VIDENSKABELIGT REFERENCE DOKUMENT: **VOLD PÅ ARBEJDSPLADSEN OG PSYKISKE HELBREDS KONSEKVENSER: ET SYSTEMATISK REVIEW MED META-ANALYSE**

Af
Laura Aviaja Rudkjøbing[1], Ane Berger Bungum[1], Esben Meulengracht Flachs[1], Nanna Hurwitz Eller[1], Marianne Borritz[1], Reiner Rugulies[2,3,4], Naja Hulvej-Rod[3], Birgit Aust[2], Karin Biering[5] og Jens Peter Bonde[1].

Københavns Stressforskningscenter

REGION

[1] Arbejds- og Miljømedicinsk Afdeling, Bispebjerg og Frederiksberg Universitets Hospital, 2400 København NV
[2] Det Nationale Forskningscenter for Arbejdsmiljø, 2100 København Ø
[3] Afdeling for Epidemiologi, Institut for Folkesundhedsvidenskab, Københavns Universitet, 1123 København K
[4] Institut for Psykologi, Københavns Universitet, 1353 København K
[5] Arbejdsmedicin - Dansk Ramazzini Center, Hospitalsenheden Vest, 7400 Herning

FORORD

I dette referencedokument præsenterer vi en systematisk gennemgang og vurdering af videnskabelige undersøgelser, som belyser sammenhængen mellem udsættelse for vold og trusler om vold på arbejdspladsen og udvikling af psykisk sygdom (fraset PTSD) og psykiske symptomer. Projektet er udført på opdrag af Arbejdsmiljøforskningsfonden efter særligt opslag med ansøgningsfrist 4.9 2017 og tilsagn om bevilling ultimo januar 2018. Arbejdet med rapporten blev påbegyndt i maj 2018 og afsluttet i december 2018.

I opslaget oplyses at der ’ønskes en oversigt over sammenhængen mellem vold og trusler på arbejdet og efterfølgende psykisk sygdom for så vidt angår andre sygdomme end posttraumatisk belastningsreaktion (PTSD). Der ønskes en udredning og beskrivelse af eksponeringen, herunder varighed. Der ønskes også en udredning vedrørende den tidsmæssige sammenhæng. Vold skal tolkes bredt og dækker over alt fra grove overfald med brug af våben til slag, spark, spyt og kradseri, eller at man får kastet ting efter sig. Det vil være relevant at få beskrevet, om volden er rettet direkte mod tilskadekomne, i modsætning til at være vidne til vold eller få genfortalt, at andre har været udsat for vold. Trusler skal forstås mere uddybende, så også truende adfærd og forfølgelse er at betegne som en trussel.’

Projektet er udført i regi af Københavns Stressforskningscenter, som er en forskningsalliance mellem Arbejds- og Miljømedicinsk Afdeling, Bispebjerg Hospital, Institut for Folkesundhedsvidenskab, Københavns Universitet og Det Nationale Forskningscenter for Arbejdsmiljø.

Læge og ph.d.-studerende Laura Aviaja Rudkjøbing, Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitetshospital, har været projektleder på projektet i tæt samarbejde med professor, overlæge, dr.med. Jens Peter Bonde, Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitetshospital, og en forfattergruppe bestående af følgende deltagere:

Esben Meulengracht Flachs, Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitets Hospital
Ane Berger Bungum, Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitets Hospital
Nanna Hurwitz Eller, overlæge dr.med., Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitets Hospital
Marianne Borritz, overlæge, ph.d., Arbejds- og Miljømedicinsk afdeling, Bispebjerg og Frederiksberg Universitets Hospital
Reiner Rugulies, professor, ph.d., Det Nationale Forskningscenter for Arbejdsmiljø
Birgit Aust, seniorforsker, ph.d., Det Nationale Forskningscenter for Arbejdsmiljø
Naja Hulvej Rod, professor, ph.d., dr.med., Institut for Folkesundhedsvidenskab, Københavns Universitet
Karin Biering, seniorforsker, ph.d., Arbejdsmedicin - Dansk Ramazzini Center, Hospitalsenheden Vest.

En detaljeret forskningsplan med præcisering af formål, afgrænsninger, søgekriterier, definition af vold og trusler om vold samt psykisk sygdom og psykiske symptomer blev drøftet ved et indledende møde i projektgruppen i april 2018 og efterfølgende publiceret på PROSPERO, en international database over protokoller for systematiske reviews (https://www.crd.york.ac.uk/prospero/). Forskerne ved arbejds- og miljømedicinsk afdeling har stået for litteratursøgning og vurderingen af de enkelte undersøgelser, Laura Rudkjøbing og Jens Peter Bonde har forfattet rapporten og hele projektgruppen har bidraget med forslag og kommentarer. Der har undervejs været afholdt 3 møder i projektgruppen – herunder et afsluttende møde i december 2018 efter at eksterne bedømmelser var indhentet. Et udkast til rapporten er gennemlæst og kommenteret af to eksterne bedømmere:

Professor, overlæge, dr.med. Martin Balslev Jørgensen, Psykiatrisk Center København.

Professor dr.med. Stein Knardahl, Nationalt Institut for Arbejdsmedicin (STAMI), Afdeling for Arbejdspsykologi og -fysiologi, Norge.

Bedømmernes bemærkninger er vedlagt rapporten og den her foreliggende endelige udgave af rapporten er revideret i henhold til de eksterne bedømmeres bemærkninger.

Rapporten er affattet på engelsk men indeholder et fyldigt dansk resumé.

Forfattergruppen

Arbejds- og Miljømedicinsk Afdeling, Bispebjerg, december 2018

INDHOLD

DANSK RESUMÉ

Baggrund: Vold og trusler om vold på arbejdspladsen er rapporteret hyppigt i litteraturen de seneste år [1-13]. Hyppigheden varierer meget alt efter fag, definitioner og målemetoder. De internationale forskningslitteratur vedrører især ansatte i sundhedssektoren [14], men vold og trusler om vold forekommer også i andre sektorer. En dansk undersøgelse fra det Nationale Forskningscenter for Arbejdsmiljø viser, at 6.0% af 34.800 tilfældig udvalgte ansatte i Danmark mellem 18-64 år har været udsat for fysisk vold på arbejdspladsen i løbet af det seneste år, mens 8.8% har været udsat for trusler om vold [15]. Tabel 1 viser fra samme undersøgelse andelen af danske lønmodtagere i forskellige udvalgte jobgrupper, der angiver at have været udsat for henholdsvis vold og trusler om vold på arbejdspladsen.

Tabel 1: Andelen af lønmodtagere udsat for henholdsvis vold og trusler om vold på arbejdspladsen i forskellige jobgrupper. *Kilde Danskernes arbejdsmiljø 2016, Det Nationale Forskningscenter for Arbejdsmiljø, NFA (Arbejdsmiljøforskning.dk).*

Jobgruppe	Andel af lønmodtagere udsat for Vold og trusler om vold
Fysisk vold	
Specialpædagoger	36.2 %
Social- og sundhedsassistenter	32.5 %
Politi og fængselsbetjente	29.7 %
Portører	28.2 %
Specialundervisere	26.9 %
Pædagoger	24,0 %
Skolelærere	19.3 %
Sygeplejersker	15.6 %
Pædagogmedhjælpere	13.8 %
Brandmænd, reddere, sikkerhedsvagter	12.0 %
Trusler	
Politi og fængselsbetjente	49.5 %
Specialpædagoger	49.2 %
Passagerservicemedarbejdere	38.9 %
Social- og sundhedsassistenter	30.7 %
Specialundervisere	27.6 %
Socialrådgivere	26.3 %
Portører m.fl.	26.1 %
Sygeplejerske	24.3 %
Servicefag i øvrigt	23.2 %
Skolelærerere	22.8 %

Det er velkendt, at svære psykologiske traumer af katastrofelignende karakter kan medføre post-traumatisk stress reaktion (PTSD) [16], mens det er dårligere belyst om psykiske traumer relateret til vold og trusler om vold kan medføre anden psykisk lidelse. Man har i tre tidligere litteraturstudier forsøgt at afdække området, men studierne er alle beskrivende og belyser ikke eksplicit risiko for psykiske lidelser ved veldefineret udsættelse for voldelig adfærd på arbejdspladsen [14, 17, 18].

Formål: At foretage en systematisk og kritisk vurdering af den videnskabelige litteratur som belyser risikoen for psykiske lidelser (fraset PTSD) (primære udfald) og psykiske symptomer (sekundært udfald) ved udsættelse for vold og trusler om vold på arbejdet (eksponering). Herunder ønsker vi at belyse om kilden til vold og trusler samt graden af forberedelse og uddannelse har betydning for risikoen. I opslaget efterlyses en gennemgang af risikoen for psykisk sygdom (forstået som medicinsk lidelse i henhold til international klinisk sygdomslære), men da den relevante litteratur herom er yderst sparsom, har vi medtaget studier, der belyser psykiske symptomer. Psykiske lidelser og psykiske symptomer er således fokus for litteraturgennemgangen.

Metode: Rapporten er en systematisk litteratur gennemgang baseret på PRISMA retningslinjer (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) og forskningsplanen er forlods i maj 2018 registreret i PROSPERO (CRD42018087076), som er en international database for forskningsprotokoller. Formålet hermed er at sikre en transparent forskningsproces og modvirke datadreven rapportering. Vi anvendte fire bibliografiske databaser (PubMed, Embase, Web of Science og PsycINFO) og søgte engelsksprogede videnskabelige artikler fra databasernes start frem til denne udrednings begyndelse i maj 2018. Eksponeringen omfattede vold eller trusler om vold på arbejdspladsen. Vold dækkede alt fra grove overfald med brug af våben til slag, spark, spyt og kradseri eller at man fik ting kastet efter sig. Trusler om vold omfattede mundtlige eller skriftlige

truende udsagn, truende adfærd i form af f.eks. hævet knytnæve, frembrusende adfærd samt forfølgelse. Mobning eller seksuel chikane var ikke inkluderet med mindre det tydeligt indebar fysisk vold eller trusler om vold. De primære udfald var psykisk sydom, nemlig depressiv lidelse og angst lidelse, men ikke PTSD samt tilpasnings- og belastningsreaktioner, sidstnævnte fordi årsagen er indeholdt i sygdomsdefinitionen hvorfor en vurdering af årsagssammenhæng med sædvanlig epidemiologisk teknik ikke er mulig.

Depressiv lidelse (major depression) blev defineret som en psykiatrisk lidelse diagnosticeret på basis af ICD-10 eller DSM-IV kriterier: mindst 2 kernesymptomer (nedtrykthed, nedsat interesse, nedsat energi (kun ICD-10)), ledsaget af enkelte andre symptomer og med relevant sværhedsgrad og forløb. Diagnosen stilles bedst ved standardiseret psykiatrisk interview. I befolkningsundersøgelser kan anvendes spørgeskemaredskaber til måling af depressive symptomer, hvis validitet i nogen tilfælde er vurderet i forhold til depressiv lidelse (psykiatrisk interview). I denne udredning er depressive symptomer målt med validerede spørgeskemaer kun vurderet som et relevant udtryk for depressiv lidelse, såfremt forekomsten af tilstanden er under 10% i den anvendte sammenlignings-gruppe. Herved er lagt vægt på, at forekomst af depressiv lidelse på over 10% i en erhvervsaktiv population er usandsynlig [19].

Sekundære udfald inkluderede depressive symptomer, angstsymptomer, distress, udbrændthed inklusive udmattelse, og søvnforstyrrelser, ud fra følgende definitioner:

- **Depressive symptomer og angstsymptomer.** Tilstande med optræden af symptomer som i vekslende omfang og sværhedsgrad ses ved depressiv lidelse (nedtrykthed, nedsat interesse, initiativ, selvtillid, selvbebrejdelser, selvmordstanker, koncentrationsbesvær, søvnproblemer, appetitforstyrrelser) henholdsvis angstlidelse (en lang række psykiske og legemlige symptomer, herunder anspændthed, hjertebanken, rysten, indsovningsbesvær, irritabilitet,

rastløshed, uro). I befolkningsundersøgelser anvendes forskellige spørgeskema-baserede redskaber til at indhente information om depressive symptomer og angstsymptomer (se tabel 1). Der anvendes forskellige algoritmer for gruppering og rapportering og forskellige versioner af det samme spørgeskema, hvilket kan forklare, at der kan være store forskelle i symptomforekomst målt med samme redskab udover den variation, der skyldes brug af forskellige måleredskaber og undersøgelse af forskellige befolkningsgrupper.

- **Psykisk distress** er en vagt defineret tilstand med forekomst af en række symptomer såsom koncentrationsbesvær, søvnproblemer, ubeslutsomhed, anspændthed, mistet selvtillid, nedtrykthed, ringe velbefindende og måles f.eks. med 12 item versionen af General Health Questionnaire (GHQ) med vekslende algoritmer for sammentælling og gruppering. Der er overlap til depressive symptomer og angstsymptomer.
- **Udbrændthed** er ikke en medicinsk diagnose, men en tilstand karakteriseret ved udmattelse, udtalt træthed, svigtende initiativ og energi. Der er overlap med depressive symptomer.

Vi fandt i alt 2.443 artikler ved søgning i databaserne og efter eksklusion af dubletter var antallet 2.316 artikler. Udvælgelsen af relevante artikler blev foretaget i to trin, først screening af titel og resumé, hvorved 2.243 artikler blev udelukket og herefter gennemlæsning af hele artiklen, hvor 59 artikler blev udelukket. Derudover gennemgik vi alle litteraturlister i de medtagne artikler samt litteraturlister fra tidligere litteraturgennemgange og resumér fra artikler, der har nævnt de inkluderede artikler, hvilket resulterede i yderligere ti artikler, så i alt 24 studier blev inkluderet. Kun studier, hvor et estimat for risikoen mellem vold/trusler om vold og sygdom/symptomer var oplyst eller kunne beregnes, blev medtaget. Efter udvælgelsen af relevante artikler blev oplysninger om bl.a. studiernes design, population, eksponering og udfald overført til tabeller. Der blev foretaget vurdering af hvert studie efter to principper; *fuldstændighed af rapportering* bestående af otte spørgsmål

om hvorvidt der var tilstrækkelig information om studiets design, population, rekruttering, deltagelsesrate, eksponering, udfald, dataanalyse og statistisk model til at andre i princippet ville kunne gennemføre det pågældende studium. Derudover vurderede vi fire typer af mulige fejlkilder:

1. Selektionsbias, som kan skyldes at deltagelse i undersøgelsen både er afhængig af eksponering og udfald - for eksempel at det blandt personer udsat for vold fortrinsvis er dem med symptomer der deltager
2. Common-method bias, som er fejl, som kan opstå hvis man for eksempel spørger til både eksponering og sygdom/symptomer i samme spørgeskema og deltageren (ubevidst) kæder dette sammen
3. Non-differentiel misklassifikation af eksponering og/eller udfald, som er fejlmåling eller fejlregistrering af data samt
4. Selektiv rapportering af resultater, som kan forekomme, hvis der i undersøgelser med mange sammenligninger kun rapporteres de stærkeste sammenhænge.

Endeligt vurderede vi om der var risiko for skævvridning af resultaterne (konfounding), som kan opstå når en bagvedliggende faktor både er relateret til den formodede årsag og til sygdommen – det kan for eksempel være køn eller alder *[20]*. For hver af de to principper blev udregnet en samlet score (Appendix E). Udvælgelsen af relevante artikler og vurderingen blev foretaget uafhængigt af to af projektgruppens medlemmer, og uoverensstemmelser blev løst ved konsensus.

En oversigt over oplyste sammenhænge mellem vold og trusler på arbejdspladsen og psykiske sygdomme og symptomer blev præsenteret i såkaldte *forest plots* (Appendix F*)*. Der blev foretaget statistiske analyse med et vægtet gennemsnit af risikoen for sygdom/symptomer ved udsættelse for vold og trusler om vold på tværs af alle undersøgelser og i forskellige delmængder af undersøgelserne grupperet efter udfaldstype, studietype, studiestørrelse, geografisk område samt graden af

forberedelse og uddannelse. Endelig undersøgte vi om der var publikationsbias, dvs. om studier med stærke sammenhænge oftere var publiceret. Dette blev undersøgt via såkaldte *funnel plots* (Appendix F), som viser om fordelingen af risikoestimater fordeler sig på samme måde mellem små og store studier. Graden af evidens (videnskabelig pålidelighed) for en årsagssammenhæng blev vurderet i forhold til retningslinjer udarbejdet af Dansk Selskab for Arbejds- og Miljømedicin (DASAM).

