ab OR 'emergency mobile unit':ti,ab
20	#3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19
21	'depression'/exp
22	depression:ti,ab OR depressed:ti,ab
23	'anxiety'/de OR 'catastrophizing'/exp OR 'performance anxiety'/exp OR 'anxiety disorder'/exp
24	anxiety:ti,ab OR anxious:ti,ab
25	'post traumatic stress disorder':ti,ab OR 'post traumatic stress disorders':ti,ab OR 'post-traumatic stress disorder':ti,ab OR 'post-traumatic stress disorders':ti,ab OR ptsd:ti,ab OR 'posttraumatic stress disorder':ti,ab OR 'posttraumatic stress disorders':ti,ab

#	Search term
26	'posttraumatic stress disorder'/exp
27	'post traumatic stress injury':ti,ab OR 'post-traumatic stress injury':ti,ab OR ptsi:ti,ab
28	'stress disorders':ti,ab
29	'suicidal behavior'/exp
30	suicidality:ti,ab OR suicide:ti,ab OR suicidal:ti,ab
31	'drug dependence'/exp
32	'substance abuse':ti,ab OR 'substance use':ti,ab OR 'drug use disorder':ti,ab OR 'drug use disorders':ti,ab OR 'drug abuse':ti,ab OR 'alcoholism':ti,ab OR 'alcohol use disorder':ti,ab OR 'alcohol use disorders':ti,ab OR 'alcohol abuse':ti,ab OR 'alcohol abuser':ti,ab OR 'alcohol abusers':ti,ab OR 'abusing alcohol':ti,ab OR 'marijuana use disorder':ti,ab OR 'marijuana abuse':ti,ab OR 'marijuana abuser':ti,ab OR 'abusing marijuana':ti,ab
33	'psychological well-being'/de
34	'mental health':ti,ab
35	'mental illness':ti,ab OR 'mental illnesses':ti,ab
36	'psychological effects':ti,ab
37	'professional burnout'/exp OR 'burnout'/exp
38	burnout:ti,ab OR 'burn out':ti,ab
39	'moral injury':ti,ab OR 'moral injuries':ti,ab
40	'moral injury'/exp
41	'psychological resilience'/exp
42	resilience:ti,ab OR resiliency:ti,ab
43	'crisis intervention'/exp
44	debriefing:ti,ab OR 'critical incident stress debriefing':ti,ab OR 'critical incident stress management':ti,ab
45	'psychological first aid':ti,ab
46	'psychological first aid'/exp
47	'compassion fatigue'/exp
48	'vicarious trauma'/exp
49	'secondary traumatization':ti,ab OR 'secondary traumatisation':ti,ab OR 'secondary trauma':ti,ab OR 'compassion fatigue':ti,ab OR 'vicarious trauma':ti,ab
50	#21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49
51	#20 AND #50
52	#20 AND #50 AND [11-09-2001]/sd NOT [13-10-2023]/sd
53	#20 AND #50 AND [11-09-2001]/sd NOT [13-10-2023]/sd AND [english]/lim
54	#20 AND #50 AND [11-09-2001]/sd NOT [13-10-2023]/sd AND [english]/lim AND ([embase]/lim OR [embase classic]/lim)
55	#20 AND #50 AND [11-09-2001]/sd NOT [13-10-2023]/sd AND [english]/lim AND [medline]/lim
56	#53 NOT #55

Table A-3. CINAHL and PsycInfo search strategy

#	Search term
1	(MH "Emergency Medical Services+") NOT ((MH "Sexual Assault Examination") OR (MH "Poison Control Centers") OR (MH "Trauma Centers") OR (MH "Triage"))
2	TI ("emergency medical services" OR ems) OR AB ("emergency medical services" OR ems)
3	TI (("emergency medical responder" OR "emergency medical responders" OR "emergency medical technician" OR "emergency medical technicians" OR EMT) OR AB (("emergency medical responder" OR "emergency medical responders" OR "emergency medical technician" OR "emergency medical technicians" OR EMT))
4	(MH "Emergency Medical Technicians")
5	TI (("advanced EMT" OR "advanced EMTs" OR AEMT)) OR AB (("advanced EMT" OR "advanced EMTs" OR AEMT))
6	TI (paramedic OR paramedics) OR AB (paramedic OR paramedics)
7	TI (("first responder" OR "first responders" OR "emergency responder" OR "emergency responders")) OR AB (("first responder" OR "first responders" OR "emergency responder" OR "emergency responders"))
8	TI (("field responder" OR "field responders" OR "field response" OR "field director" OR "field directors")) OR AB (("field responder" OR "field responders" OR "field response" OR "field director" OR "field directors"))
9	(MH "Firefighters")
10	TI ((firefighter OR firefighters OR "fire fighter" OR "fire fighters" OR "fireman" OR "firemen" OR "fire man" OR "fire men")) OR AB ((firefighter OR firefighters OR "fire fighter" OR "fire fighters" OR "fireman" OR "firemen" OR "fire man" OR "fire men"))
11	TI (("fire department" OR "fire departments" OR "fire brigade" OR "fire brigades" OR "fire rescue" OR "fire rescues")) OR AB (("fire department" OR "fire departments" OR "fire brigade" OR "fire brigades" OR "fire rescue" OR "fire rescues"))
12	(MH "Emergency Medical Service Communication Systems")
13	TI (dispatcher OR dispatchers) OR AB (dispatcher OR dispatchers)
14	TI (((911 OR "9-1-1" OR "9 1 1") AND (emergency OR emergencies))) OR AB (((911 OR "9-1-1" OR "9 1 1") AND (emergency OR emergencies)))
15	(MH "Ambulances")
16	TI ((ambulance OR ambulances OR "emergency mobile unit")) OR AB ((ambulance OR ambulances OR "emergency mobile unit"))
17	#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16
18	(MH "Depression+")
19	TI (depression OR depressed) OR AB (depression OR depressed)
20	(MH "Anxiety") OR (MH "Catastrophization") OR (MH "Test Anxiety") OR (MH "Anxiety Disorders+")
21	TI (anxiety OR anxious) OR AB (anxiety OR anxious)
22	TI (("post traumatic stress disorder" OR "post traumatic stress disorders" OR "post-traumatic stress disorder" OR "post-traumatic stress disorders" OR PTSD OR "posttraumatic stress disorder" OR "posttraumatic stress disorders")) OR AB (("post traumatic stress disorder" OR "post traumatic stress disorders" OR "post-traumatic stress disorder" OR "post-traumatic stress disorders" OR PTSD OR "posttraumatic stress disorder" OR "posttraumatic stress disorders"))
23	(MH "Stress Disorders, Post-Traumatic+")
24	TI (("post traumatic stress injury" OR "post-traumatic stress injury" OR PTSI)) OR AB (("post traumatic stress injury" OR "post-traumatic stress injury" OR PTSI))
25	TI "stress disorders" OR AB "stress disorders"
26	(MH "Suicide+")
27	TI ((suicidality OR suicide OR suicidal)) OR AB ((suicidality OR suicide OR suicidal))
28	(MH "Substance Use Disorders+") OR (MH "Substance Abuse+") OR (MH "Substance Dependence+")
29	TI (("substance abuse" OR "substance use" OR "drug use disorder" OR "drug use disorders" OR "drug abuse" OR "alcoholism" OR "alcohol use disorder" OR "alcohol use disorders" OR "alcohol abuse" OR "alcohol abuser" OR "alcohol abusers" OR "abusing alcohol" OR "marijuana use disorder" OR "marijuana abuse" OR "marijuana abuser" OR "marijuana abuser" OR "abusing marijuana")) OR AB (("substance abuse" OR "substance use" OR "drug use disorder" OR "drug use disorders" OR "drug abuse" OR "alcoholism" OR "alcohol use disorder" OR "alcohol use disorders" OR "alcohol abuse" OR "alcohol abuser" OR "alcohol abusers" OR "abusing alcohol" OR "marijuana use disorder" OR "marijuana abuse" OR "marijuana abuser" OR "marijuana abuser" OR "abusing marijuana"))
30	(MH "Mental Health")
31	TI "Mental Health" OR AB "Mental Health"