Resultater

I alt 24 artikler blev inkluderet i den systematiske litteraturgennemgang, hvoraf ti havde dataindsamling med mere end et observationstidspunkt (opfølgningsstudier) og de resterende 14 var tværsnitsstudier (kun ét måletidspunkt). Studierne kom fra 15 forskellige lande og omfattede i alt omkring 165.000 personer. En svarprocent på over 80% ved start af studiet var opnået i ni tværsnitsstudier og ved opfølgningstidspunktet var en svarprocent på over 80 % opnået i tre af de ti opfølgningsstudier. Den hyppigste undersøgte faggruppe var sygeplejersker (14 studier). Information om eksponering var selvrapporteret i spørgeskemaer (16 studier) og i interviews (seks studier), mens et studie anvendte en jobeksponeringsmatrice, hvor grad af udsættelse er baseret på personens jobtype, og et studie anvendte registreringer af voldsepisoder/erstatningskrav. Der var stor store forskelle i den rapporterede hyppighed af vold, nemlig fra 2.3% [21] til 63.4% [22] og af trusler om vold, nemlig fra 0.8% [23] til 75% [24]. Information om sygdom/symptomer kom i 15 studier fra spørgeskemaer og i seks studier fra telefon- eller direkte interviews med brug af forskellige spørgeskemaskalaer mens tre studier var baseret på hospitalsindlæggelse for psykisk lidelse henholdsvis udskrivning af antidepressiv eller angstdæmpende medicin. [1, 25, 26]. Der var stor forskel mellem studierne med hensyn til hyppigheden af de undersøgte sygdomme/symptomer. Således varierede forekomsten af depressiv lidelse og depressive symptomer mellem 4% [25] og 57% [27].

Den samlede relative risiko for psykisk sygdom efter udsættelse for vold på arbejdspladsen var 1.47 (95% sikkerhedsinterval: 1.28-1.68), hvilket svarer til en forøget risiko på 47%, men med en statistisk usikkerhed på den relative risiko mellem 28 og 68%. Efter udsættelse for trusler om vold var den relative risiko 1.82 (1.43-2.31). Da der således ikke synes at være afgørende forskel på risikoestimaterne for vold henholdsvis trusler om vold, skelnes der af overskuelighedsgrunde i det følgende ikke mellem vold og trusler om vold.

Primære udfald (psykisk sygdom): Et landsdækkende dansk registerstudie undersøgte risikoen for medicinsk diagnosticeret affektiv lidelse (langt overvejende depressiv lidelse) og fandt en øget risiko for både mænd og kvinder efter udsættelse for vold eller trusler om vold på arbejdspladsen [1]. Risikoen var stigende i relation til sandsynligheden for eksponering (ingen, lav, høj). Eksponeringen blev målt ved en jobeksponeringsmatrice, som angiver sandsynligheden for udsættelse for vold og trusler indenfor enkelte faggrupper. Disse fund blev støttet af to studier, der benyttede udskrivelsen af antidepressiv medicin som et tilnærmet mål for depressiv lidelse [25, 26] og et studie der anvendte en veldokumenteret selvrapporteret depressionsskala [28]. Den samlede relative risiko for depressiv lidelse ifølge disse fire studier var 1.42 (95% sikkerhedsgrænse s1.31-1.54). Der var fejlkilder i alle fire studier hvoraf nogle forventes at medføre overvurdering og andre undervurdering af sammenhængen mellem vold og risikoen for depressiv lidelse. En vurdering af netto indvirkningen på den samlede risiko er ikke mulig. Et enkelt studie brugte udskrivning af angstdæmpende midler (anxiolytika) som tilnærmet mål for angstdiagnose og fandt en relativ risiko på 1.05 (95% sikkerhedsgrænse 0.76-1.45) [25].

Sekundære udfald (psykiske symptomer og søvnproblemer)

Depressive symptomer: blev rapporteret i otte studier [21, 22, 27, 29-33]. Alle studier fandt en øget risiko med en sammenlagt relativ risiko på 2.33 (95% sikkerhedsgrænser 1.71-3.17). Alle studier havde mindst en type fejlkilde – fortrinsvis medførende overvurdering af risiko.

Angst symptomer: blev rapporteret i tre studier [30, 32, 33] med en samlet relativ risiko på 2.40 (95% sikkerhedsgrænser 0.78-7.36). Alle tre studier havde to-tre typer fejlkilder.

Psykisk distress: blev målt i fire studier [34-37] med en forekomst i referencegruppen svingende fra 17% til 39%. Den samlede relative risiko i de fire studier var 1.29 (95% sikkerhedsgrænser 1.01-1.64). Fuldstændighed af rapportering-score var mellem fem og syv og alle studier havde potentielle fejlkilder.

Udbrændthed: blev rapporteret i fire studier [24, 38-40], og udmattelse, som har et vist overlap med udbrændthed, i to studier [34, 41]. Tre af studierne var opfølgningsstudier og tre var tværsnitsstudier og den samlede relative risiko for alle seks studier var 1.60 (95% sikkerhedsgrænser 1.25-2.05) og for de tre kohortestudier alene var den samlede relative risiko 1.50 (95% sikkerhedsgrænser 0.98-2.27). Alle studier havde potentielle fejlkilder og scoren for fuldstændighed af rapportering var mellem seks og otte.

Søvnproblemer: blev adresseret i to kohorte studier [42, 43] og et tværsnitsstudie [23] med en prævalens svingende fra 5.1% til 29.7%. For alle tre studier var den samlede 1.26 (95% sikkerhedsgrænser 1.13-1.41) og for de to opfølgningsstudier alene 1.22 (95% sikkerhedsgrænser 1.09-1.37). Fuldstændighed af rapporteringscore var syv-otte og i det ene studie blev fejlkilderne vurderet som værende beskedne.

Kilden til eksponering: I alle studier var vold og trusler om vold primært udøvet af patienter, kunder eller klienter. Vold kollegaer imellem eller med kriminelt formål var ikke tydeligt rapporteret og det var ikke muligt at se om denne faktor modificerede risikoen for udvikling af psykisk sygdom og psykiske symptomer.

Graden af beredthed og uddannelse: I fem studier formodede vi, at studiepopulationen ville være mere forberedt og bedre trænet til at håndtere voldsepisoder i deres arbejde (f.eks. politibetjente, fængselspersonale, sundhedsfaglige på psykiatriske afdelinger). Den samlede relative risiko for disse fem studier var lavere 1.26 (95% sikkerhedsgrænser 1.05-1.52) end for de resterende studier, hvor vi ikke ville forvente en særlig grad af beredthed eller uddannelse af de ansatte 1.76 (95% sikkerhedsgrænser 1.49-2.06).

Prognose: Ingen studier belyste eksplicit forløb med henblik på symptomudvikling og arbejdstilknytning efter psykisk sygdom eller symptomer i relation til udsættelse for vold eller trusler om vold på arbejdspladsen. Forløbet ved depressiv lidelse generelt uafhængigt af årsager fører i de fleste tilfælde til normalisering af tilstanden i løbet af måneder [44].

Vurdering

I alt er 24 studier inkluderet i denne litteraturgennemgang, og hovedparten viser en sammenhæng mellem udsættelse for vold eller trusler om vold på arbejdspladsen og øget risiko for udvikling af psykisk lidelse og psykiske symptomer. Vores vurdering af evidens for, at disse sammenhænge kan opfattes som kausale (årsagsforbundne) og de vigtigste begrundelser for denne vurdering fremgår af tabel 2.

Tabel 2: Evaluering af evidens for kausal sammenhæng på basis af retningslinjer udarbejdet af Dansk Selskab for Arbejds- og Miljømedicin.

Udfald	**Grad af evidens**	**Kriterier**
Depressiv lidelse	+	**Begrænset evidens.** En årsagssammenhæng er mulig. Der er fundet konsistent sammenhæng mellem udsættelse for vold og trusler om vold på arbejdspladsen i flere store befolkningsundersøgelser, men det er ikke usandsynligt (det er muligt), at dette kan tilskrives fejlkilder (bias og /eller konfounding). Ved denne vurdering er lagt vægt på, at ingen studier omhandler depressiv lidelse baseret på psykiatrisk interview, og at studierne hver især er behæftet med forskellige fejlkilder. For eksempel er det i et studie om indlæggelse på grund af affektiv lidelse (overvejende depression) muligt, at den påviste overhyppighed helt eller delvist skyldes lettere adgang til sundhedsvæsenet for ansatte med udsættelse for vold. I to andre studier undersøges brug af antidepressiv medicin, som dog også udskrives til andre tilstande end depressiv lidelse. Nogle fejlkilder forventes at medføre overvurdering og andre undervurdering af sammenhængen mellem vold og risikoen for depressiv lidelse.
Angstlidelse fraset PTSD	**0**	**Utilstrækkelig evidens.** Der er ingen befolkningsundersøgelser, som vedrører angst lidelse efter udsættelse for vold eller trusler om vold på arbejdspladsen. Der er dog ét studie, som viser en sammenhæng mellem udsættelse for vold/trusler om vold og udskrivning af angstdæmpende medicin, hvilken dog også udskrives til andre tilstande end angstlidelser.
Depressive symptomer Angstsymptomer Psykisk distress Udbrændthed	+ + + +	**Begrænset evidens**. En årsagssammenhæng er mulig. En positiv sammenhæng mellem udsættelse for vold og trusler om vold på arbejdspladsen og psykiske helbredssymptomer er konsistent beskrevet i flere befolkningsundersøgelser, men det er ikke usandsynligt (det er muligt), at dette forhold kan forklares ved fejlkilder (bias eller konfounding). Ved den vurdering er lagt vægt på, at studierne er forskellige med hensyn til definition og afgrænsning af vold/trusler om vold og det studerede helbredsproblem, hvilket afspejles i den store variation i forekomst af dette fra undersøgelse til undersøgelse. Selvom der gennemgående findes øget risiko for nedsat mentalt helbred, er fortolkningen derfor usikker. Hertil kommer, at hovedparten af undersøgelserne er baseret på selvrapporterede data om både vold/trusler om vold og mentalt helbred som kan medføre overvurdering af risiko. Andre fejlkilder med relation til udvælgelse og bortfald i

		studiegrupperne kan i nogle tilfælde have medført overvurdering og i andre tilfælde undervurdering af sammenhæng.
Søvnproblemer	++	**Moderat evidens.** En årsagssammenhæng er sandsynlig. Forøget forekomst af søvnproblemer i relation til udsættelse for vold på arbejdspladsen er beskrevet i tre store og velgennemførte befolkningsundersøgelser. Det kan ikke udelukkes med rimelig sikkerhed, at dette kan tilskrives fejlkilder (bias og/eller konfounding), men dette anses ikke for en sandsynlig forklaring. Ved denne vurdering er lagt vægt på, at søvnproblemer er defineret på en ensartet måde i tre studier, at resultaterne er konsistente, at ét studie er et tre-fase studie, hvor risikoen for fejl som følge af selvrapportering af vold/trusler om vold og søvnproblemer er mindre, samt at ét studie har en kort opfølgningstid, hvilket styrker antagelsen af, at påviste sammenhænge er årsagssammenhænge.

DASAMS klassifikation, se i øvrigt appendix G
+++ stærk evidens for en kausal sammenhæng
++ moderat evidens for en kausal sammenhæng
+ begrænset evidens for en kausal sammenhæng
0 utilstrækkelig evidens for en kausal sammenhæng
- evidens for at der ikke foreligger kausal sammenhæng

Konklusion: Ved en systematisk gennemgang af videnskabelige undersøgelser offentliggjort i tidsskrifter med fagfællebedømmelse er fundet 24 studier, som belyser mental helbred ved erhvervsmæssig udsættelse for vold eller trusler om vold på arbejdspladsen. Med få undtagelser rapporteres øget forekomst af forringet mentalt helbred ved udsættelse for vold eller trusler om vold. Hyppigheden af nedsat mentalt helbred er i de undersøgte populationer gennemsnitligt omkring 70% højere blandt udsatte (95% sikkerhedsgrænser 45%-90%).

Ved vurdering af evidensen for, at de beskrevne sammenhænge er kausale (årsagsforbundne), har vi vurderet hver type af mental helbredsforringelse for sig.

Vi vurderer, at der er begrænset evidens for, at depressiv lidelse kan forårsages af vold/trusler om vold på arbejdspladsen. Der foreligger ingen studier, hvor diagnosen depression er bekræftet ved psykiatrisk interview, hvilket anses for den mest pålidelige metode og de fire studier, som anvender de bedste tilnærmede mål (proxyer) for depressiv lidelse, er behæftet med fejlkilder, som kan medføre både falsk positive og falsk negative sammenhænge. Der findes utilstrækkelig evidens for, at udsættelse for vold /trusler om vold kan medføre udvikling af angstsygdomme. Forekomst af angst efter vold og trusler er kun belyst i et studie, men resultatet er ikke er be- eller afkræftet i andre studier.

Hvad angår sammenhængen mellem vold/trusler om vold på arbejdspladsen og udvikling af psykiske symptomer, er evidensen begrænset. Flere studier finder en sammenhæng med udvikling af depressive symptomer, angstsymptomer, psykisk distress og udbrændthed, men der er store forskelle i definition og afgrænsning af vold/trusler om vold og symptomer, hvilket begrænser sammenligneligheden. Hertil kommer en række fejlkilder, herunder at selvrapporterede data om både vold/trusler om vold og symptomer vil kunne medføre en overvurdering af sammenhængen.

Der findes moderat evidens for en årsagssammenhæng mellem udsættelse for vold/trusler om vold på arbejdspladsen og udvikling af søvnforstyrrelser. Tre studier finder en klar sammenhæng, hvor det ikke findes sandsynligt, at sammenhængen skyldes fejlkilder.

ABSTRACT (290 words)

Background: Associations between workplace violence and mental health outcomes have been described in narrative reviews, but the weight of the evidence remains to be established.

Objectives: To systematically review the epidemiological evidence linking work-related exposure to violence and threats of violence with risk of mental disorders and mental ill health symptoms.

Methods: A search in PubMed, EMBASE, PsycINFO and Web of Science to identify original articles that provide quantitative risk estimates. The evidence was weighted according to completeness of reporting and potential common method bias and bias due to differential selection, selective reporting, misclassification of exposure and outcome and healthy worker effect.

Results: We identified 14 cross-sectional and 10 cohort studies with eligible risk estimates. Violence/threats at the workplace was ascertained by self-report in most studies. Four studies reported an elevated adjusted risk of depressive disorder (pooled RR 1.42 95% CI 1.31-1.54, I^2=0%), 14 out of 17 studies reported increased occurrence of a range of symptom outcomes (pooled RR 2.33, 95% CI 3.17, I^2=42%) and three studies reported consistently increased risk of sleep disturbance (pooled RR 1.22, 1.09-1.37, I^2=0%). In most studies common method bias and confounding is not unlikely (possible) and strong heterogeneity in outcome definitions precludes strict interpretation of the pooled risk estimates.

Conclusion: There is limited evidence that violence and threats of violence at the workplace is causally related to depressive disorder, depressive and anxiety symptoms, psychological distress and burnout, respectively. The evidence is insufficient regarding anxiety disorders. There is moderate evidence that violence and threats of violence may cause disturbed sleep.

Wider implications: Additional insight into links between occupational violence and mental health may be obtained by studies that use independent and refined measures of exposure and outcome and that are designed to accommodate details of the timing of outcomes relative to occurrence of violence or threats at the workplace.

INTRODUCTION

Violence and threats of violence at the workplace have in numerous studies been reported among employees in the healthcare sector and among social workers, teachers, police and prison personnel [1-13, 45]. Estimates of the frequency vary considerable in the literature according to occupational setting, definitions, and measurement methods [14]. In a Danish survey among 34.800 randomly selected employees between 18 to 64 years of age, 6.0% of the employees reported exposure to physical workplace violence and 8.8% reported threats of violence at their workplace during the last 12 months [15]. In general, the prevalence in studies investigating violence and threats of violence is varying across work sectors, but the health care sector has been the focus of most studies of workplace violence. In a study of workplace violence among nurses in eight European countries, 22% of the nurses reported frequent violent episodes from patients and relatives [39].

The plausibility of the hypothesis that workplace violence is causing mental disorders is supported by two lines of reasoning. First, there is evidence that exposure to very severe psychological trauma of a catastrophic nature is linked to development of posttraumatic stress syndrome (PTSD) during the following months [16]. PTSD is characterized by symptoms that directly point back to the trauma (flash backs, avoidance behavior), but also includes common mental distress symptoms such as anxiety, depressed mood, concentration difficulties and withdrawal. Second, a systematic review of prospective studies addressing risk of depressive disorder following exposure to severe psychological traumatic events (for instance disasters) provide some evidence for causal links although it still is unclear whether effects are attributable to the psychological exposure per se or emotions related to personal loss [46]. The question is therefore foremost if violence and threats of violence occurring at the workplace in general exceed a likely threshold that distinguish daily hassles from an occupational hazard and herby causes mental disorders in addition to PTSD.

Several studies have investigated health consequences of workplace violence and at least three reviews have explored this issue in a narrative approach. Needham and colleagues reviewed the non-somatic effects of patient's aggression towards nurses and described associations with anxiety, fear, PTSD and PTSD related symptoms [17]. Hogh and Viitasara reported consequences such as anger, distress, fatigue, anxiety, fear and symptoms of PTSD following work place violence [18]. Lanctôt and Guay also reported associations between workplace violence and psychological and emotional symptoms [14].

These reviews all indicate that exposure to violence or threats of violence at the workplace is associated with risk of mental ill-health. However, as the reviews were descriptive and narrative in design, they did not provide any meta-analyses and pooled risk estimates, did not systematically assess risk of bias and did not grade the strength of evidence.

The objective of this systematic review and meta-analysis is therefore to search and synthesize the epidemiological evidence for the relation between work-related exposure to violence or threats of violence and the risk of depressive and anxiety disorder (primary outcomes) and mental ill health symptoms (secondary outcomes), respectively. We also aim to examine whether the association of violence and mental disorders is modified by the source and the setting of violence and by the assumed level of preparedness and training across occupational groups.