#	Search term
32	TI ("Mental illness" OR "mental illnesses") OR AB ("Mental illness" OR "mental illnesses")
33	TI "psychological effects" OR AB "psychological effects"
34	(MH "Burnout, Professional+")
35	TI (burnout OR "burn out") OR AB (burnout OR "burn out")
36	TI ("moral injury" OR "moral injuries") OR AB ("moral injury" OR "moral injuries")
37	(MH "Hardiness")
38	TI (resilience OR resiliency) OR AB (resilience OR resiliency)
39	(MH "Crisis Intervention")
40	TI ((debriefing OR "critical incident stress debriefing" OR "critical incident stress management")) OR AB ((debriefing OR "critical incident stress debriefing" OR "critical incident stress management"))
41	TI "psychological first aid" OR AB "psychological first aid"
42	(MH "Compassion Fatigue")
43	TI (("secondary traumatization" OR "secondary traumatisatation" OR "secondary trauma" OR "compassion fatigue" OR "vicarious trauma")) OR AB (("secondary traumatization" OR "secondary traumatisatation" OR "secondary trauma" OR "compassion fatigue" OR "vicarious trauma"))
44	#18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43
45	#17 AND #44 With: Limiters - Published Date: 20010901-20231031; Language: English Expanders - Apply related words; Apply equivalent subjects Search modes - Boolean/Phrase

Table A-4. Cochrane search strategy

#	Search term
1	("emergency medical services"):ti,ab
2	EMS:ti,ab
3	MeSH descriptor: [Emergency Medical Services] explode all trees
4	MeSH descriptor: [Emergency Service, Hospital] explode all trees
5	MeSH descriptor: [Advanced Trauma Life Support Care] explode all trees
6	MeSH descriptor: [Poison Control Centers] explode all trees
7	MeSH descriptor: [Triage] explode all trees
8	#3 NOT (#4 OR #5 OR #6 OR #7)
9	#1 OR #2 OR #8
10	("emergency medical responder" OR "emergency medical responders" OR "emergency medical technician" OR "emergency medical technicians" OR EMT):ti,ab
11	MeSH descriptor: [Emergency Medical Technicians] explode all trees
12	("advanced EMT" OR "advanced EMTs" OR AEMT):ti,ab
13	paramedic:ti,ab OR paramedics:ti,ab
14	("first responder" OR "first responders" OR "emergency responder" OR "emergency responders"):ti,ab
15	("field responder" OR "field responders" OR "field response" OR "field director" OR "field directors"):ti,ab
16	MeSH descriptor: [Firefighters] explode all trees
17	(firefighter OR firefighters OR "fire fighter" OR "fire fighters" OR "fireman" OR "firemen" OR "fire man" OR "fire men"):ti,ab
18	("fire department" OR "fire departments" OR "fire brigade" OR "fire brigades" OR "fire rescue" OR "fire rescues"):ti,ab
19	MeSH descriptor: [Emergency Medical Dispatcher] explode all trees
20	(dispatcher OR dispatchers):ti,ab
21	((911 OR "9-1-1" OR "9 1 1") AND (emergency OR emergencies)):ti,ab
22	MeSH descriptor: [Ambulances] explode all trees
23	(ambulance OR ambulances OR "emergency mobile unit"):ti,ab
24	#9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23
25	MeSH descriptor: [Depression] explode all trees
26	depression:ti,ab OR depressed:ti,ab
27	MeSH descriptor: [Anxiety] this term only
28	MeSH descriptor: [Catastrophization] explode all trees
29	MeSH descriptor: [Performance Anxiety] explode all trees
30	MeSH descriptor: [Anxiety Disorders] explode all trees
31	anxiety:ti,ab OR anxious:ti,ab
32	("post traumatic stress disorder" OR "post traumatic stress disorders" OR "post-traumatic stress disorder" OR "post-traumatic stress disorders" OR PTSD OR "posttraumatic stress disorder" OR "posttraumatic stress disorders"):ti,ab
33	MeSH descriptor: [Stress Disorders, Post-Traumatic] explode all trees
34	("post traumatic stress injury" OR "post-traumatic stress injury" OR PTSD):ti,ab
35	"stress disorders":ti,ab
36	MeSH descriptor: [Suicide] explode all trees
37	(suicidality OR suicide OR suicidal):ti,ab
38	MeSH descriptor: [Substance-Related Disorders] explode all trees
39	("substance abuse" OR "substance use" OR "drug use disorder" OR "drug use disorders" OR "drug abuse" OR "alcoholism" OR "alcohol use disorder" OR "alcohol use disorders" OR "alcohol abuse" OR "alcohol abuser" OR "alcohol abusers" OR "abusing alcohol" OR "marijuana use disorder" OR "marijuana abuse" OR "marijuana abuser" OR "marijuana abuser" OR "abusing marijuana"):ti,ab
40	MeSH descriptor: [Mental Health] explode all trees
41	"mental health":ti,ab
42	"mental illness":ti,ab OR "mental illnesses":ti,ab
43	"psychological effects":ti,ab
44	MeSH descriptor: [Burnout, Psychological] explode all trees
45	MeSH descriptor: [Burnout, Professional] explode all trees
46	burnout:ti,ab OR "burn out":ti,ab
47	"moral injury":ti,ab OR "moral injuries":ti,ab

#	Search term
48	MeSH descriptor: [Resilience, Psychological] explode all trees
49	resilience:ti,ab OR resiliency:ti,ab
50	MeSH descriptor: [Crisis Intervention] explode all trees
51	(debriefing OR "critical incident stress debriefing" OR "critical incident stress management"):ti,ab
52	"psychological first aid":ti,ab
53	MeSH descriptor: [Compassion Fatigue] explode all trees
54	("secondary traumatization" OR "secondary traumatisatio" OR "secondary trauma" OR "compassion fatigue" OR "vicarious trauma"):ti,ab
55	#25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38 OR #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48 OR #49 OR #50 OR #51 OR #52 OR #53
56	#24 AND #55 with Cochrane Library publication date Between Sep 2001 and Oct 2023

Risk of Bias Assessment

For longitudinal studies, we used the following items from the Joanna Briggs Institute Checklist for Cohort Studies² and the Newcastle Ottawa Scale for Cohort Studies:³

- Were the study groups similar and recruited from the same population?
- Were the exposures measured similarly to assign people to both exposed and unexposed groups?
- Was the exposure measured in a valid and reliable way?
- Were confounding factors identified?
- Were strategies to deal with confounding factors stated?
- Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?
- Were the outcomes measured in a valid and reliable way?
- Was the follow up time reported and sufficient to be long enough for outcomes to occur?
- Was follow up complete, and if not, were the reasons to loss to follow up described and explored?
- Were strategies to address incomplete follow up utilized?
- Was appropriate statistical analysis used?

For cross-sectional studies, we used the following items from the risk of bias tool proposed by Hoy et al.⁴

- Was the study target population a close representation of the national population in relation to relevant variables, e.g., age, sex, occupation?
- Was the sampling frame a true or close representation of the target population?
- Was some form of random selection used to select the sample, or, was a census undertaken?
- Was the likelihood of non-participation bias minimal?
- Were data collected directly from the participants?
- Was an acceptable case definition used in the study?
- Was the study instrument that measured the parameter of interest (e.g. prevalence of depression) shown to have reliability and validity (if necessary)?
- Was the same mode of data collection used for all participants?
- Was the length of the shortest prevalence period for the parameter of interest appropriate?
- Were the numerator(s) and denominator(s) for the parameter of interest appropriate??

We assessed randomized trials using the Cochrane Risk of Bias tool.⁵ The domains are:

- Random sequence generation
- Allocation concealment
- Blinding of participants, personnel, and outcome assessors
- Incomplete outcome data
- Selective outcome reporting
- Other sources of bias

For non-randomized comparative studies of interventions, we used the Risk of Bias in Non-randomized Studies (ROBINS-I) tool.⁶ The domains of ROBINS-I are:

- Confounding
- Selection of participants into the study
- Blinding of participants, personnel, and outcome assessor
- Incomplete outcome data
- Selective outcome reporting
- Other bias

Grading the Strength of the Body of Evidence

We graded the strength of evidence by using the grading scheme recommended by the Agency for Healthcare Research and Quality (AHRQ) Methods Guide for Conducting Comparative Effectiveness Reviews.⁷ The strength of evidence grades were based on the following domains:

- Study limitations [low, medium, or high level of study limitation] - Rated according to the degree to which studies for a given outcome are likely to reduce bias based on study design and conduct across individual studies.
- Directness [direct or indirect] - Rated by degree to which the outcome is directly or indirectly related to outcomes of interest.
- Consistency [consistent, inconsistent, or unknown/not applicable] - Rated by degree to which studies find similar magnitude of effect or same direction of effect.
- Precision [precise or imprecise] - Describes the level of certainty of the estimate of effect for a particular outcome with a precise estimate being one that allows a clinically useful conclusion. This may be based on sufficiency of sample size and number of events, and if these are adequate, the interpretation of the confidence interval.