METHODS

A review protocol has been registered at PROSPERO before initiation of the review process (Prospero.org, number CRD42018087076, Supplementary data Appendix, A). The review was conducted

and reported in accordance with the PRISMA 2009 guidelines for Meta-analyses and Systematic reviews. The PRISMA checklist is provided in Supplementary data, Appendix B.

Information sources

We searched the databases PubMed, EMBASE, PsycINFO and Web of Science and the systematic electronic search was supplemented by sifting of reference lists in retrieved papers and reviews and a citation search.

Eligibility criteria

We aimed to identify journal articles providing quantitative risk estimates for mental disorders in relation to work-related exposure to physical violence or threats of physical violence. The complete search specification is provided in the online Supplementary data, Appendix C.

Eligibility criteria for inclusion in the systematic review were:

1. Full text papers in English in journals with peer-review published up to May 1st 2018
2. Exposures: Violence at the workplace defined as being exposed to direct aggressive physical assault (e.g. pushing, hitting with an object or body part, slapping, kicking, punching, pinching, scratching, biting, spitting, pulling, clapping, beating, shooting, stabbing, squeezing, twisting, wiping, rape) or to threats of physical violence (oral or written intimidating or threatening statements, threatening behaviour as raised fist, advancing behaviour and stalking).
3. Primary outcomes: Mental health disorders (depressive disorder (ICD10 F32-33) and anxiety disorder (ICD10 F40-41), but not PTSD and adjustment disorders (ICD10 F43) since these disorders are defined by their cause and therefore cannot be examined in epidemiological studies of exposure-outcome relations.

Depressive disorder is defined by the ICD-10 or the DSM-IV classification: at least two of three core symptoms (depressed mood, loss of interest and enjoyment, and loss of energy (only ICD-10)), together with several associated symptoms and with relevant severity and duration. A standardized psychiatric interview is considered the most accurate way to diagnose depression. Questionnaires are often used in population-based surveys to measure depressive symptoms and these are in some cases validated against psychiatric interview as the gold standard. For this review depressive symptoms measured with validated questionnaires are only seen as a valid measure of depressive disorder if the prevalence is below 10% in the reference group. This is because a prevalence of depressive disorder above 10 % in the working population is unlikely [19].

4. Secondary outcomes were depressive symptoms, anxiety symptoms, psychological distress, burnout, including emotional exhaustion and fatigue, and disturbed sleep. The definitions are as follows:

   Depressive symptoms and anxiety symptoms: Occurrence of symptoms seen in depressive disorders (feeling sad, loss of energy, loss of interest in activities once enjoyed, changes in appetite, sleep problems, feeling worthless, difficulty concentrating, thoughts of death or suicide) and symptoms seen in anxiety disorder (a variety of mental and physical symptoms including raised heartbeat, tremor, difficulty breathing, difficulty falling asleep, irritability, restlessness and increased sensitivity to surroundings) but without fulfilling the criterions for depressive or anxiety disorders – for instance core symptoms are lacking or because criterions for severity and duration are not fulfilled. Questionnaires are often used to collect information about depressive symptoms and anxiety symptoms in population based studies (Table one). Different algorithms for grouping and reporting are used and different versions of the same questionnaire exist, which can explain the large differences in the prevalence of

symptoms measured with the same survey, besides variation due to different measuring tools and studying of different populations.

Psychological distress is not a well-defined condition with occurrence of a variety of symptoms such as difficulty of concentrating, sleep problems, difficulty making decisions, tenseness, depressed mood and poor well-being and is measured with for example the 12 item version of the General Health Questionnaire (GHQ) with different algorithms for counting and grouping. Symptoms are overlapping with depressive symptoms and anxiety symptoms.

Burnout is not a medical diagnose, but a condition characterized by exhaustion, extreme fatigue, loss of energy and initiative. Symptoms are overlapping with depressive symptoms.

5. Outcome ascertainment by self-reports, interviews, clinical examinations, medical records and/or public health registries including drug prescription databases.
6. Types of studies: Cross-sectional, cohort, case-referent and other observational designs that provide quantitative risk estimates based upon comparison of outcomes across levels of exposure.
7. Outcomes occurring up to one year after the end of exposure.
8. Effect measures: Indicators of relative or absolute risk

Criteria for exclusion of studies were:

1. Studies in which the exposure was witnessing violence or threats of violence.
2. Verbal assault and hostile behaviour, bullying, sexual assault and harassment unless it explicitly included violence or threats of violence as defined above
3. Case studies and other designs without a reference group.

Search and Study selection

We combined medical subject headings (MeSH) and generic terms for the exposures and outcomes (Appendix C) and obtained in total 2,316 publications after removal of duplicates. Titles and abstracts were sifted independently to assess eligibility and 73 papers were retrieved for full text reading. Among these, several reports failed to provide data on exposure, outcome or relevant risk estimates as detailed in Supplementary data, Appendix D. Hand searches of the bibliographies of retrieved primary reports and reviews and searches of papers citing the included papers resulted in ten additional papers. No attempt was made to retrieve papers from the unpublished literature. The steps in the literature search are presented in Figure 1.

Data collection process

From each publication the extracted data included: First author, year and country of publication, exposed and reference population (type and number of participants), age and gender distribution, occupational group, study design, type of exposure, exposure ascertainment, type of outcome, outcome ascertainment, comparison group(s), relative risk(s) and confidence interval(s) (CI), completeness of reporting (8 items), bias and confounding score (0-5, with 0 meaning unlikely and 5 meaning likely bias) [20]. Risk estimates with 95% CI were extracted for each measured outcome. In some studies, the authors did not distinguish between physical violence and threats of violence and in these cases, we reviewed the study outcome to be threats of violence. If the relevant relative risks were not reported but data were available, we computed risk estimates and confidence intervals. This was the case in five of the included studies, three studies reported the risk estimate as beta with a confidence interval [33, 37, 43], while one study reported a mean and a standard deviation [22] and one study only reported the data for a two-way table [31].

For each study we examined the source and the setting of workplace violence in terms of criminal intent, customer/client or worker-on-worker. According to assumed level of preparedness and training we rated the level as high or low depending on the occupational group (high level of preparedness: police officers, social workers, prison guards, and health care workers in psychiatry; lower level of preparedness: teachers, professional drivers, health care workers in non-psychiatric professions.

Quality assessment

Completeness of reporting

Each publication was evaluated for completeness of reporting of the following eight study characteristics modified after Bonzini et al [20]: (1) study design, (2) definition of study population, (3) recruitment procedure, (4) response rate, (5) exposure ascertainment, (6) outcome ascertainment, (7) data analyses, (8) statistical modelling (see appendix E).

We evaluated whether each of these study characteristics were described or not and assigned a value of one if the criterion was fulfilled and zero if not. Giving equal weight to each of the eight items, we considered completeness of reporting as sufficient if the sum of the 0/1 scores for each paper was ≥6 [20]. Completeness of reporting is not a direct measure of scientific quality or validity, but a measure of reporting quality.

Bias and confounding

Before beginning the review process we identified potential types of bias that were considered of importance. These types of biases are:

1. Selection bias due to differential participation in cross-sectional and case control studies or differential drop-out in cohort studies with a risk for overrepresentation of exposed with

disease. Bias because of low participation or high drop-out is of less concern in surveys designed and completed without a specific objective to study violence and mental health, because the participation is less likely to be directly related to exposure and outcome when the objective is not known to the participants. This type of bias can both inflate or deflate the risk estimates.

2. Common method bias because of self-report of both exposure and outcome. Applies in particular to cross-sectional and case-control studies but may also affect cohort studies. This type of bias is expected to inflate risk estimates.
3. Non-differential misclassification of exposure or outcome or both, because of crude or inaccurate methods of ascertainment of exposure and on methods of ascertainment of outcome. This bias is expected to cause deflated risk estimates.
4. Selective reporting of results in studies with multiple analyses. This is expected to result in inflated risk estimates.
5. Confounding was considered unresolved unless sex, age and socioeconomic status (measured with education, income and occupational class) were accounted for by analysis or design.

Each paper was assessed with respect to each of these five types of bias. For each bias the risk was rated as high or low and translated into a score, 1 for high risk and 0 for low. These scores were summed up, and we categorised a study at higher risk of bias if the score was two or higher. Two authors independently reviewed the papers and rated the completeness of reporting and the five specific types of bias. Discrepancies were resolved by consensus or involvement of a third author, if necessary

Meta-analysis

To obtain a pooled risk estimate across studies we first averaged risk estimates within a study if several relevant risk estimates were provided – for example, when risk estimates were provided separately for men and women or for several types or levels of exposure. If the exposure was divided into levels by severity of the exposure and the risks were reported according to these levels, the highest level versus the reference category was selected for the meta-analysis. We fitted a fixed effect model to compute an average estimate within a study (Stata version 12, METAN procedure). Next, we computed a pooled risk estimate across all studies grouped by exposure and by primary and secondary outcomes by weighing the odds ratio (OR) or equivalent (relative risk or hazard ratios) by the inverse variance using random effects models, because the true risk, if any, is likely to differ across studies. Heterogeneity was assessed by the I^2 statistic. Meta-analyses were carried out in R version 3.4.4 using packages meta, metaphor and forestplot.

In additional analyses we excluded studies with potential bias or missing information on two or more of the eight study characteristics that we evaluated. Potential publication bias was addressed by funnel plots displaying study size by risk estimate and by evaluation of asymmetry.

Assessing the epidemiologic evidence

The epidemiologic evidence was assessed according to criteria provided by the Danish Society of Occupational Medicine (DASAM), in which the evidence is divided into five categories, see appendix G.

RESULTS

Characteristics of the literature database

General characteristics. We identified 24 independent studies that fulfilled the eligibility criteria. Fourteen studies were identified through database search and further ten studies were identified from a review of bibliographies of published papers (Figure one). Ten of the identified studies were cohort or nested case-control studies and the remaining 14 were cross-sectional studies. The characteristics of the studies stratified by outcome are provided in Tables 1-7.

The studies covered 15 countries, almost one third from Scandinavia but all continents were represented. Sample sizes varied from small (< 300 workers) to very large in studies with national coverage, the median sample size being 6.867, and the total number of participants was around 165.000. Participation rates at baseline were above 80% in nine studies and participation rates at follow-up were above 80% in three of the ten cohort studies. The most frequent occupational group studied was nurses and other health care professionals (14 studies), while other occupations such as police officers, drivers and teachers were less frequently examined. Risk estimates were mainly based upon comparisons of respondents reporting exposure to violence or threats of violence versus respondents reporting no such exposure.

Exposure characteristics. Information on exposure to workplace violence or threats of violence was retrieved by self-reports in questionnaires in 16 studies,, interviews (six studies), a job exposure matrix (one study) [1] and records of compensation claims (one study) [26]. Questions were most often one- or two- item questions such as “Have you been exposed to physical violence at your workplace during the last 12 months?” without further specification. However, two studies specified a list of 13-18 items of different forms of violent incidents and threats [36, 40], and eight studies applied multi-item scales developed in earlier research such as the Violent Incidence Form (VIF) [24,

33, 35], The Experience of Assault Questionnaire [22] or the Workplace Violence in the Health Sector Country Case Studies Research Instruments, [21, 27, 34, 37]. The majority of the studies had the most recent 12 month time period as exposure window but three studies asked about the previous six months [22, 28, 32] and in two studies the time frame was not clearly defined in the questionnaire [39, 41]. Data on frequency of exposure the preceding 12 months were obtained in some studies while measures of severity and temporality were scarce. The prevalence of reported exposure varied substantially across studies – from 2.3 % [21] to 63.4 % [22] for violence and from 0.8 % [23] to 75 % [24] for threats of violence.

Outcome characteristics. Outcome ascertainment was based upon questionnaire replies (15 studies) or telephone/face-to-face interview (six studies) using different versions of symptom scales such as CES-D (Center for Epidemiologic Studies Depression Scale), BDI (Beck Depression Inventory), GHQ (general health questionnaire), SCL (symptom check list) and the SF-36 vitality scale. Two studies used prescription of antidepressive pharmaceuticals and one study hospital records to identify cases with antidepressive disorder [1, 25, 26]. Outcome occurrence varied substantially – for instance the prevalence of depressive disorders and depressive symptoms spanned from 4 % [25] to 57 % [27].

Completeness of reporting and bias. In general, the studies had satisfactory completeness of reporting according to the specified criteria, but for 17% of the studies the score was less than 6 indicating incomplete reporting, mostly because of lacking information on the data analyses and recruitment procedure.

The risk of selection bias due to a non-response of more than 20% of the study population or loss to follow-up larger than 20% was rated high in ten studies (42%). Five of these studies were cohort studies and five were cross-sectional.

Common method bias due to concomitant self-reports of exposure and outcome was likely in all cross-sectional studies and of concern in five (50%) of the ten cohort studies.

Non-differential misclassification of exposure was likely in a study applying a job exposure matrix [1], and in a study in which exposure was based upon records of compensation claims [26], but in general also of concern in cohort studies where exposure is only measured at baseline but not during the follow-up period (all the follow-up studies).

Selective reporting of statistically significant results when multiple comparisons had been performed was considered a risk in three of the 24 studies (12%).

Potential confounding was evaluated as being unresolved in 46 % (11 studies) of the included studies making this, together with common method bias, the most frequently occurring type of bias. Confounding was mostly found to be unreported or unmeasured in the cross-sectional studies (eight of the 11 studies).

Overview of risk estimates

The 24 studies provide in all 41 risk estimates on the association between exposure to violence/threats of violence and mental health outcomes of which 39 were above unity and with a weighted pooled relative risk of 1.70 (95% CI 1.47-1.95), see Figure 2-3. None of the 24 studies used absolute measures of risk. Since the difference in the pooled risk of exposure to violence (RR 1.47, 95% CI 1.28-1.68) and exposure to threats of violence (RR 1.82, 95% CI 1.43-2.31), see Figure 2-5, was minor, we do not distinguish these exposures in the following.

Primary outcomes (psychiatric disorders)

One nationwide registry-based study explicitly addressed risk of medically diagnosed depressive disorder (and other mood disorders) and reported an elevated risk among men and women following both violence and threats of violence [1]. The risk increased with the frequency of the exposure (0%, low, high) for both men and women (Table one). In this study exposure was assigned using a job exposure matrix which indicates the probability of being subject to violence or threats. Therefore, this study is of ecologic nature. Findings are supported by two cohort studies using prescription of anti-depressive medication as a proxy for depressive disorder [25, 26] and one study using the revised version of the 20 item CES-D, providing more reliable data on depressive disorder as evidenced by an occurrence of 6.6% in the reference group [28]. Although the latter was designed as a cohort study, the reported association between self-reported exposure and outcome was cross-sectional. The revised version of the CES-D inventory has improved content validity over the original version [47] and with a realistic prevalence of depression in the reference group the revised version is assessed as a validated measure of depressive disorder. One of the studies using prescription of anti-depressive medicine reported a prevalence of depressive disorder of 14.8 % in the reference group, which we rate as a poor proxy for depressive disorder. This study, however, have a unique exposure ascertainment because of person-independent information (claim reports) [26]. The weighted averaged RR for depression according to these 4 studies was 1.42 (95% CI 1.31-1.54, I^2=0%), for forest and funnel plots see appendix F. Completeness of reporting score was eight for all four studies. Bias could not be ruled out *with confidence* in any of the studies (Table eight). One of the cohort studies used prescription for anxiolytics as a *proxy for anxiety diagnosis* and found a RR of 1.05 (95% CI 0.76-1.45) [25].

Secondary outcomes (mental ill health symptoms and sleep problems)

Depressive symptoms were addressed in eight studies (ten risk estimates), including one cohort study, that all reported a relative risk above unity (pooled RR 2.33 (95% CI 1.71 – 3.17, I^2 = 42%)) for forest and funnel plots see appendix F. The outcome was ascertained by the original CES-D inventory, contrary to the revised version as mentioned above, in two studies [29, 31], by the BD-Inventory in two studies [22, 33], by the Zung Self-rating Depression Scale I in two studies [27, 30] and by the PHQ scale (Patient Health Questionnaire Depression Scale) in two studies [21, 32]. The prevalence of depressive symptoms in the reference group spanned from 15% to 57% and therefore not considered as valid proxies for major depression (Table two). One study addressed exposure-response relationship and showed an increased risk of depressive symptoms when exposed to work-place violence or threats of violence several times compared to none and one or few times [21]. Completeness of reporting score varied between four and eight and all studies were afflicted with at least one type of likely bias (Table eight).

Anxiety symptoms were reported in three studies and measured with three different scales (Table four): The Zung Self-rating Anxiety Scale (SAS) [30], Goldberg Anxiety Scale [32] and the State Trait Anxiety Inventory (STAI-Y) [33]. The pooled RR was 2.40 (95% CI 0.78-7.36, I^2=90%), see appendix F for forest and funnel plots. Data on the prevalence was provided in two studies being 13% and 26% respectively. Completeness of reporting score was from five-eight and all studies had two-three types of bias each (Table eight).