These domains were used to assign a strength of evidence rating as being high, moderate, low, or insufficient for each key outcome after discussion between two investigators [Table A-5]. To ensure consistency and validity of the assessment, the strength of evidence grades were reviewed by the entire team of investigators prior to assigning a final grade.

Table A-5. Definitions of the grades of overall strength of evidence.

Grade	Definition
High	We are very confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has few or no deficiencies. We believe that the findings are stable (i.e., another study would not change the conclusions).
Moderate	We are moderately confident that the estimate of effect lies close to the true effect for this outcome. The body of evidence has some deficiencies. We believe that the findings are likely to be stable, but some doubt remains.
Low	We have limited confidence that the estimate of effect lies close to the true effect for this outcome.

	The body of evidence has major or numerous deficiencies (or both). We believe that additional evidence is needed before concluding either that the findings are stable or that the estimate of effect is close to the true effect.
Insufficient	We have no evidence, we are unable to estimate an effect, or we have no confidence in the estimate of effect for this outcome. No evidence is available, or the body of evidence has unacceptable deficiencies, precluding reaching a conclusion.

Peer Review and Public Commentary

Experts and individuals representing stakeholder and user communities will be invited to provide external peer review of this systematic review. AHRQ representatives and an associate editor will also provide comments. We will address all reviewer comments, revising the text as appropriate. The peer-reviewed draft report will be posted on the AHRQ website for four weeks to elicit public comment. A disposition of comments table of peer and public comments will be posted on the AHRQ website 3 months after AHRQ posts the final systematic review.

References

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- Munn Z, Moola S, Lisy K, et al. Chapter 5: Systematic reviews of prevalence and incidence. In: Aromataris E, Munn Z, eds. JBI Manual for Evidence Synthesis. 2020.
- Wells GA, Wells G, Shea B. The Newcastle-Ottawa Scale (NOS) for Assessing the Quality of Nonrandomised Studies in Meta-Analyses.
- Hoy D, Brooks P, Woolf A, et al. Assessing risk of bias in prevalence studies: modification of an existing tool and evidence of interrater agreement. *J Clin Epidemiol.* 2012 Sep;65(9):934-9. doi: 10.1016/j.jclinepi.2011.11.014. PMID: 22742910.
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- Sterne JA, Hernán MA, Reeves BC, et al. ROBINS-I: a tool for assessing risk of bias in non-randomised studies of interventions. *Bmj.* 2016 Oct 12;355:i4919. doi: 10.1136/bmj.i4919. PMID: 27733354.
- AHRQ Methods for Effective Health Care. Methods Guide for Effectiveness and Comparative Effectiveness Reviews. Rockville (MD): Agency for Healthcare Research and Quality (US); 2008.

Appendix B. List of Excluded Studies

1. Aasa U, Brulin C, Angquist KA, et al. Work-related psychosocial factors, worry about work conditions and health complaints among female and male ambulance personnel. *Scand J Caring Sci.* 2005 Sep;19(3):251-8. doi: 10.1111/j.1471-6712.2005.00333.x. PMID: 16101853. - **Not focused on an intervention of interest (applies to KQ2-4 only studies)**
2. Aasa U, Brulin C, Angquist KA, et al. Work-related psychosocial factors, worry about work conditions and health complaints among female and male ambulance personnel. *Scand J Caring Sci.* 2005 Sep;19(3):251-8. doi: 10.1111/j.1471-6712.2005.00333.x. PMID: 16101853. - **Does not report on an outcome of interest**
3. Actrn. A randomised controlled trial of a wellbeing and resilience program for emergency service personnel/first responders, their significant others and their supervisors. <https://trialssearch.who.int/Trial2.aspx?TrialID=ACTRN12622001267741>. 2022 PMID: CN-02465907. - **No original data**
4. Actrn. Effect of workplace mental health screening on help-seeking behaviour in first responders. <https://trialssearch.who.int/Trial2.aspx?TrialID=ACTRN12621001457831>. 2021 PMID: CN-02349043. - **No original data**
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Qualitative study with relevant/informative data

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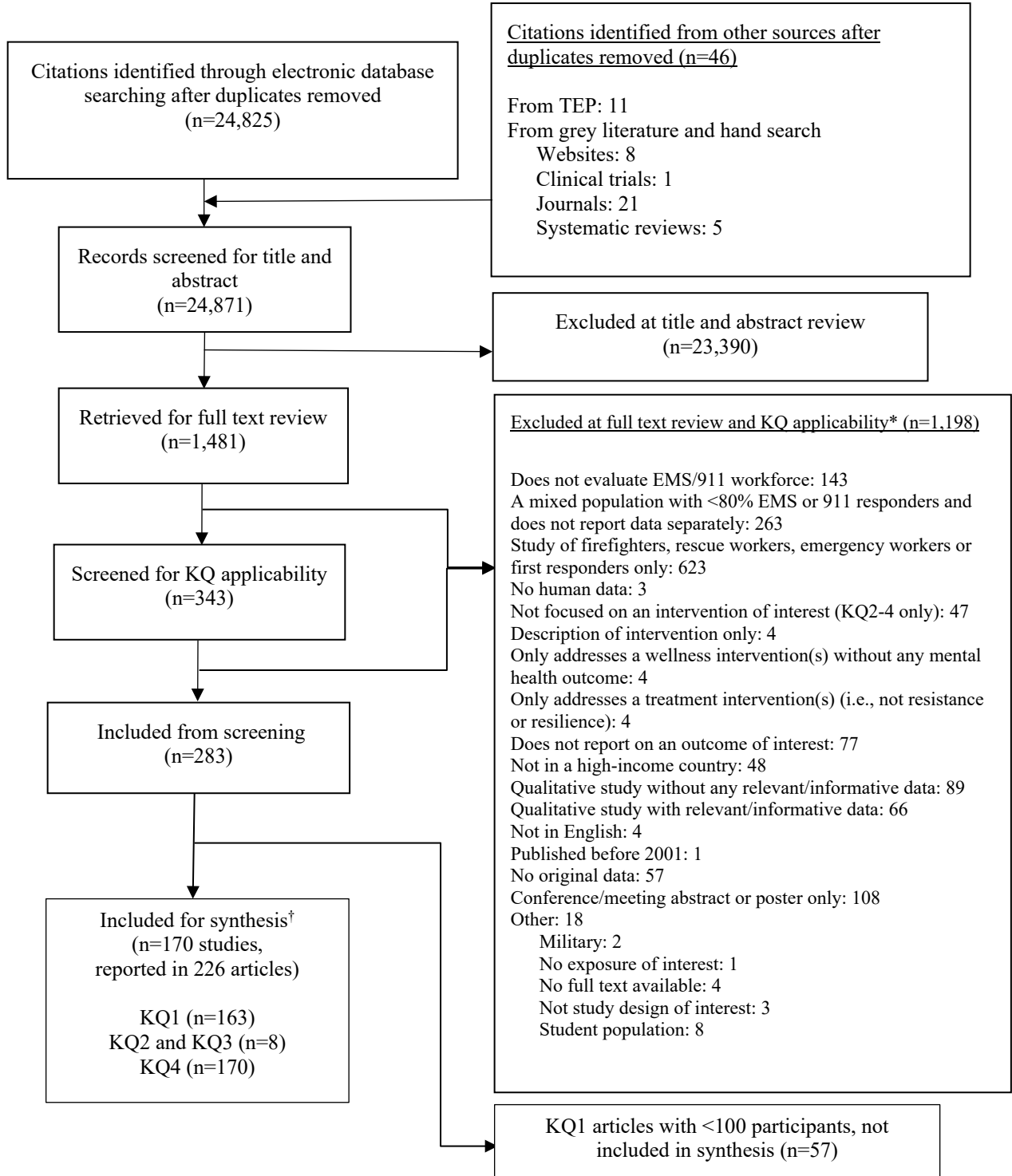
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1186. Yurtsever A, Bakalim O, Karaman Ş, et al. The effect of the online eye movement desensitization and reprocessing early intervention protocol (EMDR R-TEP) for the risk groups with post-traumatic stress symptoms during the COVID-19 pandemic. *Front Psychol.* 2022;13:935782. doi: 10.3389/fpsyg.2022.935782. PMID: 36248508.- **A mixed population with <80% EMS or 911 responders and does not report data separately**
1187. Zaidi SMIH, Yaqoob N, Mirza H. Compassion satisfaction, secondary traumatic stress and burnout among rescuers. *Journal of Postgraduate Medical Institute.* 2017;31(3):314-8. - **Not in a high-income country**
1188. Zegel M, Kabel KE, Lebeaut A, et al. Distress overtolerance among firefighters: Associations with posttraumatic stress. *Psychological trauma : theory, research, practice and policy.* 2023;15:S315-S8. doi: 10.1037/tra0001393. - **Study of firefighters, rescue workers, emergency workers or first responders only**
1189. Zegel M, Kabel KE, Lebeaut A, et al. Distress overtolerance among firefighters: Associations with posttraumatic stress. *Psychol Trauma.* 2022 Oct 27doi: 10.1037/tra0001393. PMID: 36301294.- **A**