Psychological distress was measured in four studies by the GHQ [34-37]. The four studies included four risk estimates, all above unity and one study analyzed the outcome on a continuous scale and reported a significantly increased distress score following exposure to violence as well as threats of violence (Table five). The prevalence of psychological distress in the reference groups spanned

from 17% to 39%. The temporality between events and outcomes was not clearly reported. The weighted pooled estimate across all studies was 1.29 (95% CI 1.01-1.64, I^2=58%), for forest and funnel plots see appendix F. One study divided the exposure into four levels according to the frequency of violent acts (none, seldom, somewhat often and very often) but did not find a consistent increased risk according to these levels (Table five) [36]. Completeness of reporting score was from five to seven. All studies were afflicted with likely bias (Table eight).

Burnout comprising symptoms such as being physically or emotionally exhausted and feeling tired was addressed in four studies using the Maslach Burnout Inventory or the Copenhagen Burnout Inventory to define the outcome based upon a varying number of items and different scale score [24, 38-40] (Table six). Symptoms are overlapping with fatigue and exhaustion addressed in two studies [34, 41]. Three studies were follow-up studies and three were cross-sectional. The weighted pooled estimate across all studies was 1.60 (95% CI 1.25-2.05, I^2= 57%) and the corresponding data for the three cohort studies (four risk estimates) were 1.50 (95% CI 0.98-2.27, I^2=82%), for forest and funnel plots see appendix F. Two of the cohort studies and one cross-sectional study addressed the exposure-response according to the frequency of the violent acts and found an increased risk of burnout when exposed to workplace violence more often (Table six) [24, 39, 41]. Completeness of reporting score was from six to eight. All studies were afflicted with potential bias that could not be ruled out with confidence (Table eight).

Sleep problems were addressed in two cohort studies [42, 43] and one cross-sectional study [23] (four risk estimates) with a prevalence spanning 5.1% and 29.7%. The weighted pooled risk estimate across all studies was 1.26 (95% CI 1.13-1.41, I^2=0%) and the corresponding data for the two cohort studies were 1.22 (95% CI 1.09-1.37, I^2 = 0%), forest and funnel plots are shown in appendix F. In one of the cohort studies the follow-up period was three months while it was two years in

the other longitudinal study. Exposure-response was measured in one of the cohort studies in which they graded the exposure into five levels (never or very seldom, rather seldom, sometimes, rather often and very often or always) and found an increasing risk of sleep impairment through the first four classes but a slightly lower risk in the highest exposed group (Table seven) [43]. Completeness of reporting score was from seven to eight. Risk of bias was considered unlikely in one study (Table eight).

The source and setting of the exposure

All the included studies investigated violence from customers, clients, pupils or patients, while violence in the context of criminal acts or violence between employees (worker-on-worker) was not addressed. Therefore, we could not examine if the source and setting modified the association between violence and health outcome [48].

Level of preparedness and training

In five studies the study populations were from job-categories where better preparedness for and training in violence episodes were expected. The pooled relative risk in these studies was lower than in studies in which the study population was not expected to be especially prepared for violence in their work (RR 1.26, 95% CI 1.05-1.52 and RR 1.76, 95% CI 1.49-2.06, respectively) see appendix F.

Study design, size and geographic region

Considering both violence and threats of violence and all outcomes together, the pooled estimates for the ten cohort and case-control studies (RR 1.36, 95% CI 1.17-1.58) tended to be lower than the pooled estimates for the 14 cross-sectional studies (RR 1.92, 95% CI 1.55-2.37) forest and funnel

plots in Appendix F. These analyses, however, violate the basic request of uniform outcomes in meta-analyses.

Eight of the included studies had a population size above 3500 workers. The pooled risk estimates for these studies (OR 1.50, 95% CI 1.34—1.67) was lower than the risk found in the smaller studies (OR 1.75, 95% CI 1.38-2.22), see appendix F for forest and funnel plots.

Of the 24 included studies 11 were conducted in Europe. The European studies revealed a lower risk estimate RR 1.32 (95% CI 1.19-1.47), I^2=77%, compared to the rest of the world RR 2.08 (95% CI 1.68-2.56), I^2 58%, forest and funnel plots are found in appendix F.

Publication bias

Funnel plots demonstrating the relationship between precision and magnitude of the risk estimate provide some indications that large studies systematically report risks of smaller magnitude than small studies (Figure six and seven) indicating preferential publication of studies showing an association (publication bias).

Tabel 1A: Evaluation of the evidence of causal associations according to principles outlined by The Danish Society of Occupational Medicine (Appendix G).

Outcome	Grade	Criteria
Depressive disorder	+	**Limited evidence.** A causal relationship is possible. A consistent positive relationship between exposure to violence and threats of violence and depressive disorder has been observed in several major population-based surveys, but it is not unlikely (possible) that this relationship can be explained by bias or confounding. No studies measured depressive disorder with the gold standard for outcome ascertainment (psychiatric interview) and bias is an issue in all studies. For example, in one study the risk for hospitalization

		due to affective disorder (predominantly depression) may be inflated because employees in the hospital sector are more exposed to violence and may also be more likely to seek treatment in the healthcare system. Two other studies examine the prescription of antidepressive medicine which is also used for other disorders than depressive disorder. Some bias is expected to overestimate and others to underestimate the association between violence and the risk of depressive disorder.
Anxiety disorders except PTSD	0	**Insufficient evidence.** No epidemiological studies were addressing exposure to violence or threats of violence at the workplace and the risk of anxiety disorder. One study though, reported an association between exposure to violence or threats of violence and prescription of anxiolytics. However, these pharmaceuticals are also prescribed for other disorders.
Depressive symptoms Anxiety symptoms Psychological distress Burnout	+ + + +	**Limited evidence**. A causal relationship is possible. A consistent positive relationship between exposure to violence and threats of violence at the workplace and mental health symptoms has been observed in several studies but it is not unlikely (possible) that this relationship can be explained by bias or confounding. This assessment is due to differences in the definitions and delimitation of violence and threats of violence and the health problems of interest. This is seen in the variation of the prevalence between the studies, so even though the studies reported a consistent increased risk of mental health problems the interpretation is uncertain. In addition, most studies are based on self-reports of both exposure (violence or threats) and the outcome (mental health problems), which can result in an overestimation of the risk. Moreover, selection bias and loss to follow up may have resulted in overestimation and in some cases an underestimation of the association.
Disturbed sleep	++	**Moderate evidence**. A causal relationship is likely. A positive relationship between workplace violence and disturbed sleep has been observed in three large and well conducted epidemiological studies. It cannot be ruled out with reasonable confidence that this relationship can be explained by bias or confounding, although this is not a very likely explanation. Sleep problems have been defined in a uniform manner, the results are consistent and one of the studies is based on three phases which reduce the risk of bias in relation to self-reports about violence/threats of violence and sleep problems. In addition, one of the studies have a short follow-up period which strengthens the assumptions of the found associations are causal and one study provides evidence for exposure-response.

DISCUSSION

In this systematic review of the epidemiological evidence on the relation between workplace related violence and mental health, we identified 24 studies fulfilling eligibility criteria. There were 14 cross-sectional and 10 cohort studies including one nested case-referent study. Exposure was ascertained by individual recall in questionnaires or interviews in all but two studies. In cross-sectional studies events of violence or threats of violence took place up to 12 months prior to occurrence of the mental health outcome while in cohort studies time from exposure to outcome spanned three months to five years with six months to one year being the most frequent follow-up time.
Only one study [1] explicitly addressed our primary outcome in terms of diagnosed psychiatric disorder and reported a higher risk of affective disorders (primarily depressive disorders) among those exposed to violence. All the included studies, except three, reported associations between violence and/or threats of violence and a range of symptoms such as depressive symptoms, symptoms of anxiety, burnout, sleep impairment and psychological distress (mood disorders), while only three studies found no such association.

The criteria for exclusion (verbal assault and hostile behavior, bullying, sexual assault and harassment) can be difficult to differentiate from the criteria for inclusion (threats of violence). The data on exposure depends on the perception, appraisal and the state of the victim of the verbal assault, hostile behaviors or threats, making this an issue for comparability of the studies. Threats were defined as verbal threats of directly physical violence or threats as raised fits and advancing behavior. The strict definition of threats of violence applied in this review has reduced the number of eligible studies, but not necessarily reduced the number of high quality studies and studies addressing medical mental health outcomes and therefore may have few – if any – implications for the conclusions

we arrive at. The exposure to violence is easier to define and distinguish from the other mentioned behaviors though sexual harassment (which we excluded in this review) in some situations can be perceived as violence.

We evaluated confounding by sex, age and socioeconomic status according to the a-priory published protocol (https://www.crd.york.ac.uk/prospero/). Moreover, mental health status in cross-sectional studies and at baseline in follow-up studies may profoundly influence the following three aspects: (1) reporting of being subjected to violence or threats of violence (2) exacerbation of aggressive behaviors of clients or patients and (3) risk of later mental disorders or distress. Evidence for an association of mental health status and risk of bullying was found in a prospective study showing that individuals reporting mental distress exhibited higher risk of being bullied two years later [49]. However, this is not a major source of bias in cohort studies included in this review since baseline mental health was controlled for in all the cohort studies except two with burnout as outcome [39, 40].

Prognoses: Whether the prognosis of depressive disorder that is triggered by violence or threats at the workplace (assuming causal relations) is different from the prognosis is to the best of our knowledge not addressed explicitly by any studies. If not, the condition is usually normalized during some months up to one year [44].

General issues relating to causal inference

Exposure-response relations in terms of risk according to severity or frequency of violent acts might be indicative of causal effects [50, 51]. Seven studies examined the risk according to level or frequency of violent acts and five of these studies found the risk to be increased in parallel with

increasing frequency of exposure [1, 21, 24, 39, 41], including one of the studies on depressive disorder [1] and one of the studies on sleep problems [43]. In two studies the findings were inconsistent [36, 43]. Physical violence (bodily attacks) may be assumed in general to represent more severe exposure than threats of violence, but the pooled risk estimates were not higher following violence than threats of violence.

Consistency of risk estimates across studies with different designs, settings and geographical regions was remarkable with almost all studies reporting an elevated risk in relation to work related violence and threats of violence. This consistency needs, however, to be viewed in the light of the extreme variation in baseline outcome prevalence in the reference groups, which for instance for depressive symptoms was spanning more than one order of magnitude. Most likely this variation is due to differences in outcome definition and ascertainment rather than reflecting large variation of the occurrence of well-defined outcomes. Most studies addressed the occurrence of depression by use of different scales asking about several symptoms that are prevalent in depressive disorder. Although several of these scales are validated tools for use in large population based studies [52-55], they usually cannot substitute a psychiatric interview [56]. This is evident from the high frequency of depressive symptoms in the reference groups which in all but one of the included studies ranged from 16% to 57%. This by far exceeds the known prevalence of major depression in gainfully employed populations, which is about 4% in men and 9% in women [57]. However, one study [28] used the Center for Epidemiologic Studies Depression Scale and reported a prevalence of depression in the reference group of 6.6%. This is in range with the risk found in the general population [58] and accordingly the outcome measure in this study was considered a proxy of depressive disorder.

Bias causing assumed inflation of the risk estimates. Information on exposure as well as outcome was in 21 of the 24 studies obtained by questionnaire or interview and are therefore not mutually

independent observations. Since psychological troubles or even a predisposition for mood disorders may influence perception and reporting of violence or threats, there is a risk for so called common method bias, which is expected to inflate risk estimates towards higher values [59-61]. This bias is especially relevant in cross-sectional studies, where respondents answer questions on exposure and outcome in the same questionnaire at a given point in time. The temporality of exposure and outcome information in cohort studies is expected to diminish this type of bias, but may not solve the problem entirely [59]. Finally, the literature in this review seems not to be affected by any substantial *publication bias* according to assessment by standard methods. The retrieval of risk estimates by predefined criteria and irrespective of the objectives of the included papers is counteracting skewed findings because of selective reporting since we among many reported estimates extracted the specific estimate fulfilling the criteria for this review.

Bias causing assumed deflation of the risk estimates: selective inclusion where individuals who are healthy at baseline may represent a more robust survivor population – either because employees with mental health problems avoid jobs with a high potential for violence or because employees who became victim to violence and subsequently encountered mental health problems may have left the job before entering the study. In addition, some people would never consider working in a psychiatric ward or a prison, so self-selection into jobs might also play a role. Moreover, if violence is triggering a disorder without delay – as would be expected – and victims recover within some months it may be difficult to detect an increased risk in follow-up studies with a long time span from baseline reporting of violence and ascertainment of the outcome at follow-up. This could be the case for the cohort studies included in this review where follow-up intervals in most studies were two years.

In the majority of the studies included in this review the exposure window was defined as the preceding 12 months, meaning that if the mental health outcome is transient and in close relation to the

violent episode, it will not be detected. Another source of bias that likely results in attenuated risk estimates is misclassification of exposure in studies using job exposure matrices, but this only applies to one study in this review.

Effect modification. The risk of mental illnesses might be lower in professions with an assumed high level of preparedness, because employees might be more trained and prepared for that they might be exposed to violent attacks which might prevent development of long-term health consequences. Moreover, at these workplaces support to cope with aggressive episodes afterwards may be more developed. It is therefore of some interest that the pooled risk estimate was indeed lower in these occupational groups.

CONCLUSION

A systematic review of scientific studies published in peer-review journals resulted in 24 studies addressing mental health by exposure to violence or threats of violence at the workplace. With few exceptions, the studies reported an increased risk of mental health problems when exposed to violence or threats of violence. The frequency of mental health problems in the studied populations is on average about 70% higher among the exposed employees (95% CI 45%-90%).

Whether the described associations are causal is assessed individually for each mental health outcome.

The evidence that violence and threats of violence at the workplace may cause depressive disorder is considered limited. None of the studies explicitly ascertain the depressive disorder diagnosis by a psychiatric interview which is seen as the most reliable method and biases that may have resulted in

both inflated or deflated risk estimates were identified in all four studies that used the most appropriate proxies for depressive disorder.

There is insufficient evidence that violence and threats of violence at the workplace cause anxiety disorder. Only one study examined the association between exposure to violence and threats of violence at work and anxiety (measured by treatment with anxiolytics) and the result has not been corroborated in other studies.

There is limited evidence that violence and threats of violence at the workplace may cause *mental ill health symptoms*. Several studies consistently demonstrate associations between reporting of work-related violence and mental ill health symptoms such as depressive symptoms, psychological distress, emotional exhaustion, fatigue and burnout, but the existing evidence precludes causal inference because of strong heterogeneity of exposure and outcome measures that limit the comparability. In addition, a causal association is uncertain because common method bias due to self-reported data about both exposure to violence/threats of violence and mental health problems may result in an overestimation of the association.

There is moderate evidence that exposure to violence at work and threats of violence at work is associated with a higher risk of disturbed sleep. Three studies report an association, where it is not likely that the association is due to bias.

For future research, we recommend that studies focus on addressing the major sources of biases and confounding identified in this review and in particular we aim for independent and refined measures of exposure and outcome.

ACKNOWLEDGEMENTS

The project was funded by The Danish Working Environment Research Fund (reference number 52-2017-09).

CONFLICTS OF INTEREST

None declared

REFERENCES

1. Wieclaw, J., E. Agerbo, P.B. Mortensen, H. Burr, F. Tuchsen, and J.P. Bonde, *Work related violence and threats and the risk of depression and stress disorders.* J Epidemiol Community Health, 2006. **60**(9): p. 771-5.
2. Menckel, E. and E. Viitasara, *Threats and violence in Swedish care and welfare--magnitude of the problem and impact on municipal personnel.* Scand J Caring Sci, 2002. **16**(4): p. 376-85.
3. Gerberich, S.G., T.R. Church, P.M. McGovern, H.E. Hansen, N.M. Nachreiner, M.S. Geisser, et al., *An epidemiological study of the magnitude and consequences of work related violence: the Minnesota Nurses' Study.* Occup Environ Med, 2004. **61**(6): p. 495-503.
4. Gacki-Smith, J., A.M. Juarez, L. Boyett, C. Homeyer, L. Robinson, and S.L. MacLean, *Violence against nurses working in US emergency departments.* J Nurs Adm, 2009. **39**(7-8): p. 340-9.
5. Fernandes, C.M., F. Bouthillette, J.M. Raboud, L. Bullock, C.F. Moore, J.M. Christenson, et al., *Violence in the emergency department: a survey of health care workers.* CMAJ, 1999. **161**(10): p. 1245-8.
6. Fallahi Khoshknab, M., F. Oskouie, F. Najafi, N. Ghazanfari, Z. Tamizi, and H. Ahmadvand, *Psychological violence in the health care settings in iran: a cross-sectional study.* Nurs Midwifery Stud, 2015. **4**(1): p. e24320.
7. De Puy, J., N. Romain-Glassey, M. Gut, P. Wild, P. Mangin, and B. Danuser, *Erratum to: Clinically assessed consequences of workplace physical violence.* Int Arch Occup Environ Health, 2015. **88**(2): p. 225.
8. Cheung, T., P.H. Lee, and P.S.F. Yip, *Workplace Violence toward Physicians and Nurses: Prevalence and Correlates in Macau.* Int J Environ Res Public Health, 2017. **14**(8).
9. Campbell, J.C., J.T. Messing, J. Kub, J. Agnew, S. Fitzgerald, B. Fowler, et al., *Workplace violence: prevalence and risk factors in the safe at work study.* J Occup Environ Med, 2011. **53**(1): p. 82-9.
10. Camerino, D., M. Estryn-Behar, P.M. Conway, B.I. van Der Heijden, and H.M. Hasselhorn, *Work-related factors and violence among nursing staff in the European NEXT study: a longitudinal cohort study.* Int J Nurs Stud, 2008. **45**(1): p. 35-50.
11. Astrom, S., G. Bucht, M. Eisemann, A. Norberg, and B.I. Saveman, *Incidence of violence towards staff caring for the elderly.* Scand J Caring Sci, 2002. **16**(1): p. 66-72.
12. Alameddine, M., Y. Mourad, and H. Dimassi, *A national study on nurses' exposure to occupational violence in Lebanon: prevalence, consequences and associated factors.* PloS one, 2015. **10**(9): p. e0137105.
13. Abderhalden, C., I. Needham, T. Dassen, R. Halfens, J.E. Fischer, and H.J. Haug, *Frequency and severity of aggressive incidents in acute psychiatric wards in Switzerland.* Clin Pract Epidemiol Ment Health, 2007. **3**: p. 30.
14. Lanctôt, N. and S. Guay, *The aftermath of workplace violence among healthcare workers: A systematic literature review of the consequences.* Aggression and violent behavior, 2014. **19**(5): p. 492-501.
15. Jensen C.T., Johnsen N.F., Linde P, and B. E., *Danish working environment 2016*, The National Research Centre for the Working Environment, 2018.