- mixed population with <80% EMS or 911 responders and does not report data separately**
1190. Zegel M, Lebeaut A, Raines AM, et al. POSTTRAUMATIC STRESS DISORDER SYMPTOMS AND DRINKING MOTIVES AMONG COLLEGE STUDENTS AND FIREFIGHTERS: THE ROLE OF DISTRESS OVERTOLERANCE. *Alcoholism: Clinical and Experimental Research*. 2022;46:211A. doi: 10.1111/acer.14833. - **Conference/meeting abstract or poster only**
1191. Zegel M, McGrew SJ, Wardle MC, et al. The Main and Interactive Effects of Distress Tolerance and Reward Function on Posttraumatic Stress Disorder Symptoms Among Firefighters. *Psychological Trauma: Theory, Research, Practice & Policy*. 2023;15:S319-S26. doi: 10.1037/tra0001240. PMID: 171925032. - **Study of firefighters, rescue workers, emergency workers or first responders only**
1192. Zegel M, McGrew SJ, Wardle MC, et al. The main and interactive effects of distress tolerance and reward function on posttraumatic stress disorder symptoms among firefighters. *Psychol Trauma*. 2022 Apr 28;doi: 10.1037/tra0001240. PMID: 35482680.- **A mixed population with <80% EMS or 911 responders and does not report data separately**
1193. Zeig-Owens R, Singh A, Triplett S, et al. Assembling the Career Firefighter Health Study cohort: A methods overview. *Am J Ind Med*. 2021 Aug;64(8):680-7. doi: 10.1002/ajim.23266. PMID: 34114224. - **Study of firefighters, rescue workers, emergency workers or first responders only**
1194. Zhang S, Jiang J, Hao L, et al. What matters most? Network analysis of mental health, recovery experiences, sleep, and fatigue among career firefighters. *Stress Health*. 2023 Aug;39(3):663-72. doi: 10.1002/smi.3215. PMID: 36538510. - **Not in a high-income country**
1195. Zhou AY, Carder M, Gittins M, et al. Work-related ill health in doctors working in Great Britain: Incidence rates and trends. *The British Journal of Psychiatry*. 2017;211(5):310-5. doi: 10.1192/bjp.bp.117.202929. PMID: 2018-36884-011. - **Does not report on an outcome of interest**
1196. Zijlstra JA, Beesems SG, De Haan RJ, et al. Psychological impact on dispatched local lay rescuers performing bystander cardiopulmonary resuscitation. *Resuscitation*. 2015;92:115-21. doi: 10.1016/j.resuscitation.2015.04.028. - **Does not evaluate EMS/911 workforce**
1197. Zolnikov TR, Furio F. First responders and social distancing during the COVID-19 pandemic. *Journal of Human Behavior in the Social Environment*. 2021;31(1-4):244-53. doi: 10.1080/10911359.2020.1811826. PMID: 149729430. - **Qualitative study without relevant/informative data**
1198. Zsido AN, Csokasi K, Vincze O, et al. The emergency reaction questionnaire - First steps towards a new method. *Int J Disaster Risk Reduct*. 2020 Oct;49:101684. doi: 10.1016/j.ijdrr.2020.101684. PMID: 32501418. - **Does not evaluate EMS/911 workforce**

Appendix C. Results

Figure C-1. Results of the search and screening



EMS=emergency medical services; KQ=key question; TEP = technical expert panel

*Sum of excluded articles exceeds 1,198 because reviewers were not required to agree on reasons for exclusion.

†Sum of articles included in the syntheses does not equal the sum of the studies as there is some overlap between KQs.

Table C-1. Key Question 1 articles with less than 100 participants

Author, year	Country	Population enrolled	Sample size at baseline (all participants)	Sample size at baseline (EMS participants only)	Study design
Aasa, 2006 ¹	Sweden	EMS	26	26	Cohort study, single group
Abed Alah, 2021 ²	Qatar	EMS	394	37	Cross-sectional study
Alharthy, 2017 ³	Saudi Arabia	EMS	135	37	Cross-sectional study
Arvaniti, 2021 ⁴	Greece	EMS	74	74	Cross-sectional study
Austin, 2018 ⁵	US	EMS	54	54	Cross-sectional study
Bardhan, 2023 ⁶	US	EMS	36	36	Cross-sectional study
Bergmueller 2018 ⁷	Germany	EMS	97	97	Cross-sectional study
Bethea, 2020 ⁸	US	EMS	127	57	Cross-sectional study
Bond, 2023 ⁹	US	EMS	3500	59	Cross-sectional study
Casado, 2006 ¹⁰	Spain	EMS	111	79	Cross-sectional study
Crampton, 2014 ¹¹	US	EMS	87	87	Cross-sectional study
Dodd, 2022 ¹²	Australia, UK, USA, Canada	EMS	198	72	Cross-sectional study
Frazer, 2022 ¹³	Australia	EMS	286	61	Cross-sectional study
Fritz, 2005 ¹⁴	Germany	EMS	87	87	Cross-sectional study
Getrich, 2013 ¹⁵	US	EMS	246	82	Cross-sectional study
Guadagni 2018 ¹⁶	Canada	EMS	41	41	Cross-sectional study
Haddock, 2012 ¹⁷	US	EMS	656	80	Cross-sectional study
Hafeez, 2003 ¹⁸	US	EMS	99	99	Cross-sectional study
Hallinan, 2019 ¹⁹	US	EMS	3018	28	Cross-sectional study
Hruska, 2021 ²⁰	US	EMS	70	79	Cohort study, single group
Janka, 2018 ²¹	Austria	EMS	60	30	Cross-sectional study
Johnson, 2005 ²²	UK	EMS	25352	52	Cross-sectional study
Jurišová, 2016 ²³	Slovakia	EMS	62	62	Cross-sectional study
Khan, 2021 ²⁴	Australia	EMS	12	12	Cross-sectional study
Kobelski, 2023 ²⁵	Poland	EMS	245	46	Cross-sectional study
Korn, 2023 ²⁶	US	EMS	78	78	Cross-sectional study
Kukowski, 2016 ²⁷	Canada	EMS	87	87	Cross-sectional study
LeBlanc, 2011 ²⁸	Canada	EMS	22	22	Cohort study, single group
Maia 2010 ²⁹	Portugal	EMS	59	59	Cross-sectional study
Markert-Green, 2021 ³⁰	US	EMS	50	50	Cross-sectional study
Miller 2021 ³¹	US	EMS	38	38	Cross-sectional study

Author, year	Country	Population enrolled	Sample size at baseline (all participants)	Sample size at baseline (EMS participants only)	Study design
Musso, 2019 ³²	US	EMS	84	84	Cross-sectional study
Ogińska-Bulik, 2015 ³³	Poland	EMS	80	80	Cross-sectional study
Ondrejková, 2022 ³⁴	Slovakia	EMS	610	57	Cross-sectional study
Peifer, 2021 ³⁵	Germany	EMS	33	16	Cohort study, comparative
Pelletier, 2022 ³⁶	Canada	EMS	12	12	Cohort study, single group
Petrie, 2022 ³⁷	Australia	EMS	7845	95	Cross-sectional study
Philips, 2022 ³⁸	Australia	EMS	90	90	Cross-sectional study
Pink, 2021 ³⁹	UK	EMS	12989	99	Cross-sectional study
Piotrowski, 2021 ⁴⁰	Poland	EMS	75	75	Cross-sectional study
Pisarski, 2002 ⁴¹	Australia	EMS	60	60	Cross-sectional study
Pow, 2017 ⁴²	Canada	EMS	87	87	Cross-sectional study
Reed, 2017 ⁴³	US	EMS	59	59	Cross-sectional study
Regehr 2007 ⁴⁴	Canada	EMS	86	86	Cross-sectional study
Regehr, 2002 ⁴⁵	Canada	EMS	86	86	Cross-sectional study
Rus 2019 ⁴⁶	Romania	EMS	140	60	Cross-sectional study
Shepherd, 2014 ⁴⁷	UK	EMS	45	45	Cross-sectional study
Skogstad, 2015 ⁴⁸	Norway	EMS	238	89	Cross-sectional study
Sofianopoulos 2011 ⁴⁹	Australia	EMS	60	60	Cross-sectional study
Soravia, 2020 ⁵⁰	Switzerland	EMS	1002	97	Cross-sectional study
Spencer, 2006 ⁵¹	US	EMS	77	77	Cross-sectional study
Tal, 2020 ⁵²	US	EMS	128	31	Cross-sectional study
Tatebe, 2020 ⁵³	US	EMS	258	94	Cross-sectional study
Threatt, 2016 ⁵⁴	US	EMS	37	37	Cross-sectional study
van der Velden, 2008 ⁵⁵	Netherlands	EMS	66	66	Cohort study, single group
Wesemann, 2020 ⁵⁶	Germany	EMS	55	10	Cohort study, comparative
Ziarko, 2022 ⁵⁷	Poland	EMS	170	15	Cross-sectional study