16. Utzon-Frank, N., N. Breinegaard, M. Bertelsen, M. Borritz, N.H. Eller, M. Nordentoft, et al., *Occurrence of delayed-onset post-traumatic stress disorder: a systematic review and meta-analysis of prospective studies.* Scand J Work Environ Health, 2014. **40**(3): p. 215-29.
17. Needham, I., C. Abderhalden, R.J. Halfens, J.E. Fischer, and T. Dassen, *Non-somatic effects of patient aggression on nurses: a systematic review.* J Adv Nurs, 2005. **49**(3): p. 283-96.
18. Hogh, A. and E. Viitasara, *A systematic review of longitudinal studies of nonfatal workplace violence.* European journal of work and organizational psychology, 2005. **14**(3): p. 291-313.
19. Wittchen, H.U., F. Jacobi, J. Rehm, A. Gustavsson, M. Svensson, B. Jonsson, et al., *The size and burden of mental disorders and other disorders of the brain in Europe 2010.* Eur Neuropsychopharmacol, 2011. **21**(9): p. 655-79.
20. Bonzini, M., D. Coggon, and K.T. Palmer, *Risk of prematurity, low birthweight and pre-eclampsia in relation to working hours and physical activities: a systematic review.* Occup Environ Med, 2007. **64**(4): p. 228-43.
21. da Silva, A.T., M.F. Peres, S. Lopes Cde, L.B. Schraiber, E. Susser, and P.R. Menezes, *Violence at work and depressive symptoms in primary health care teams: a cross-sectional study in Brazil.* Soc Psychiatry Psychiatr Epidemiol, 2015. **50**(9): p. 1347-55.
22. Ryan, E.P., J. Aaron, M.L. Burnette, J. Warren, R. Burket, and T. Aaron, *Emotional responses of staff to assault in a pediatric state hospital.* J Am Acad Psychiatry Law, 2008. **36**(3): p. 360-8.
23. Park, J.B., A. Nakata, N.G. Swanson, and H. Chun, *Organizational factors associated with work-related sleep problems in a nationally representative sample of Korean workers.* International Archives of Occupational and Environmental Health, 2013. **86**(2): p. 211-222.
24. Couto, M.T. and S. Lawoko, *Burnout, workplace violence and social support among drivers and conductors in the road passenger transport sector in Maputo City, Mozambique.* J Occup Health, 2011. **53**(3): p. 214-21.
25. Madsen, I.E., H. Burr, F. Diderichsen, J.H. Pejtersen, M. Borritz, J.B. Bjorner, et al., *Work-related violence and incident use of psychotropics.* Am J Epidemiol, 2011. **174**(12): p. 1354-62.
26. Dement, J.M., H.J. Lipscomb, A.L. Schoenfisch, and L.A. Pompeii, *Impact of hospital type II violent events: use of psychotropic drugs and mental health services.* Am J Ind Med, 2014. **57**(6): p. 627-39.
27. Fang, H., X. Zhao, H. Yang, P. Sun, Y. Li, K. Jiang, et al., *Depressive symptoms and workplace-violence-related risk factors among otorhinolaryngology nurses and physicians in Northern China: a cross-sectional study.* BMJ Open, 2018. **8**(1): p. e019514.
28. Geiger-Brown, J., C. Muntaner, K. McPhaul, J. Lipscomb, and A. Trinkoff, *Abuse and violence during home care work as predictor of worker depression.* Home Health Care Serv Q, 2007. **26**(1): p. 59-77.
29. Jung, P.K., J.U. Won, J. Roh, J.H. Lee, H. Seok, W. Lee, et al., *Workplace Violence Experienced by Substitute (Daeri) Drivers and Its Relationship to Depression in Korea.* J Korean Med Sci, 2015. **30**(12): p. 1748-53.
30. Gong, Y., T. Han, W. Chen, H.H. Dib, G. Yang, R. Zhuang, et al., *Prevalence of anxiety and depressive symptoms and related risk factors among physicians in China: a cross-sectional study.* PLoS One, 2014. **9**(7): p. e103242.

31. Cavanaugh, C., J. Campbell, and J.T. Messing, *A longitudinal study of the impact of cumulative violence victimization on comorbid posttraumatic stress and depression among female nurses and nursing personnel.* Workplace Health Saf, 2014. **62**(6): p. 224-32.
32. Butterworth, P., L.S. Leach, and K.M. Kiely, *Why it's important for it to stop: Examining the mental health correlates of bullying and ill-treatment at work in a cohort study.* Aust N Z J Psychiatry, 2016. **50**(11): p. 1085-1095.
33. Maran, A.D., A. Varetto, M. Zedda, and N. Magnavita, *Workplace violence toward hospital staff and volunteers: a survey of an Italian sample.* Journal of Aggression, Maltreatment & Trauma, 2018. **27**(1): p. 76-95.
34. Zafar, W., U.R. Khan, S.A. Siddiqui, S. Jamali, and J.A. Razzak, *Workplace Violence and Self-reported Psychological Health: Coping with Post-traumatic Stress, Mental Distress, and Burnout among Physicians Working in the Emergency Departments Compared to Other Specialties in Pakistan.* J Emerg Med, 2016. **50**(1): p. 167-77.e1.
35. Magnavita, N. and T. Heponiemi, *Violence towards health care workers in a Public Health Care Facility in Italy: a repeated cross-sectional study.* BMC Health Serv Res, 2012. **12**: p. 108.
36. Leino, T.M., R. Selin, H. Summala, and M. Virtanen, *Violence and psychological distress among police officers and security guards.* Occup Med (Lond), 2011. **61**(6): p. 400-6.
37. Jaradat, Y., M.B. Nielsen, P. Kristensen, K. Nijem, E. Bjertness, H. Stigum, et al., *Workplace aggression, psychological distress, and job satisfaction among Palestinian nurses: A cross-sectional study.* Appl Nurs Res, 2016. **32**: p. 190-198.
38. Hamdan, M. and A.A. Hamra, *Burnout among workers in emergency Departments in Palestinian hospitals: prevalence and associated factors.* BMC Health Serv Res, 2017. **17**(1): p. 407.
39. Estryn-Behar, M., B. van der Heijden, D. Camerino, C. Fry, O. Le Nezet, P.M. Conway, et al., *Violence risks in nursing--results from the European 'NEXT' Study.* Occup Med (Lond), 2008. **58**(2): p. 107-14.
40. Andersen, D.R., L.P. Andersen, C.A. Gadegaard, A. Hogh, A. Prieur, and T. Lund, *Burnout among Danish prison personnel: A question of quantitative and emotional demands.* Scand J Public Health, 2017. **45**(8): p. 824-830.
41. Hogh, A., V. Borg, and K.L. Mikkelsen, *Work-related violence as a predictor of fatigue: A 5-year follow-up of the Danish Work Environment Cohort Study.* Work & Stress, 2003. **17**(2): p. 182-194.
42. Gluschkoff, K., M. Elovainio, T. Hintsa, J. Pentti, P. Salo, M. Kivimaki, et al., *Organisational justice protects against the negative effect of workplace violence on teachers' sleep: a longitudinal cohort study.* Occup Environ Med, 2017. **74**(7): p. 511-516.
43. Eriksen, W., B. Bjorvatn, D. Bruusgaard, and S. Knardahl, *Work factors as predictors of poor sleep in nurses' aides.* Int Arch Occup Environ Health, 2008. **81**(3): p. 301-10.
44. Posternak, M.A., D.A. Solomon, A.C. Leon, T.I. Mueller, M.T. Shea, J. Endicott, et al., *The naturalistic course of unipolar major depression in the absence of somatic therapy.* J Nerv Ment Dis, 2006. **194**(5): p. 324-9.
45. Cheung, T. and P.S. Yip, *Workplace violence towards nurses in Hong Kong: prevalence and correlates.* BMC Public Health, 2017. **17**(1): p. 196.

46. Bonde, J.P., N. Utzon-Frank, M. Bertelsen, M. Borritz, N.H. Eller, M. Nordentoft, et al., *Risk of depressive disorder following disasters and military deployment: systematic review with meta-analysis.* Br J Psychiatry, 2016. **208**(4): p. 330-6.
47. Muntaner, C. and E. Barnett, *Depressive symptoms in rural West Virginia: labor market and health services correlates.* J Health Care Poor Underserved, 2000. **11**(3): p. 284-300.
48. Hershcovis, M.S. and J. Barling, *Towards a multi-foci approach to workplace aggression: A meta-analytic review of outcomes from different perpetrators.* Journal of Organizational Behavior, 2009. **31**(1): p. 24-44.
49. Finne, L.B., S. Knardahl, and B. Lau, *Workplace bullying and mental distress - a prospective study of Norwegian employees.* Scand J Work Environ Health, 2011. **37**(4): p. 276-87.
50. Rothman, K.J. and S. Greenland, *Causation and causal inference in epidemiology.* Am J Public Health, 2005. **95 Suppl 1**: p. S144-50.
51. Hill, A.B., *THE ENVIRONMENT AND DISEASE: ASSOCIATION OR CAUSATION?* Proc R Soc Med, 1965. **58**: p. 295-300.
52. Radloff, L.S., *The CES-D Scale: A Self-Report Depression Scale for Research in the General Population.* Applied Psychological Measurement, 1977. **1**(3): p. 385-401.
53. Johns, S.A., K. Kroenke, E.E. Krebs, D.E. Theobald, J. Wu, and W. Tu, *Longitudinal comparison of three depression measures in adult cancer patients.* J Pain Symptom Manage, 2013. **45**(1): p. 71-82.
54. Biggs, J.T., L.T. Wylie, and V.E. Ziegler, *Validity of the Zung Self-rating Depression Scale.* Br J Psychiatry, 1978. **132**: p. 381-5.
55. Beck, A.T., R.A. Steer, and M.G. Carbin, *Psychometric properties of the Beck Depression Inventory: Twenty-five years of evaluation.* Clinical Psychology Review, 1988. **8**(1): p. 77-100.
56. Krebber, A.M., L.M. Buffart, G. Kleijn, I.C. Riepma, R. de Bree, C.R. Leemans, et al., *Prevalence of depression in cancer patients: a meta-analysis of diagnostic interviews and self-report instruments.* Psychooncology, 2014. **23**(2): p. 121-30.
57. Kessler, R.C., H.S. Akiskal, M. Ames, H. Birnbaum, P. Greenberg, R.M. Hirschfeld, et al., *Prevalence and effects of mood disorders on work performance in a nationally representative sample of U.S. workers.* Am J Psychiatry, 2006. **163**(9): p. 1561-8.
58. Olsen, L.R., E.L. Mortensen, and P. Bech, *Prevalence of major depression and stress indicators in the Danish general population.* Acta Psychiatr Scand, 2004. **109**(2): p. 96-103.
59. Podsakoff, P.M., S.B. MacKenzie, J.Y. Lee, and N.P. Podsakoff, *Common method biases in behavioral research: a critical review of the literature and recommended remedies.* J Appl Psychol, 2003. **88**(5): p. 879-903.
60. Kolstad, H.A., A.M. Hansen, A. Kaergaard, J.F. Thomsen, L. Kaerlev, S. Mikkelsen, et al., *Job strain and the risk of depression: is reporting biased?* Am J Epidemiol, 2011. **173**(1): p. 94-102.
61. Kasl, S.V., *Measuring job stressors and studying the health impact of the work environment: an epidemiologic commentary.* J Occup Health Psychol, 1998. **3**(4): p. 390-401.