EMS = emergency medical services; UK = United Kingdom; US = United States

Table C-2. List of primary studies with co-publications

Parent study Author, year	Number of co-publications	Co-publication citation
Bernaldo-De-Quiros , 2015 ⁵⁸	1	Gómez-Gutiérrez MM, Bernaldo-de-Quirós M, Piccini AT, et al. Posttraumatic Stress Symptomatology in Pre-Hospital Emergency Care Professionals Assaulted by Patients and/or Relatives: Importance of Severity and Experience of the Aggression. <i>J Interpers Violence</i> . 2016 Jan;31(2):339-54. doi: 10.1177/0886260514555370. PMID: 25381283.
Carleton, 2020 ⁵⁹	4	Angehrn A, Teale Sapach MJN, Ricciardelli R, et al. Sleep Quality and Mental Disorder Symptoms among Canadian Public Safety Personnel. <i>Int J Environ Res Public Health</i> . 2020 Apr 15;17(8)doi: 10.3390/ijerph17082708. PMID: 32326489. Carleton RN, Affi TO, Taillieu T, et al. Anxiety-related psychopathology and chronic pain comorbidity among public safety personnel. <i>J Anxiety Disord</i> . 2018 Apr;55:48-55. doi: 10.1016/j.janxdis.2018.03.006. PMID: 29566981. Carleton RN, Affi TO, Turner S, et al. Mental Disorder Symptoms among Public Safety Personnel in Canada. <i>Can J Psychiatry</i> . 2018 Jan;63(1):54-64. doi: 10.1177/0706743717723825. PMID: 28845686. Vig KD, Mason JE, Carleton RN, et al. Mental health and social support among public safety personnel. <i>Occup Med (Lond)</i> . 2020 Sep 9;70(6):427-33. doi: 10.1093/occmed/kqaa129. PMID: 32705138.
Cheng, 2022 ⁶⁰	1	Kshtriya S, Lawrence J, Kobezak HM, et al. Investigating Strategies of Emotion Regulation As Mediators of Occupational Stressors and Mental Health Outcomes in First Responders. <i>Int J Environ Res Public Health</i> . 2022 Jun 8;19(12)doi: 10.3390/ijerph19127009. PMID: 35742258.
Crowe, 2020 ⁶¹	1	Crowe RP. An assessment of burnout among emergency medical services professionals: ProQuest Information & Learning; 2020.
Donnelly , 2012 ⁶²	3	Donnelly EA, Bennett M. Development of a critical incident stress inventory for the emergency medical services. <i>Traumatology: An International Journal</i> . 2014;20(1):1-8. doi: 10.1177/1534765613496646. Donnelly EA, Chonody J, Campbell D. Measuring chronic stress in the emergency medical services. <i>Journal of Workplace Behavioral Health</i> . 2014;29(4):333-53. doi: 10.1080/15555240.2014.965824. Donnelly EA. Occupationally related stress exposures and stress reactions in the emergency medical services: ProQuest Information & Learning; 2012.
Essex , 2008 ⁶³	1	Bennett P, Williams Y, Page N, et al. Levels of mental health problems among UK emergency ambulance workers. <i>Emerg Med J</i> . 2004 Mar;21(2):235-6. doi: 10.1136/emj.2003.005645. PMID: 14988360.
Gartner , 2018 ⁶⁴	1	Behnke A, Rojas R, Karabatsiakos A, et al. Childhood maltreatment compromises resilience against occupational trauma exposure: A retrospective study among emergency medical service personnel. <i>Child Abuse Negl</i> . 2020 Jan;99:104248. doi: 10.1016/j.chiabu.2019.104248. PMID: 31731138.
Halpern , 2011 ⁶⁵	3	Halpern J, Maunder RG, Schwartz B, et al. Downtime after critical incidents in emergency medical technicians/paramedics. <i>Biomed Res Int</i> . 2014;2014:483140. doi: 10.1155/2014/483140. PMID: 24877101. Halpern J, Maunder RG, Schwartz B, et al. Identifying, describing, and expressing emotions after critical incidents in paramedics. <i>J Trauma Stress</i> . 2012 Feb;25(1):111-4. doi: 10.1002/jts.21662. PMID: 22354514. Maunder RG, Halpern J, Schwartz B, et al. Symptoms and responses to critical incidents in paramedics who have experienced childhood abuse and neglect. <i>Emerg Med J</i> . 2012 Mar;29(3):222-7. doi: 10.1136/emj.2010.099838. PMID: 21422029.

Parent study Author, year	Number of co-publications	Co-publication citation
Harris , 2023 ⁶⁶	1	Nguyen E, Meadley B, Harris R, et al. Sleep and mental health in recruit paramedics: a 6-month longitudinal study. <i>Sleep</i> . 2023 Aug 14;46(8)doi: 10.1093/sleep/zsad050. PMID: 36861384.
Holland , 2011 ⁶⁷	1	Holland WM. Fire/Emergency Medical Services and coping methods: Mitigating traumatic stress symptomatology in emergency services professionals: ProQuest Information & Learning; 2008.
Hutchinson, 2021 ⁶⁸	1	Hutchinson LC, Forshaw MJ, Poole H. The role of individual factors in the mental health of NHS ambulance personnel. <i>Journal of Paramedic Practice</i> . 2022;14(8):314-20. doi: 10.12968/jpar.2022.14.8.314. PMID: 158666313.
Jonsson , 2003 ⁶⁹	1	Jonsson A, Segesten K. Daily stress and concept of self in Swedish ambulance personnel. <i>Prehosp Disaster Med</i> . 2004 Jul-Sep;19(3):226-34. doi: 10.1017/s1049023x00001825. PMID: 15571199.
Kim , 2022 ⁷⁰	1	Hwang S, Kwon KT, Lee SH, et al. Correlates of burnout among healthcare workers during the COVID-19 pandemic in South Korea. <i>Sci Rep</i> . 2023 Feb 27;13(1):3360. doi: 10.1038/s41598-023-30372-x. PMID: 36849638.
Kohler , 2018 ⁷¹	1	Köhler M, Goebel S, Pedersen A. PTSD severity among emergency personnel: An investigation based on the Ehlers and Clark cognitive model. <i>Psychological trauma : theory, research, practice and policy</i> . 2019;11(6):677-84. doi: 10.1037/tra0000466.
Kyron, 2022 ⁷²	5	Kyron MJ, McEvoy PM, Gilbey D, et al. Sexual orientation and prevalence of mental health difficulties among emergency services employees. <i>J Affect Disord</i> . 2021 May 15;287:240-6. doi: 10.1016/j.jad.2021.02.032. PMID: 33799043. Kyron MJ, Podlogar MC, Joiner TE, et al. Allowing nondisclosure in surveys with suicide content: Characteristics of nondisclosure in a national survey of emergency services personnel. <i>Psychol Assess</i> . 2020 Dec;32(12):1106-17. doi: 10.1037/pas0000949. PMID: 33030937. Kyron MJ, Rikkers W, LaMontagne A, et al. Work-related and nonwork stressors, PTSD, and psychological distress: Prevalence and attributable burden among Australian police and emergency services employees. <i>Psychol Trauma</i> . 2022 Oct;14(7):1124-33. doi: 10.1037/tra0000536. PMID: 31789534. Kyron MJ, Rikkers W, Page AC, et al. Prevalence and predictors of suicidal thoughts and behaviours among Australian police and emergency services employees. <i>Aust N Z J Psychiatry</i> . 2021 Feb;55(2):180-95. doi: 10.1177/0004867420937774. PMID: 32615800. Rikkers W, Lawrence D. Barriers to seeking help for an emotional or mental health condition among Australian emergency services workers. <i>Australasian Journal of Disaster & Trauma Studies</i> . 2022;26(1):23-33. PMID: 159690204
Lilly , 2015 ⁷³	3	Allen CE, Mercer MC, Lilly MM. Duty-Related Posttraumatic Stress Symptoms in 911 Telecommunicators: The Roles of Childhood Trauma Exposure and Emotion-Focused Coping. <i>Journal of Aggression, Maltreatment & Trauma</i> . 2016;25(7):686-701. doi: 10.1080/10926771.2016.1175534. PMID: 117671879. Lilly MM, London MJ, Mercer MC. Predictors of Obesity and Physical Health Complaints Among 911 Telecommunicators. <i>Saf Health Work</i> . 2016 Mar;7(1):55-62. doi: 10.1016/j.shaw.2015.09.003. PMID: 27014492. London MJ, Mercer MC, Lilly MM. Considering the Impact of Early Trauma on Coping and Pathology to Predict Posttraumatic Growth Among 9-1-1 Telecommunicators. <i>J Interpers Violence</i> . 2020 Nov;35(21-22):4709-31. doi: 10.1177/0886260517716942. PMID: 29294814.

Parent study Author, year	Number of co-publications	Co-publication citation
Ma , 2020 ⁷⁴	1	Hsiao YY, Chang WH, Ma IC, et al. Long-Term PTSD Risks in Emergency Medical Technicians Who Responded to the 2016 Taiwan Earthquake: A Six-Month Observational Follow-Up Study. <i>Int J Environ Res Public Health</i> . 2019 Dec 7;16(24)doi: 10.3390/ijerph16244983. PMID: 31817877.
Makara-Studzińska , 2021 ⁷⁵	4	Makara-Studzińska M, Kruczek A, Borzyszkowska A, et al. Profiles of Occupational Burnout in the Group of Representatives of High-Risk Professions in Poland. <i>Int J Environ Res Public Health</i> . 2022 May 22;19(10)doi: 10.3390/ijerph19106297. PMID: 35627838. Makara-Studzińska M, Załuski M, Adamczyk K. Burnout and Perceived Stress of Polish Emergency Call Takers and Dispatchers. <i>Int J Environ Res Public Health</i> . 2021 Sep 28;18(19)doi: 10.3390/ijerph181910206. PMID: 34639502. Załuski M, Makara-Studzińska M. Latent Occupational Burnout Profiles of Working Women. <i>Int J Environ Res Public Health</i> . 2022 May 27;19(11)doi: 10.3390/ijerph19116525. PMID: 35682109. Załuski M, Makara-Studzińska M. Profiles of Burnout, Job Demands and Personal Resources among Emergency Call-Takers and Dispatchers. <i>Healthcare (Basel)</i> . 2022 Jan 31;10(2)doi: 10.3390/healthcare10020281. PMID: 35206895.
Mausz, 2021 ⁷⁶	1	Mausz J, Donnelly EA, Moll S, et al. Mental Disorder Symptoms and the Relationship with Resilience among Paramedics in a Single Canadian Site. <i>Int J Environ Res Public Health</i> . 2022 Apr 17;19(8)doi: 10.3390/ijerph19084879. PMID: 35457746.
Pierce , 2012 ⁷⁷	1	Lilly MM, Pierce H. PTSD and depressive symptoms in 911 telecommunicators: The role of peritraumatic distress and world assumptions in predicting risk. <i>Psychological Trauma: Theory, Research, Practice, and Policy</i> . 2013;5(2):135-41. doi: 10.1037/a0026850.
Renkiewicz , 2021 ⁷⁸	3	Renkiewicz GK, Hubble MW. Secondary trauma response in emergency services systems (STRESS) project: quantifying and predicting vicarious trauma in emergency medical services personnel. <i>Br Paramed J</i> . 2023 Mar 1;7(4):23-34. doi: 10.29045/14784726.2023.3.7.4.23. PMID: 36875827. Renkiewicz GK, Hubble MW. Secondary Traumatic Stress in Emergency Services Systems (STRESS) Project: Quantifying and Predicting Compassion Fatigue in Emergency Medical Services Personnel. <i>Prehosp Emerg Care</i> . 2022 Sep-Oct;26(5):652-63. doi: 10.1080/10903127.2021.1943578. PMID: 34128453. Renkiewicz GK, Hubble MW. Secondary Traumatic Stress in Emergency Services Systems Project: Quantifying the Effect of Personal Trauma Profiles on Lifetime Prevalence of Suicidality in Emergency Medical Services Personnel. <i>Air Med J</i> . 2022 Sep-Oct;41(5):463-72. doi: 10.1016/j.amj.2022.04.002. PMID: 36153144.
Reti, 2022 ⁷⁹	1	Reti T, de Terte I, Stephens C. Perceived social support predicts psychological distress for ambulance personnel. <i>Traumatology</i> . 2022;28(2):267-78. doi: 10.1037/trm0000331.
Soto-Camara, 2022 ⁸⁰	1	Molina-Oliva M, Martín-Sánchez R, Pastor-Benito E, et al. Influence of Previous Mental State on Psychological Outcomes of Spanish Out-of-Hospital Professionals during the COVID-19 Pandemic. <i>Int J Environ Res Public Health</i> . 2023 Feb 17;20(4)doi: 10.3390/ijerph20043574. PMID: 36834266.

Parent study Author, year	Number of co- publications	Co-publication citation
Stanley , 2018 ⁸¹	11	<p>Bartlett BA, Jardin C, Martin C, et al. Posttraumatic stress and suicidality among firefighters: The moderating role of distress tolerance. <i>Cognitive Therapy and Research</i>. 2018;42(4):483-96. doi: 10.1007/s10608-018-9892-y.</p> <p>Bing-Canar H, Ranney RM, McNett S, et al. Alcohol Use Problems, Posttraumatic Stress Disorder, and Suicide Risk Among Trauma-Exposed Firefighters. <i>J Nerv Ment Dis</i>. 2019 Mar;207(3):192-8. doi: 10.1097/nmd.0000000000000947. PMID: 30724832.</p> <p>Boffa JW, Stanley IH, Smith LJ, et al. Posttraumatic Stress Disorder Symptoms and Suicide Risk in Male Firefighters: The Mediating Role of Anxiety Sensitivity. <i>J Nerv Ment Dis</i>. 2018 Mar;206(3):179-86. doi: 10.1097/nmd.0000000000000779. PMID: 29309295.</p> <p>Erez G, Yakubovich S, Sadeh H, et al. Pediatric psychiatric emergency rooms during COVID-19: A multi-center study. <i>BMC Psychiatry</i>. 2022;22doi: 10.1186/s12888-022-04371-7.</p> <p>Lebeaut A, Tran JK, Vujanovic AA. Posttraumatic stress, alcohol use severity, and alcohol use motives among firefighters: The role of anxiety sensitivity. <i>Addict Behav</i>. 2020 Jul;106:106353. doi: 10.1016/j.addbeh.2020.106353. PMID: 32087474.</p> <p>Lebeaut A, Zegel M, Healy NA, et al. PTSD Symptom Severity, Pain Intensity, and Pain-Related Disability Among Trauma-Exposed Firefighters: the Moderating Role of Mindfulness. <i>Mindfulness (N Y)</i>. 2022 Mar;13(3):786-98. doi: 10.1007/s12671-022-01836-4. PMID: 36404797.</p> <p>Miloslavich K, Leonard SJ, Wardle MC, et al. Alcohol Use Severity, Anger and Drinking Motives among Firefighters. <i>Subst Use Misuse</i>. 2023;58(5):601-9. doi: 10.1080/10826084.2023.2177113. PMID: 36803652.</p> <p>Paulus DJ, Gallagher MW, Bartlett BA, et al. The unique and interactive effects of anxiety sensitivity and emotion dysregulation in relation to posttraumatic stress, depressive, and anxiety symptoms among trauma-exposed firefighters. <i>Compr Psychiatry</i>. 2018 Jul;84:54-61. doi: 10.1016/j.comppsy.2018.03.012. PMID: 29694933.</p> <p>Torres VA, Strack JE, Dolan S, et al. Identifying Frequency of Mild Traumatic Brain Injury in Firefighters. <i>Workplace Health Saf</i>. 2020 Oct;68(10):468-75. doi: 10.1177/2165079920922576. PMID: 32525463.</p> <p>Zegel M, Lebeaut A, Healy N, et al. Mental Health Correlates of Probable Posttraumatic Stress Disorder, Probable Alcohol Use Disorder, and Their Co-Occurrence among Firefighters. <i>Behav Modif</i>. 2022 Mar;46(2):395-421. doi: 10.1177/01454455211033517. PMID: 34323099.</p> <p>Zegel M, Tran JK, Vujanovic AA. Posttraumatic stress, alcohol use, and alcohol use motives among firefighters: The role of distress tolerance. <i>Psychiatry Res</i>. 2019 Dec;282:112633. doi: 10.1016/j.psychres.2019.112633. PMID: 31708250.</p>
Stanley, 2017 ⁸²	1	<p>Stanley IH, Hom MA, Spencer-Thomas S, et al. Examining anxiety sensitivity as a mediator of the association between PTSD symptoms and suicide risk among women firefighters. <i>J Anxiety Disord</i>. 2017 Aug;50:94-102. doi: 10.1016/j.janxdis.2017.06.003. PMID: 28645017.</p>
Sterud , 2008 ⁸³	2	<p>Sterud T, Hem E, Lau B, et al. A comparison of general and ambulance specific stressors: predictors of job satisfaction and health problems in a nationwide one-year follow-up study of Norwegian ambulance personnel. <i>J Occup Med Toxicol</i>. 2011 Mar 31;6(1):10. doi: 10.1186/1745-6673-6-10. PMID: 21450112.</p> <p>Sterud T, Hem E, Lau B, et al. Suicidal ideation and suicide attempts in a nationwide sample of operational Norwegian ambulance personnel. <i>J Occup Health</i>. 2008;50(5):406-14. doi: 10.1539/joh.18025. PMID: 18654042.</p>