Figure 1: Prisma flow diagram

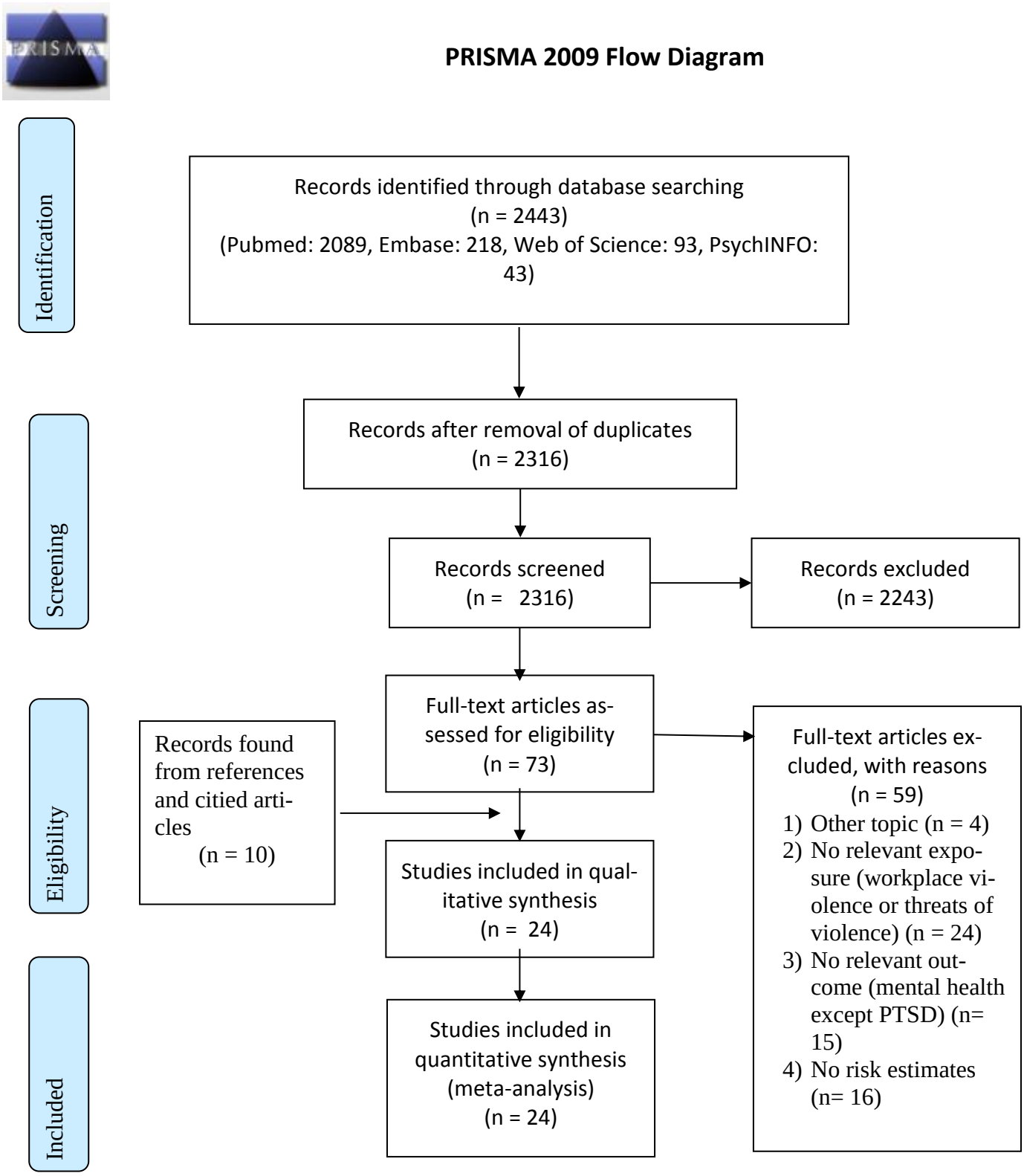


Figure 2: Forests plot including all 20 studies addressing violence

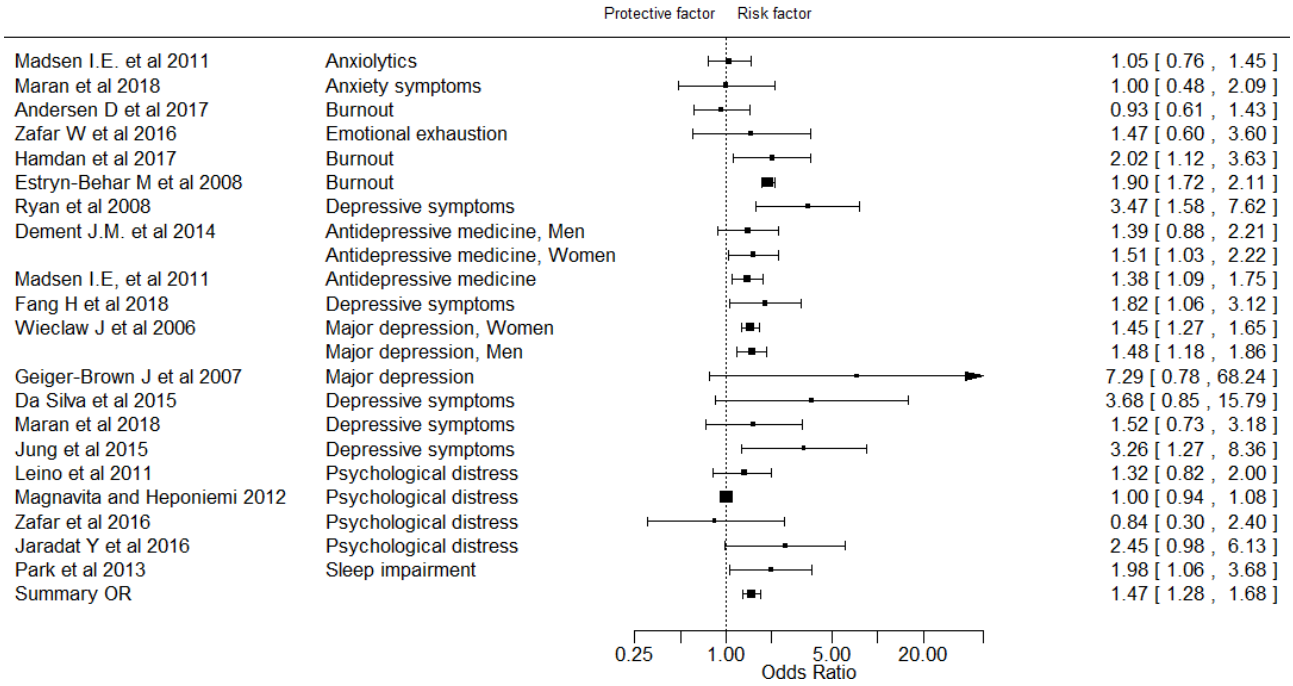


Figure 3: Forests plot including all 17 studies addressing threats of violence

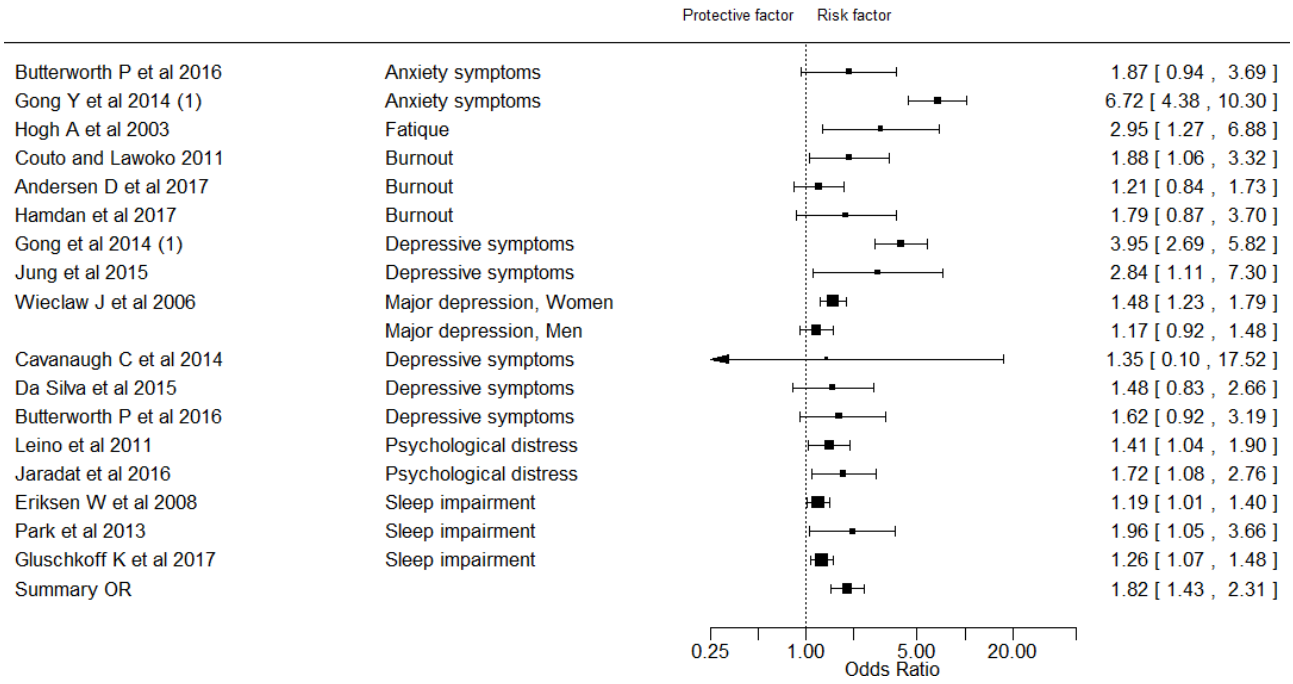


Figure 4: Funnel plot including all 20 studies addressing violence

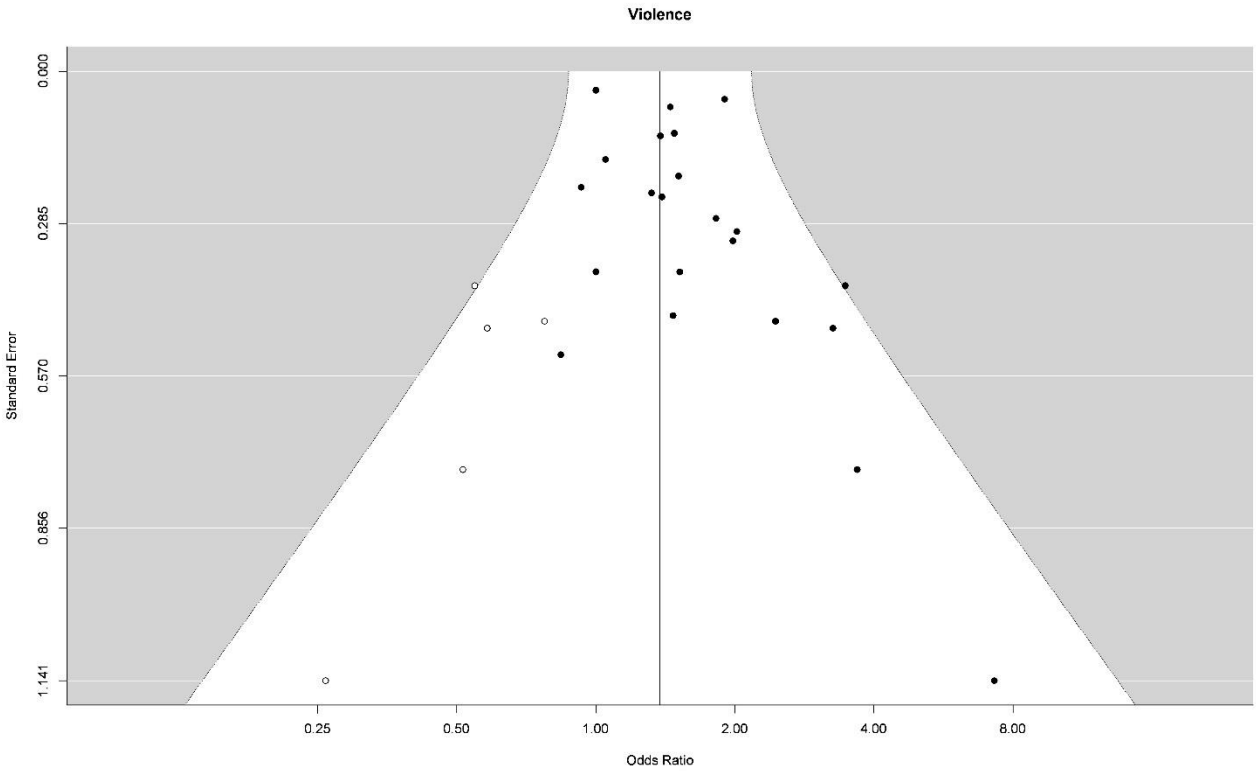


Figure 5: Funnel plot including all 17 studies addressing threats of violence

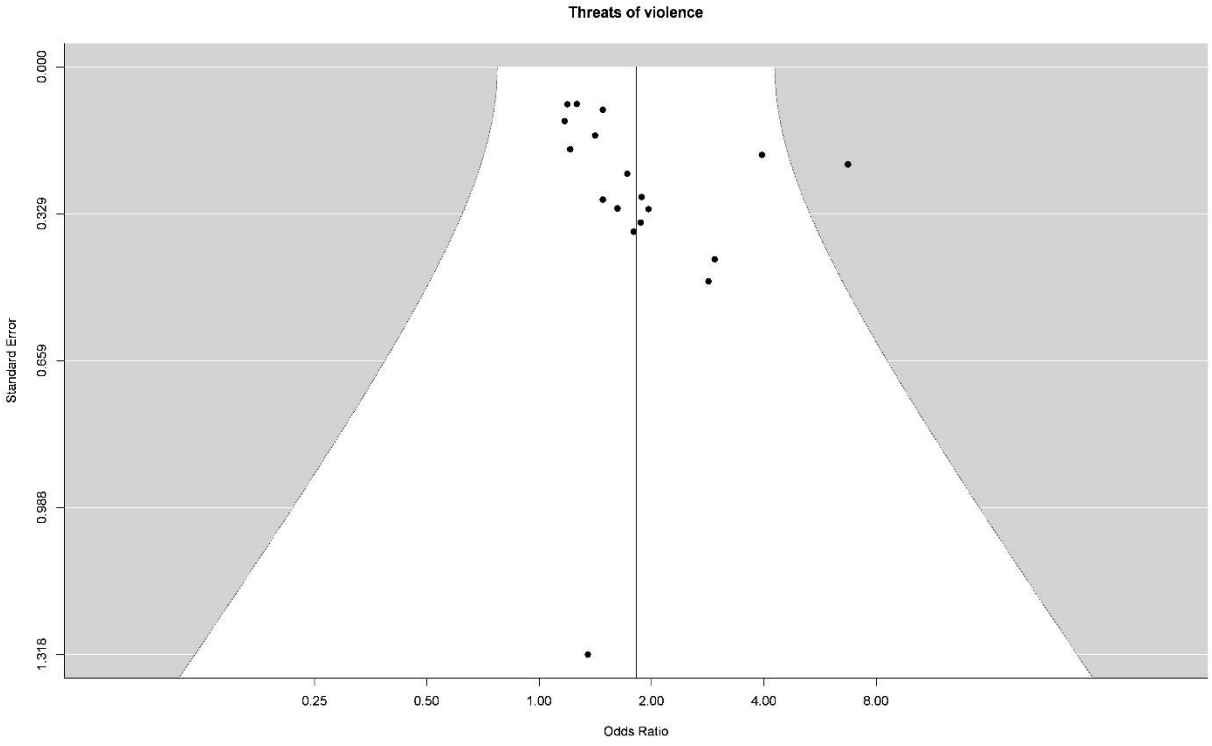


Figure 6: Funnel-plot addressing publication bias for all included studies

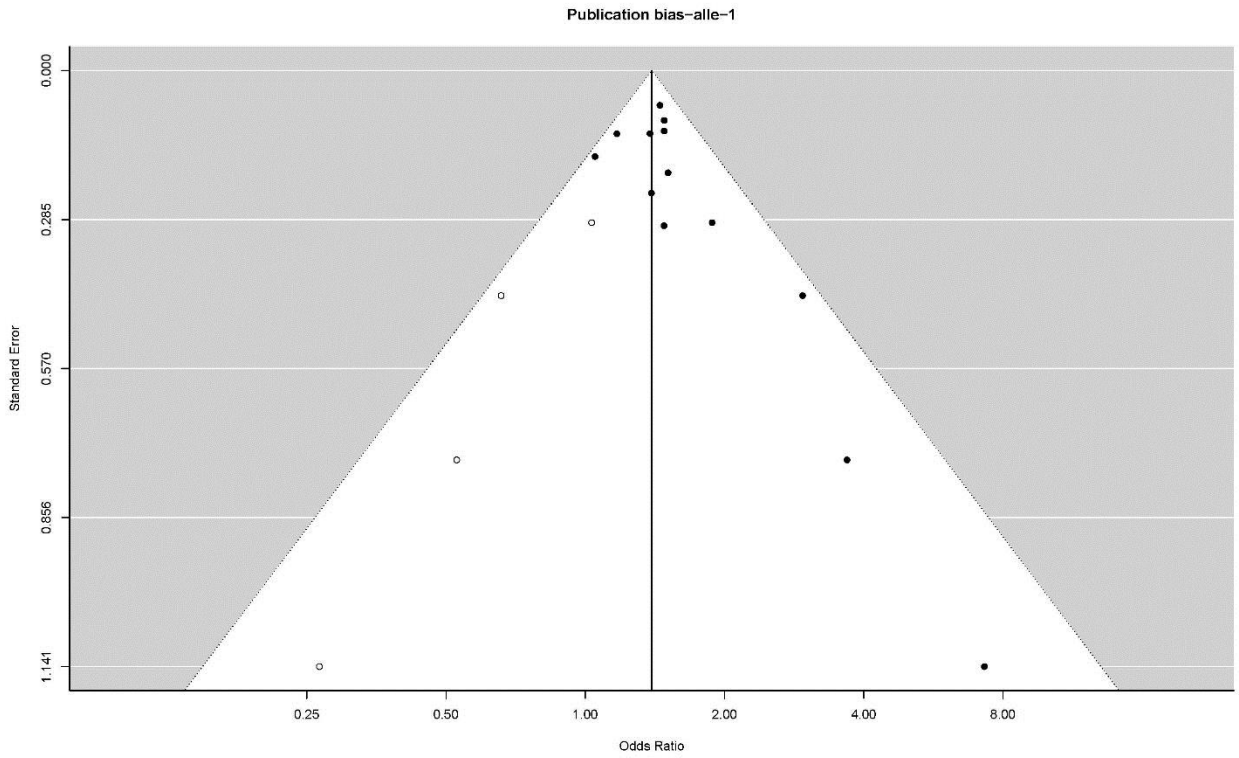


Figure 7: Funnel plot addressing publication bias in the ten included cohort studies

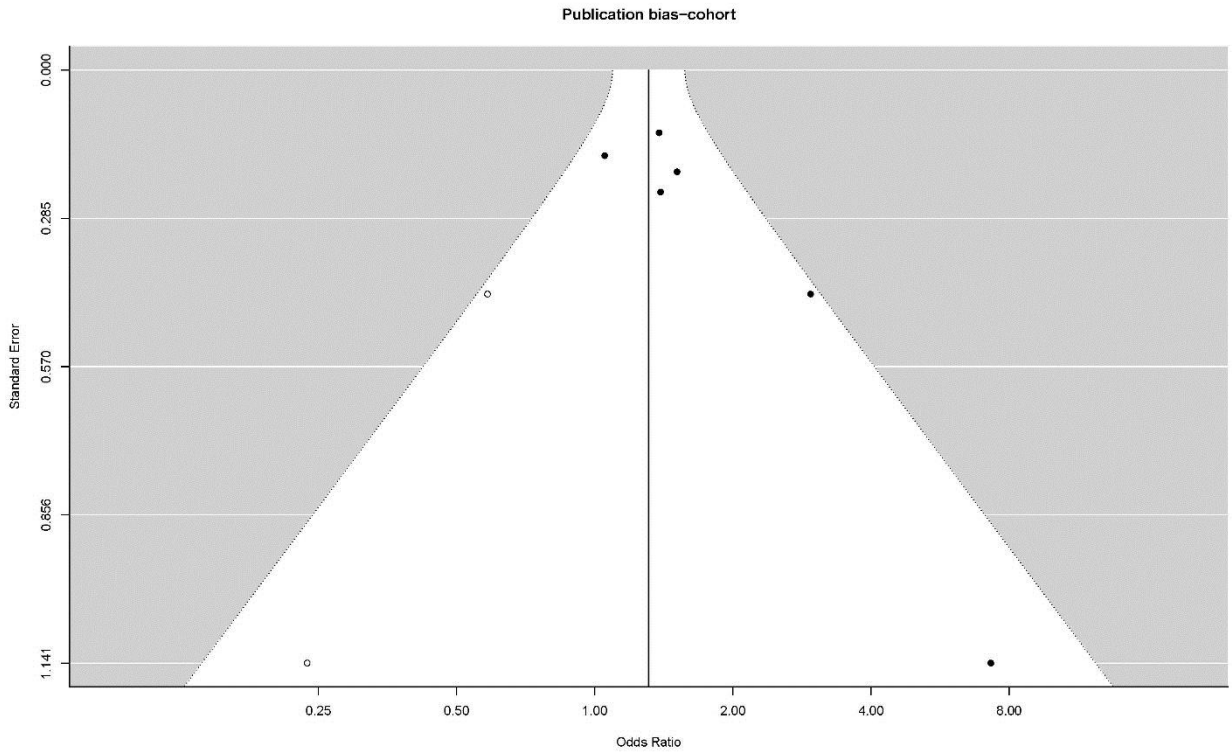


Table 1. Characteristics of studies addressing psychiatric disorders and prescription of antidepressive medicine. Shaded rows are cohort studies.