Parent study Author, year	Number of co- publications	Co-publication citation
Trachik, 2015 ⁸⁴	1	Marks MR, Cunningham A, C. B. Finding control in the chaos: A case for mindfulness in the dispatch center. Ann Emerg Dispatch Response. 2018;6(2):5-10.

Table C-3. List of instruments utilized by included studies

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Abbreviated Maslach Burnout Inventory† (aMBI) ⁸⁵	Burnout	12	-	-	-	-	-	-	-	-	-	Moderate scores in ≥2 subscales
aMBI: Personal accomplishment (PA) subscale††	Burnout	4	0-48	Better	-	39-48	32-38	0-31	-	-	-	-
aMBI: Emotional exhaustion (EE) subscale††	Burnout	5	0-54	Worse	-	0-16	17-26	27-54	-	-	-	-
aMBI: Depersonalization (DP) subscale††	Burnout	3	0-21	Worse	-	0-6	7-12	13-30	-	-	-	-
Alcohol Use Disorders Identification Test (AUDIT) ⁸⁶	Substance Use	10	0-40	Worse	0	1-7	8-14	15-40	-	-	-	-
Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) ⁸⁷	Substance Use	3	0-12	Worse	-	W: 0-2 M: 0-3	W: 3-5 M: 4-5	W: 6-7 M: 6-7	W: 8-12 M: 8-12	-	-	-
Anxiety Sensitivity Index-3 (ASI-3) ⁸⁸	Anxiety	18	0-72	Worse	-	0-16	17-22	23-72	-	-	-	-
Beck Depression Inventory (BDI) ⁸⁹	Depression	21	0-63	Worse	-	0-9	10-18	19-29	30-63	-	-	-
Burnout Assessment Tool-12 (BAT-12) ^{90, 91}	Burnout	12	1-5	Worse	-	-	-	-	-	1-2.53	2.54-2.95	2.96-5
BAT-12: Exhaustion subscale	Burnout	3	1-5	Worse	-	-	-	-	-	1-3.16	3.17-3.49	3.50-5
BAT-12: Mental distance subscale	Burnout	3	1-5	Worse	-	-	-	-	-	1-2.16	2.17-3.16	3.17-5
BAT-12: Emotional impairment subscale	Burnout	3	1-5	Worse	-	-	-	-	-	1-2.16	2.17-2.82	2.83-5
BAT-12: Cognitive impairment subscale	Burnout	3	1-5	Worse	-	-	-	-	-	1-2.82	2.83-3.16	3.17-5
Cut, Annoyed, Guilty, and Eye Questionnaire (CAGE) ^{92, 93}	Substance Use	4	0-4	Worse	-	-	-	-	-	0-1	-	2-4
Calgary Symptoms of Stress Inventory (C-SOSI) ⁹⁴	Stress	56	0-280	Worse	-	-	-	-	-	-	-	-
C-SOSI: Depression subscale	Depression	8	0-40	Worse	-	-	-	-	-	-	-	-

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Center for Epidemiologic Studies-Depression (CES-D) ⁹⁵	Depression	20	0-60	Worse	-	-	-	-	-	0-15	16-60	
Center for Epidemiologic Studies-Depression-10 (CES-D-10/CESD-R-10) ⁹⁶	Depression	10	0-30	Worse	-	-	-	-	-	0-9	-	10-30
Center for Epidemiologic Studies-Depression-Revised (CESD-R) ⁹⁷	Depression	20	0-60	Worse	-	-	-	-	-	0-15	16-60	-
Copenhagen Burnout Inventory (CBI) ⁹⁸	Burnout	19	0-100	Worse	-	0-49	50-74	75-99	100	-	-	-
CBI: Work burnout subscale	Burnout	7	0-100	Worse	-	0-49	50-74	75-99	100	-	-	-
Davidson Trauma Scale-8 (DTS-8) / Treatment-outcome Post-traumatic Stress Disorder Scale (TOP-8) ⁹⁹	PTSD	8	0-32	Worse	-	-	-	-	-	-	-	Any item ≥ 2
Depression Anxiety Stress Scale-21 (DASS-21): Depression subscale ¹⁰⁰	Depression	7	0-42	Worse	0-9	10-13	14-20	21-27	28-42	-	-	-
DASS-21: Anxiety subscale ¹⁰⁰	Anxiety	7	0-42	Worse	0-7	8-9	10-14	15-19	20-42	-	-	-
DASS-21: Tension/stress subscale ¹⁰⁰	Stress	7	0-42	Worse	0-14	15-18	19-25	26-33	34-42	-	-	-
Everly Behavioral Stress ⁸ (EBS68)	Stress	-	-	-	-	-	-	-	-	-	-	-
General Health Questionnaire-12 (GHQ-12) ¹⁰¹	Depression; Stress	12	0-36	Worse	-	-	-	-	-	-	-	13-36
General Health Questionnaire-28 (GHQ-28) ¹⁰²	Stress	28	0-84	Worse	-	-	-	-	-	-	-	5-84
Generalized Anxiety Disorder 2 (GAD-2) ¹⁰³	Anxiety	2	0-6	Worse	-	-	-	-	-	0-2	-	3-6
Generalized Anxiety Disorder-7 (GAD-7) ¹⁰⁴	Anxiety	7	0-21	Worse	0-4	5-9	10-14	15-21	-	-	-	-

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Global Assessment of Posttraumatic Stress (GAPS) / Escala Global de Evaluación del Estrés Postraumático (EGEP) ¹⁰⁵	PTSD	64	-	Worse	-	-	-	-	-	-	-	-
Global Assessment of Recent Stress (GARS) ¹⁰⁶	Stress	7	0-63	Worse	-	-	-	-	-	-	-	-
Hospital Anxiety and Depression Scale (HADS): Depression subscale ¹⁰⁷	Depression	7	0-21	Worse	-	-	-	-	-	0-7	8-10	11-21
HADS: Anxiety subscale ¹⁰⁷	Anxiety	7	0-21	Worse	-	-	-	-	-	0-7	8-10	11-21
Impact of Event Scale (IES/IES-15) ¹⁰⁸	PTSD	15	0-75	Worse	-	-	-	-	-	0-29	-	30-75
IES: Intrusion subscale	PTSD	7	0-35	Worse	-	-	-	-	-	-	-	-
IES: Avoidance subscale	PTSD	8	0-40	Worse	-	-	-	-	-	-	-	-
Impact of Event Scale-6 (IES-6) ¹⁰⁹	PTSD	6	0-4	Worse	-	-	-	-	-	-	-	1.75-5
Impact of Event Scale-Revised (IES-R) ¹⁰⁷	PTSD	22	0-88	Worse	-	-	-	-	-	0-32	33-88	-
IES-R: Intrusion subscale	PTSD	7	0-28	Worse	-	-	-	-	-	-	-	-
IES-R: Avoidance subscale	PTSD	8	0-32	Worse	-	-	-	-	-	-	-	-
IES-R: Hyperarousal subscale	PTSD	7	0-28	Worse	-	-	-	-	-	-	-	-
International Trauma Questionnaire (ITQ) ¹¹⁰	PTSD	18	0-72	Worse	-	-	-	-	-	-	-	10-72
Job Stress Scale ¹¹¹	Stress	13	13-65	Worse	-	-	-	-	-	-	-	-
Job Stress Survey (JSS) ^{112, 113}	Stress	30	30-270	Worse	-	-	-	-	-	-	-	70-270
Kessler Psychological Distress Scale-6 (K6) ¹¹⁴	Stress	6	0-24	Worse	-	-	-	-	-	-	-	13-24
Kessler Psychological Distress Scale-10 (K10) ¹¹⁵	Stress	10	10-50	Worse	10-19	20-24	25-29	30-50	-	-	-	-
Link Burnout Questionnaire (LBQ) ¹¹⁶	Burnout	24	24-144	Worse	-	-	-	-	-	-	-	-
Maslach Burnout Inventory – General Survey (MBI-GS): Cynicism subscale ¹¹⁷	Burnout	5	0-30	Worse	-	-	-	-	-	0-10	-	11-30
MBI-GS: Exhaustion subscale ¹¹⁷	Burnout	5	0-30	Worse	-	-	-	-	-	0-15	-	16-30

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Maslach Burnout Inventory – Human Services Survey for Medical Personnel (MBI-HSS): Personal accomplishment subscale ¹¹⁷	Burnout	8	0-48	Better	-	40-48	34-39	0-33	-	-	-	-
MBI-HSS: Emotional exhaustion subscale ¹¹⁷	Burnout	9	0-63	Worse	-	0-18	19-26	27-63	-	-	-	-
MBI-HSS: Depersonalization subscale ¹¹⁷	Burnout	5	0-35	Worse	-	0-5	6-9	10-35	-	-	-	-
Minnesota Multiphasic Personality Inventory-2 (MMPI-2) ¹¹⁸	Depression	567	0-1680	Worse	-	-	-	-	-	-	-	70-120 in a subscale
Moral Injury Events Scale (MIES) ¹¹⁹	Moral injury	9	-	-	-	-	-	-	-	-	-	-
MIES: Transgressions-Self subscale	Moral injury	6	6-36	Worse	-	-	-	-	-	-	-	-
MIES: Transgressions-Other subscale	Moral injury	3	3-18	Worse	-	-	-	-	-	-	-	-
Oldenburg Burnout Inventory (OLBI) ^{120, 121}	Burnout	16	16-64	Worse	-	-	-	-	-	-	-	-
Patient Health Questionnaire-2 (PHQ-2) / Kroenke-2 scale ¹²²	Depression	2	0-6	Worse	-	-	-	-	-	0-2	-	3-6
Patient Health Questionnaire-9 (PHQ-9) ¹²³	Depression	9	0-27	Worse	0-4	5-9	10-14	15-19	20-27	-	-	-
Panic Disorder Severity Scale (PDSS) ¹²⁴	Anxiety	7	0-28	Worse	-	-	-	-	-	0-8	-	9-28
Paykel's Suicidal Feelings in the General Population Questionnaire ¹²⁵	Suicidality	5	0-5	Worse	-	-	-	-	-	0	-	1-5
Perceived Stress Scale-10 (PSS-10) ¹²⁶	Stress	10	0-40	Worse	-	0-13	14-26	27-40	-	-	-	-
Perceived Stress Scale-14 (PSS-14) ¹²⁷	Stress	14	0-56	Worse	-	0-18	19-37	38-56	-	-	-	-
Peritraumatic Distress Inventory (PDI) ¹²⁸	Peritraumatic stress	13	0-52	Worse	-	-	-	-	-	0-13	-	14-52

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Police Stress Questionnaire: Organizational (PSQ-Org) ¹²⁹	Stress	20	0-7	Worse	-	0-2.6	2.7-3.9	4.0-7.0	-	-	-	-
Police Stress Questionnaire: Operational (PSQ-Op) ¹²⁹	Stress	20	0-7	Worse	-	0-2.0	2.1-3.4	4.7-7.0	-	-	-	-
Primary Care PTSD Screen for DSM-5 (PC-PTSD-5) ¹³⁰	PTSD	5	0-5	Worse	-	-	-	-	-	0-3	-	4-5
Primary Care PTSD Screen (PC-PTSD) ¹³¹	PTSD	4	0-4	Worse	-	-	-	-	-	0-2	-	3-4
PTSD Checklist for DSM-5 (PCL-5) ¹³²	PTSD	20	0-80	Worse	-	-	-	-	-	-	-	33-80
PTSD Checklist – Civilian Version (PCL-C) ¹³³	PTSD	17	17-85	Worse	-	-	-	-	-	-	-	50-85
PTSD Checklist – Military Version (PCL-M) ¹³⁴	PTSD	17	17-85	Worse	-	-	-	-	-	17-49	-	50-85
Posttraumatic Stress Diagnostic Scale (PDS) ¹³⁵	PTSD	24	0-96	Worse	-	-	-	-	-	0-27	-	28-96
Post Traumatic Symptom Scale-10 (PTSS-10/PTSS) ¹³⁶	PTSD	10	10-70	Worse	-	-	-	-	-	-	-	35-70
Professional Quality of Life (ProQOL) ¹³⁷	Burnout; Peritraumatic stress	-	-	-	-	-	-	-	-	-	-	-
ProQOL: STS Subscale	Peritraumatic Stress	10	10-50	Worse	-	10-22	23-41	42-50	-	-	-	-
ProQOL: Burnout	Burnout	10	10-50	Worse	-	10-22	23-41	42-50	-	-	-	-
Questionnaire for Secondary Traumatization ¹³⁸	Peritraumatic stress	31	31-155	Worse	-	31-64	65-82	83-155	-	-	-	-
Short Professional Quality of Life (Short ProQOL) ¹³⁹	Burnout	9	9-45	Worse	-	-	-	-	-	-	-	-
Short ProQOL: Burnout subscale	Burnout	3	3-15	Worse	-	-	-	-	-	-	-	-
Short Screening Scale for DSM-IV-PTSD ¹⁴⁰	PTSD	7	0-7	Worse	-	-	-	-	-	0-3	-	4-7

Instrument Name	Outcome(s)*	No. of Items	Range	Direction (Higher is...)	Normal	Mild	Moderate	Severe	Very Severe	Normal	Doubtful/ At Risk	Diagnosis/ Likely
Staff Burnout Scale for Health Professionals (SBS-HP) ¹⁴¹	Burnout	20	20-140	Worse	-	-	-	-	-	-	-	-
State-Trait Anxiety Inventory-Short Form (STAI-SF) ¹⁴²	Anxiety	6	0-18	Worse	-	-	-	-	-	-	-	-
Suicide Behaviors Questionnaire-Revised (SBQ-R) ¹⁴³	Suicidality	4	3-18	Worse	-	-	-	-	-	0-6	7-18	-
Symptom Checklist-90-R (SCL-90-R): Depression subscale ¹⁴⁴	Depression	13	0-52	Worse	-	-	-	-	-	-	-	-
Taiwan Ministry of Labor Burnout Measurement Tool ^{†,§}	Burnout	13	-	-	-	-	-	-	-	-	-	-
Taiwan Ministry of Labor Burnout Measurement Tool: Personal-related burnout subscale	Burnout	6	-	Worse	-	<50	50-70	>70	-	-	-	-
Taiwan Ministry of Labor Burnout Measurement Tool: Work-related burnout subscale	Burnout	7	-	Worse	-	<45	45-60	>60	-	-	-	-
Traumatic Life Events Questionnaire (TLEQ) ¹⁴⁵	PTSD	23	0-138	Worse	-	-	-	-	-	-	-	-
Workplace Perceived Stress Questionnaire / Perceived Stress at Work Scale ¹⁴⁶	Stress	10	0-40	Worse	-	-	-	-	-	-	-	-
Work-Related Behavior and Experience Patterns / Arbeitsbezogenes Verhaltens- und Erlebensmuster (AVEM) ^{147, 148}	Burnout	66	66-396	Worse	-	-	-	-	-	-	-	-

Abbreviations (not defined above): DSM=Diagnostic and Statistical Manual of Mental Disorders, M=men, PTSD=posttraumatic stress disorder, STS=secondary traumatic stress, W=women

* Instruments using self-report psychometrics to assess PTSD are evaluating probable PTSD, not a diagnosis

† Score is reported by subscales instead of a total score

†† aMBI subscale scores are calculated using weighted scoring; apply MBI-HSS ranges

§ Unpublished instrument

¹Diagnostic cut-offs were published in the 3rd edition of the Maslach Burnout Inventory Manual (1996); however, the most recent 4th edition has removed them.

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