Author Country	**Population**	**Fol-low-up**	**Exposure ascertain-ment**	**Outcome**	**Outcome ascertainment**	**Out-come preva-lence in the ref-erence group**	**Comparison**	**RR (95% CI)**	**Com-plet-eness of re-port-ing 0-8**	**Bias score 0-5**
Wieclaw J. et al 2006, Denmark [1]	Patients from The Danish Psychiatric Central Re-search Register (N 14 166) and matched controls (age, sex and time) from Statis-tics Denmark's Integrated Database for Labour Mar-ket research (N 58 060)	12 months	Job exposure matrix	Affective disorders (F30-39)	Register data, hospital records	n.a.	Threats Men 0% 0-20% >20% Women 0% 0-20% >20% Violence Men 0% 0-14% >14% Women 0% 0-14% > 14%	 1.00 (ref) 1.07 (0.96-1.19) 1.17 (0.92-1.48) 1.00 (ref) 1.14 (1.04-1.26) 1.48 (1.23-1.79) 1.00 (ref) 1.03 (0.90-1.18) 1.45 (1.27-1.65) 1.00 (ref) 1.25 (1.03-1.23) 1.48 (1.18-1.86)	8	2
Geiger-Brown J. et al 2007, USA	Home care workers Wave 1, N 1643	6 months	Telephone interview, 5 questions about the	Depres-sion	Revised Center for Epidemiologic Studies	6.6 %	Threats vs none Violence vs none	3.74 (0.82-17.12)	8	2

[28]	Wave 2, N 1198 Response rate 88 %		level of violence		Depression Scale(RCES-D) 20 items		Both threats and violence	7.29 (0.78-68.24) 10.8 (3.87-30.19)		
Madsen I.E.H. et al 2011, Denmark [25]	Random sample of the working-age population in Denmark N 15.246 Response rate 60-80%	3.6 years	Self-administered questionnaire and interviews, 2 questions	Antidepressants	Register of Medicinal Products Statistics	Antidepressiva 4.1 %	Violence yes vs no	1.38 (1.09-1.75)	8	1
Dement J.M. et al 2014, USA [26]	Nurses, nurses' aides, police officers, security workers N 9884	6 years	Register, (workers compensation (WC) claims, incident reports, and OSHA logs).	Prescriptions for ante-depression or anti-anxiety drugs/ Register	National Drug Codes (NDC) contained within the line-item pharmacy claims	Antidepressiva and anxiolytics 14.8 %	Reporting an incident vs not reporting an incident Male Female	1.39 (0.88-2.21) 1.51(1.03-2.22)	8	1

Table 2 . Characteristics of studies addressing depressive symptoms. Shaded are cohort studies

Author Country	**Population**	**Follow-up**	**Exposure ascertainment**	**Outcome**	**Outcome ascertainment**	**Outcome prevalence in the reference group**	**Comparison**	**RR (95% CI)**	**Completeness of reporting 0-8**	**Bias score 0-5**

Ryan E.P. et al 2008, USA [22]	Employees at a pediatric state psychiatric hospital N 93	-	Self-administered questionnaire, The Experience of Assault Questionnaire, 23 items	Depressive symptoms	The Beck Depression Inventory-II (BDI-II), 21 items	n.a.	Assaulted (A) vs non-assaulted (NA)	3.47 (1.58-7.62)	4	3
Cavanaugh C. et al 2014, USA [31]	Female nurses and nursing personnel (N 1044) Response rate 81%	6 months	Self-administered questionnaire, 1 question	Depressive symptoms	The Center for Epidemiologic Studies depression scale (CESD-10)	20.0 %	Threats or physical workplace violence at baseline yes/no	1.35 (0.10-17.52)	5	3
Gong Y. et al 2014, China [30]	Physicians working in public hospitals N=2641 Response rate 96.46%	-	Self-administered questionnaire, 1 question	Depressive symptoms	The Zung Self-Rating Depression Scale (SDS)	28.1 %	Frequency of conflict and violence - often compared to none (ref)	3.95 (2.69-5.82)	7	2
Da Silva A.T.C. et al 2015, Brazil [21]	Physicians, nurses, nursing assistants and community health workers N 2940 Response rate 93%	-	Face-to-face interview, the questionnaire of the WHO multi-country study on women's health and domestic violence	Depressive symptoms	Patient Health Questionnaire, 9 items (PHQ-9)	Depressive symptoms 36.3% Probable major depression 16%	Threats vs no threats One/few times Several times Physical aggression vs none One/few times Several times	 1.28 (0.95-1.74) 1.48 (0.83-2.66) 1.67 (0.91-3.04) 3.68 (0.85-15.79)	8	1

Jung P.K. et al 2015, Korea [29]	Substitute drivers, N=161	-	Self-administered questionnaire, 2 questions	Depressive symptoms	The Center for Epidemiologic Studies depression scale (CESD-10)	16.8 %	Verbal violence >4 times a year vs <4 times a year (or none) Experienced vs Never experienced physical violence over the past year	2.84 (1.11-.30) 3.26 (1.27-8.36)	6	2
Butterworth P. et al 2016, Australia [32]	Randomly selected residents of Canberra and Queanbeyan (NSW) aged 52-58 years N 1466 Response rate 80%	-	Face-to-face interview and online questionnaire, 3 single questions	Depressive symptoms	Patient Health Questionnaire Depression Scale (PHQ)	14.6 %	Threats of violence vs no threats of violence	1.62 (0.92, 3.19)	8	2
Fang H. et al 2018, China [27]	Otorhinolaryngologists and nurses N=652 Response rate 83.6 %	-	Self-administered questionnaire, modified version of WHO 2003	Depressive symptoms	Zung self-rating depression scale (SDS)	57.2 %	Physical violence yes/no	1.82 (1.06-3.12)	7	2
Maran D.A. et al 2018, Italy [33]	Hospital staff in cardiology and oncology N=99	-	Self-administered questionnaire, Violent Incident Form (VIF)	Depressive symptoms	Beck Depression Inventory (BDI)	n.a.	Depression suffering yes/no	1.52 (0.73-3.18)	5	3

Table 3. Characteristics of the study addressing the prescription of anxiolytic medicine. Shaded rows are cohort studies.

Author Country	Population	Follow-up	Exposure ascertainment	Outcome	Outcome ascertainment	Outcome prevalence in the reference group	Comparison	RR (95% CI)	Completeness of reporting 0-8	Bias score 0-5
Madsen I.E.H. et al 2011, Denmark [25]	Random sample of the working-age population in Denmark N 15.246 Response rate 60-80%	3.6 years	Self-administered questionnaire and interviews, 2 questions	Anxiolytics	Register of Medicinal Products Statistics	2.7 %	Violence yes vs no	1.05 (0.76-1.45)	8	1

Table 4. Characteristics of studies addressing anxiety symptoms. Shaded are cohort studies.

Author Country	Population	Follow-up	Exposure ascertainment	Outcome	Outcome ascertainment	Outcome prevalence in the reference group	Comparison	RR (95% CI)	Completeness of reporting 0-8	Bias score 0-5
Gong Y. et al 2014, China [30]	Physicians working in public hospitals N=2641 Response rate 96.46%	-	Self-administered questionnaire, 1 question	Anxiety symptoms	The Zung Self-rating Anxiety Scale (SAS)	25.7 %	Frequency of conflict and violence - often compared to none (ref)	6.72 (4.38-10.3)	7	2

Butter-worth P. et al 2016, Australia [32]	Randomly selected residents of Canberra and Queanbeyan (NSW) aged 52-58 years N 1466 Response rate 80%	-	Face-to-face interview and online question-naire, 3 questions	Anxiety symp-toms	Face-to-face interview and online question-naire, Goldberg Anxiety Scale (9 items)	13.2 %	Threats of violence vs no threats of violence	1.87 (0.94, 3.69)	8	2
Maran D.A. et al 2018, Italy [33]	Hospital staff in cardiology and oncology N=99	-	Self-administered question-naire, Violent Incident Form (VIF)	Anxiety symp-toms	State-Trait Anxiety Inventory (STAI Y)	n.a.	State anxiety, suffering yes/no	1.00 (0.48-2.09)	5	3

Table 5. Characteristics of cross-sectional studies addressing psychological distress.

Author Country	**Population**	**Follow-up**	**Exposure ascertainment**	**Outcome**	**Outcome ascertainment**	**Outcome prevalence in the reference group**	**Comparison**	**RR (95% CI)**	**Completeness of reporting 0-8**	**Bias score 0-5**
Leino T.M. et al 2011, Finland [36]	Police officers and security guards N=1993 Response rate 58 %	-	Self-administered questionnaire, 1 question and a list of 13 items of differed forms	Psycho-logi-cal distress	General Health questionnaire (GHQ12)	17%	Physically violent acts none vs Seldom Somewhat often very often Threats or	1.30 (0.88-1.92) 1.23 (0.82-1.82) 1.32 (0.87-2.00)	7	2

			of physical violence				None vs at least once	1.41 (1.04-1.90)		
Magnavita N. and Heponiemi T. 2012, Italy [35]	Health care workers N 1455 Response rate 80,1%	-	Self-administered questionnaire, the Violent Incident Form (VIF)	Psychological 'problems'	General Health questionnaire (GHQ 12)	n.a.	Physical violence vs none	1.00 (0.94-1.08)	5	3
Jaradat Y. et al 2016, Palestine [37]	Nurses N=343 Response rate 92.2%	-	Self-administered questionnaire, WHO 2003	Psychological distress	General Health Questionnaire GHQ 30	n.a.	Exposed vs unexposed Violence Threats	2.45 (0.98-6.13) 1.72 (1.08-2.76)	7	2
Zafar W. et al 2016, Pakistan [34]	Physicians working in 4 large hospitals N 179 Response rate 92.2 %	-	Self-administered questionnaire, WHO 2003	Mental distress (anxiety, depression)	General Health Questionnaire (GHQ12)	39.3%	Physical attack vs no attacks	0.84 (0.3-2.4)	7	2

Table 6. Characteristics of studies addressing burnout, emotional exhaustion and fatigue. Shaded rows are cohort studies

Author Country	**Population**	**Follow-up**	**Exposure ascertainment**	**Outcome**	**Outcome ascertainment**	**Outcome prevalence in the reference**	**Comparison**	**RR (95% CI)**	**Completeness of reporting**	**Bias score 0-5**

						group			**0-8**	
Hogh A. et al 2003, Denmark [41]	Random sample of Danish citizens/employees N 4961 Response rate 90 %	5 years	Telephone interview, 1 question	Fatigue	Telephone interview, SF-36 questionnaire, 4 questions	9.4%	Exposure to violence no or only slightly vs Not much Moderately Very much	 1.13 (0.73-1.74) 1.75 (1.03-2.97) 2.95 (1.27-6.88)	8	2
Estryn-Behar M. et al 2008, 8 European countries [39]	Nurses N 39.898 (NEXT study) Response rate 51 %	1 year	Self-administered questionnaire, 1 question	Burnout	The Copenhagen Burnout Inventory, 6 items	n.a.	Violence seldom vs Monthly Weekly+	1.38 (1.26-1.52) 1.90 (1.72-2.11)	5	3
Couto M.T. and Lawoko S. 2011, Mozambique [24]	Drivers and conductors working with road passenger transport N=504 Response rate 100%	-	Telephone interviews, the Violent Incident Form (VIF)	Burnout	Maslach Burnout Inventory, General Survey	Mild 30.1% Severe 3.6%	Workplace violence no vs Yes, once or twice Yes several times	0.96 (0.57-1.63) 1.88 (1.06-3.32)	8	1
Zafar W. et al 2016, Pakistan [34]	Physicians working in 4 large hospitals N 179 Response rate 92.2 %	-	Self-administered questionnaire, WHO 2003	Emotional exhaustion	Maslach Burnout Inventory, Emotional exhaustion, 9 items	42.4%	Physical attack vs no attacks	1.47 (0.6-3.6)	7	2

Andersen D. et al 2017, Denmark [40]	Prison personnel N 1741, Response rate 61%	1 year	Self-administered questionnaire, 1 question and a checklist of 11 violent incidents and 7 different threats of violence.	Burnout	Copenhagen Psychosocial Questionnaire	n.a.	Most exposed quartile vs least exposed three quartiles Violence Threats	0.93 (0.61-1.43) 1.21 (0.84-1.73)	7	4
Hamdan M. and Hamra A.A. 2017, Palestine [38]	Workers in emergency departments N=444 Response rate 74.5 %	-	Self-administered questionnaire, single question	Burnout	Maslach Burnout Inventory, Human Services Survey	64.8%	Workplace violence yes vs no Violence Threats	2.02 (1.12-3.63) 1.79 (0.87-3.70)	6	2

Table 7. Characteristics of studies addressing disturbed sleep. Shaded are cohort studies

Author Country	**Population**	**Follow-up**	**Exposure ascertainment**	**Outcome**	**Outcome ascertainment**	**Outcome prevalence in the reference group**	**Comparison**	**RR (95% CI)**	**Completeness of reporting 0-8**	**Bias score 0-5**

Eriksen W. et al 2008, Norway [43]	Random sample of nurses aids N 4774 Response rate 62 %	3 months	Self-administered questionnaire, 1 question	Poor sleep	Basic Nordic Sleep Qustionnaire, 1 item	29.7 %	Never or very seldom vs Rather seldom Sometimes Rather often Very often or always	0.87 (0.68-1.13) 1.08 (0.86-1.37) 1.77 (1.27-2.46) 1.60 (0.86-2.98)	8	1
Park J.B. et al 2013, Korea [23]	Representative sample of actively working population age 18-65 N=10039	-	Face to face interviews, 2 questions	Sleep problems	1 question yes/no	5.1 %	Violence no/yes threats no/yes	1.98 (1.06-3.68) 1.96 (1.05-3.66)	7	2
Glusch-koff K. et al 2017, Finland [42]	Primary and secondary school teachers N 4988 Response rate 80 %	2 years	Self-administered questionnaire, 1 question	Sleep disruption	Jenkins sleep problems scale, 4 items	n.a.	2 years after vs before event	1,26 (1.07-1.48)	8	0

Table 8: Completeness of reporting and assessment of bias and confounding

Study	Completeness of reporting									Assessment of bias and confounding					
	Study design	Definition of study population	Recruitment procedure	Response rate	Exposure ascertainment	Outcome ascertainment	Data analyses	Statistical modelling	**Sum score (0-8)**	Selection bias	Common method bias	Non-differential misclassification	Selective reporting of results	Confounding	**Sum score (0-5)**
Studies addressing psychiatric disease															
Wieclaw J. et al 2006	+	+	+	+	+	+	+	+	**8**	0	0	+	0	+	**2**
Geiger-Brown J. et al 2007	+	+	+	+	+	+	0	0	**8**	0	+	0	0	+	**2**
Madsen I.E.H. et al 2011	+	+	+	+	+	+	+	+	**8**	+	0	0	0	0	**1**
Dement J.M. et al 2014	+	+	+	+	+	+	+	+	**8**	0	0	+	0	0	**1**
Studies addressing depressive symptoms															
Ryan E.P. et al 2008	0	+	0	0	+	+	0	+	**4**	+	+	0	0	+	**3**
Cavanaugh C. et al 2014	+	+	0	+	+	+	0	0	**5**	+	+	0	0	+	**3**

Da Silva A.T.C. et al 2015	+	+	+	+	+	+	+	+	**8**	0	+	0	0	0	**1**
Jung P.K. et al 2015	0	+	+	0	+	+	+	+	**6**	+	+	0	0	0	**2**
Butterworth P. et al 2016	+	+	+	+	+	+	+	+	**8**	0	+	0	+	0	**2**
Fang H. et al 2018	+	+	+	+	+	+	0	+	**7**	0	+	0	0	+	**2**
Maran D.A. et al 2018	0	+	+	0	+	+	0	+	**5**	+	+	0	0	+	**3**

The table continues next page

Study	**Completeness of reporting**									**Assessment of bias and confounding**					
	Study de-sign	Definition of study po-	Recruitment procedure	Response rate	Exposure ascertain-ment	Outcome ascertain-ment	Data analy-ses	Statistical modelling	**Sum score (0-8)**	Selection bias	Common method bias	Non-diffe-rential mi-sclassifica-	Selective re-porting of	Confoun-ding	**Sum score (0-5)**
Studies addressing anxiety diagnosis															
Madsen I.E.H. et al 2011	+	+	+	+	+	+	+	+	**8**	+	0	0	0	0	**1**
Studies addressing anxiety symptoms															
Ryan E.P.	0	+	0	0	+	+	0	+	**4**	+	+	0	0	+	**3**

et al 2008															
Gong Y. et al 2014	+	+	+	+	+	+	0	+	**7**	0	+	0	0	+	**2**
Butterworth P. et al 2016	+	+	+	+	+	+	+	+	**8**	0	+	0	+	0	**2**
Maran D.A. et al 2018	0	+	+	0	+	+	0	+	**5**	+	+	0	0	+	**3**
Studies addressing psychological distress															
Leino T.M. et al 2011	0	+	+	+	+	+	+	+	**7**	+	+	0	0	0	**2**
Magnavita N 2012	+	+	+	+	0	0	0	+	**5**	0	+	0	+	+	**3**
Jaradat Y. et al 2016	+	+	0	+	+	+	+	+	**7**	0	+	0	0	+	**2**
Zafar W. et al 2016	+	+	+	+	+	+	0	+	**7**	0	+	0	0	+	**2**
Studies addressing burnout, emotional exhaustion and fatigue															
Hogh A. et al 2003	+	+	+	+	+	+	+	+	**8**	0	+	0	0	0	**1**
Estryn-Behar M. et al 2008	+	+	+	+	+	0	0	+	**5**	+	+	0	0	+	**3**
Couto M.T. and Lawoko S 2011	+	+	+	+	+	+	+	+	**8**	0	+	0	0	0	**1**

Zafar W. et al 2016	+	+	+	+	+	+	0	+	**7**	0	+	0	0	+	**2**
Andersen D. et al 2017	+	+	+	+	+	+	0	+	**7**	+	+	0	0	+	**3**
Hamdan M. and Hamra A.A. et al 2017	+	+	0	+	+	+	0	+	**6**	0	+	0	0	+	**2**
Studies addressing disturbed sleep															
Eriksen W. et al 2008	+	+	+	+	+	+	+	+	**8**	0	+	0	0	0	**1**
Park J.B. et al 2013	+	+	+	0	+	+	+	+	**7**	+	+	0	0	0	**2**
Gluschkoff K. et al 2017	+	+	+	+	+	+	+	+	**8**	0	0	0	0	0	**0**

APPENDIX

Appendix A: Prospero protocol

PROSPERO
International prospective register of systematic reviews

NHS National Institute for Health Research

Workrelated exposure to violence or threats of violence and mental disorders: a systematic review and meta-analysis

Jens Peter Bonde, Marianne Borritz, Nanna Hurwitz Eller, Esben Meulengracht Flachs, Naja Hulvej Rod, Reiner Rugulies, Birgit Aust, Laura Rudkjøbing, Ane Berger Bungum, Karin Biering

Citation

Jens Peter Bonde, Marianne Borritz, Nanna Hurwitz Eller, Esben Meulengracht Flachs, Naja Hulvej Rod, Reiner Rugulies, Birgit Aust, Laura Rudkjøbing, Ane Berger Bungum, Karin Biering. Workrelated exposure to violence or threats of violence and mental disorders: a systematic review and meta-analysis. PROSPERO 2018 CRD42018087076 Available from: http://www.crd.york.ac.uk/PROSPERO/display_record.php?ID=CRD42018087076

Review question

The objective is to search and synthesize the epidemiological scientific evidence in support of or against the hypothesis that workrelated exposure to violence or threats of violence cause mental disorders and - to the extent data are available - to examine

1. if the source and the setting of exposure in terms of criminal intent, customer/client or worker-on-worker nature (cf Workplace violence: a reprort to the nation (2001), the University of Iowa Injury Prevention Centre (UIIPRC)), respectively, modifies the risk of mental disorders
2. if occupational group according to assumed level of preparedness and training (higher: policemen, prison guards, social workers, health care workers in psychiatric professions; lower: teachers, professionel drivers, health care workers in non psychiatric professions) modifes the risk of mental disorders

Searches

We will search PubMed, EMBASE, PsycINFO and Web of Science from start of the database through May 2018 for original peer reviewed full text papers in English that provide quantitative risk estimates for mental disorders in relation to work-related exposure to physical violence or threats of physical assault. The systematic electronic search is to be supplemented by sifting of reference lists in retrieved papers and reviews and by consulting experts in the field. The grey literature and reports are not included.

Search strategy

https://www.crd.york.ac.uk/PROSPEROFILES/87076_STRATEGY_20180404.pdf

Types of study to be included

Cross-sectional, cohort, case-referent, longitudinal, follow-up, cross-over and other observational designs that provide quantitative risk estimates based upon comparison of outcomes across levels of exposure. Case studies and other designs without a proper reference are not included. In case a

sufficient number of large cohort studies with relevant exposure outcome timing is available (>15) cross-sectional studies are not included in the final assessment.

Condition or domain being studied

Primary outcomes are mental health disorders (major depression (ICD10 F32-33), anxiety (F40-41) and adjustment disorders (F43 - but not post-traumatic stress disorder F43.1). Secondary outcomes are psychological distress including exhaustion and sleep impairment. Outcomes are to be ascertained from self- reports, interview, clinical examinations, medial records and/or public health registries including drug prescription databases.

Appendix B: Checklist for the PRISMA 2009 guidelines for Meta-analyses and Systematic reviews

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	1
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	18
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	20-21
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	21
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	21
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	22
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	22
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	Appendix C
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	25
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	25
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	Table 1-7
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	26-27
Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	25
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	27-28
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	26-27
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	27-28

RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	29 + Figure 1
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	tabel 1-7
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	Table 1-8 + appendix E
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	Fig 2-5
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	31-36
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	32-36
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	17-20
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	36-37
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	38-43
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	42-43
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	44

From: Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. PLoS Med 6(7): e1000097. doi:10.1371/journal.pmed1000097

Appendix C: Systematic literature search specification

PROSPERO SUPPLEMENTAL MATERIAL

Workrelated exposure to violence and threats of violence and mental disorders: a systematic review and meta-analysis.

Tentative generic search terms to be modified for searches in PubMed, EMBASE, Web of Science and Psychinfo:

(alternative exposures MeSH/TIAB AND alternative outcomes (MeSH/TIAB) AND alternative designs (TIAB)) (inclusion criteria: original peer reviewed full text papers in English and human studies)

Exposure	Outcome	Design
workplace violence (MesH), threats, assault, aggression, battery, pushing, hitting with an object, hitting with a body part, slapping, kicking, punching, pinching, scratching, biting, pulling hair, throwing an object, spitting, beating, shooting, stabbing, squeezing, twisting, rape shaking fists, throwing furniture, destroying property	mental disorder (MeSH), depression, depressive symptoms, anxiety, adjustment disorder psychological distress, burnout, sleep, psychotropic drugs, sedativa, hypnotics	cross-sectional, case-control, case-referent, cohort, follow-up, longitudinal, prospective health effects, health outcomes

A PubMed search 16.4.2018 using these search strings results in 2.077 hits.

In the screening process, studies can be excluded in terms of the following reasons: missing relevant exposure, missing relevant outcome, missing a risk estimate or other reasons (which will be specified for each excluded study).

Appendix D: Excluded studies with reasons

Author	Title	Year	Journal	Other topic	No relevant exposure	No relevant outcome	No risk estimate	Remark
Al-Omari, H.	Physical and verbal workplace violence against nurses in Jordan	2015	Int Nurs Rev			1		outcome "being worried about violence"
Beaton, R.; Murphy, S.	Psychosocial responses to biological and chemical terrorist threats and events. Implications for the workplace	2002	Aaohn j				1	Descriptive study
Berg, A.; Palomaki, H.; Lonnqvist, J.; Lehtihalmes, M.; Kaste, M.	Depression among caregivers of stroke survivors	2005	Stroke		1			No exposure of violence or threats of violence
Bernaldo-De-Quiros, M.; Piccini, A. T.; Gomez, M. M.; Cerdeira, J. C.	Psychological consequences of aggression in pre-hospital emergency care: cross sectional survey	2015	Int J Nurs Stud				1	No risk estimates only frequency
Birkeland, M. S.; Nielsen, M. B.; Knardahl, S.; Heir, T.	Time-lagged relationships between leadership behaviors and psychological distress after a workplace terrorist attack	2016	Int Arch Occup Environ Health		1			Looking at leadership not violence or threats
Bjorkly, S.	A ten-year prospective study of aggression in a special secure unit for dangerous patients	1999	Scandinavian journal of psychology			1		Looking at aggression and threats but no outcome of mental disorders
Bond, J.; Hartley, T. A.; Sarkisian, K.; Andrew, M. E.; Charles, L. E.; Violanti, J. M.; Burchfiel, C. M.	Association of traumatic police event exposure with sleep quality and quantity in the BCOPS Study cohort	2013	Int J Emerg Ment Health		1			Violence and threats are not among the traumatic events they are looking at

Bowers, L.; Nijman, H.; Simpson, A.; Jones, J.	The relationship between leadership, teamworking, structure, burnout and attitude to patients on acute psychiatric wards	2011	Soc Psychiatry Psychiatr Epidemiol		1			Looking at leadership and teamwork, not violence
Chang, B. H.; Skinner, K. M.; Zhou, C.; Kazis, L. E.	The relationship between sexual assault, religiosity, and mental health among male veterans	2003	Int J Psychiatry Med		1			Sexual assault, with or with out violence?
Chen, W. C.; Huang, C. J.; Chen, C. C.; Wang, J. D.	The incidence and risk factors of workplace violence towards female nurses reported via internet in an acute psychiatric hospital	2011	Arch Environ Occup Health			1		violence is the outcome
Cheung, T.; Yip, P. S.	Workplace violence towards nurses in Hong Kong: prevalence and correlates	2017	BMC Public Health		1			Do not distinguish between verbal abuse, bullying, physical abuse and sexual harassment
Clausen, T.; Hansen, J. V.; Hogh, A.; Garde, A. H.; Persson, R.; Conway, P. M.; Grynderup, M.; Hansen, A. M.; Rugulies, R.	Exposure to negative acts and risk of turnover: a study of a register-based outcome among employees in three occupational groups	2016	Int Arch Occup Environ Health			1		Outcome turnover
Cooper, A. J.; Mendonca, J. D.	A prospective study of patient assaults on nursing staff in a psychogeriatric unit	1989	The Canadian Journal of Psychiatry / La Revue canadienne de psychiatrie			1		looking at diagnosis of the perpetrator
Cooper, A. J.; Mendonca, J. D.	A prospective study of patient assaults on nurses in a provincial psychiatric hospital in Canada	1991	Acta Psychiatrica Scandinavica			1		No outcome of mental health

De Puy, J.; Romain-Glassey, N.; Gut, M.; Wild, P.; Mangin, P.; Danuser, B.	Clinically assessed consequences of workplace physical violence	2015	Int Arch Occup Environ Health				1	Only proportions, no risk estimates
Demir, D.; Rodwell, J.	Psychosocial antecedents and consequences of workplace aggression for hospital nurses	2012	J Nurs Scholarsh				1	Only means
Dennis, N. M.; Swartz, M. S.	Emergency Psychiatry Experience, Resident Burnout, and Future Plans to Treat Publicly Funded Patients	2015	Psychiatr Serv		1			No exposure of threats or violence
Erdur, B.; Ergin, A.; Yuksel, A.; Turkcuer, I.; Ayrik, C.; Boz, B.	Assessment of the relation of violence and burnout among physicians working in the emergency departments in Turkey	2015	Ulus Travma Acil Cerrahi Derg		1			do not distinguish between exposed to violence or witness violence
Eriksen, W.; Tambs, K.; Knardahl, S.	Work factors and psychological distress in nurses' aides: a prospective cohort study	2006	BMC Public Health				1	
Eriksson, C. B.; Lopes Cardozo, B.; Ghitis, F.; Sabin, M.; Gotway Crawford, C.; Zhu, J.; Rijnen, B.; Kaiser, R.	Factors associated with adverse mental health outcomes in locally recruited aid workers assisting Iraqi refugees in Jordan	2013	Journal of Aggression, Maltreatment and Trauma		1			Violence or threats not among the included stressors
Ferri, P.; Silvestri, M.; Artoni, C.; Di Lorenzo, R.	Workplace violence in different settings and among various health professionals in an Italian general hospital: a cross-sectional study	2016	Psychology Research and Behavior Management			1		No clear outcomes of mental disorders
Fisher, N.; Jacoby, R.	Psychiatric morbidity in bus crews following violent assault: A follow-up study	1992	Psychological Medicine			1		outcome psychiatric state not weel defined

Friborg, M. K.; Hansen, J. V.; Aldrich, P. T.; Folker, A. P.; Kjaer, S.; Nielsen, M. B. D.; Rugulies, R.; Madsen, I. E. H.	Workplace sexual harassment and depressive symptoms: a cross-sectional multilevel analysis comparing harassment from clients or customers to harassment from other employees amongst 7603 Danish employees from 1041 organizations	2017	Bmc Public Health		1			Exposure sexual harassment
Galian-Munoz, I.; Ruiz-Hernandez, J. A.; Llor-Esteban, B.; Lopez-Garcia, C.	User Violence and Nursing Staff Burnout: The Modulating Role of Job Satisfaction	2016	J Interpers Violence				1	Emotional exhaustion score, but no risk estimate
Ghahramanlou, M.; Brodbeck, C.	Predictors of secondary trauma in sexual assault trauma counselors	2000	Int J Emerg Ment Health		1			violence or threats not included in secondary trauma
Gibson, C. J.; Gray, K. E.; Katon, J. G.; Simpson, T. L.; Lehavot, K.	Sexual Assault, Sexual Harassment, and Physical Victimization during Military Service across Age Cohorts of Women Veterans	2016	Womens Health Issues			1		outcome self-reported general health, not specified mental
Giorgi, G.; Leon-Perez, J. M.; Montani, F.; Courcy, F.; Arcangeli, G.	Distress and job satisfaction after robbery assaults: a longitudinal study	2015	Occupational Medicine-Oxford				1	Descriptive no risk estimate
Gong, Y.; Han, T.; Yin, X.; Yang, G.; Zhuang, R.; Chen, Y.; Lu, Z.	Prevalence of depressive symptoms and work-related risk factors among nurses in public hospitals in southern China: a cross-sectional study	2014	Scientific reports				1	Not reporting a useful risk estimate
Groer, M. W.; Burns, C.	Stress response in female veterans: an allostatic perspective	2009	Rehabil Nurs				1	Descriptive no risk estimate
Guay, S.; Tremblay, N.; Goncalves, J.;	Effects of a peer support programme for youth social services employees experiencing	2017	BMJ Open				1	Descriping a protocol

Bilodeau, H.; Geoffrion, S.	potentially traumatic events: A protocol for a prospective cohort study							
Hanson, G. C.; Perrin, N. A.; Moss, H.; Laharnar, N.; Glass, N.	Workplace violence against homecare workers and its relationship with workers health outcomes: a cross-sectional study	2015	BMC Public Health				1	reports only regression coefficients
Hensel, J. M.; Lunsky, Y.; Dewa, C. S.	Exposure to client aggression and burnout among community staff who support adults with intellectual disabilities in Ontario, Canada	2012	J Intellect Disabil Res		1			Do not distinguish between exposed or witnessed
Hensel, J. M.; Lunsky, Y.; Dewa, C. S.	The mediating effect of severity of client aggression on burnout between hospital inpatient and community residential staff who support adults with intellectual disabilities	2014	J Clin Nurs		1			Do not distinguish between exposed or witnessed
Laschinger, H. K. S.; Grau, A. L.	The influence of personal dispositional factors and organizational resources on workplace violence, burnout, and health outcomes in new graduate nurses: A cross-sectional study	2012	International Journal of Nursing Studies		1			Exposure bullying
Lorenzo-Lopez, L.; de Labra, C.; Maseda, A.; Lorenzo, T.; Agrafojo, H.; Rodriguez-Villamil, J. L.; Gonzalez-Abraldes, I.; Millan-Calenti, J. C.	Caregiver's distress related to the patient's neuropsychiatric symptoms as a function of the care-setting	2017	Geriatr Nurs		1			exposed to neuropsychiatric symptoms from patients
Mac Donald, C. L.; Johnson, A. M.; Wierzechowski, L.;	Prospectively assessed clinical outcomes in concussive blast vs nonblast traumatic brain injury	2014	JAMA Neurol	1				Traumatic brain injury

Kassner, E.; Stewart, T.; Nelson, E. C.; Werner, N. J.; Zonies, D.; Oh, J.; Fang, R.; Brody, D. L.	among evacuated US military personnel							
MacDonald, C. L.; Johnson, A. M.; Nelson, E. C.; Werner, N. J.; Fang, R.; Flaherty, S. F.; Brody, D. L.	Functional status after blast-plus-impact complex concussive traumatic brain injury in evacuated United States military personnel	2014	J Neurotrauma	1				Blast vs non-blast traumatic brain injury
Magnavita, N.	The exploding spark: workplace violence in an infectious disease hospital--a longitudinal study	2013	Biomed Res Int		1			
Magnavita, N.; Garbarino, S.; Winwood, P. C.	Measuring psychological trauma in the workplace: Psychometric properties of the italian version of the psychological injury risk indicator - A cross-sectional study	2015	Scientific World Journal				1	Compare PIRI with GHQ12, no risk estimate
Martin, L.; Rosen, L. N.; Durand, D. B.; Knudson, K. H.; Stretch, R. H.	Psychological and physical health effects of sexual assaults and non-sexual traumas among male and female United States Army soldiers	2000	Behavioral Medicine		1			Exposed to lifetime trauma
McCallum, E. B.; Murdoch, M.; Erbes, C. R.; Arbisi, P.; Polusny, M. A.	Impact of Deployment-Related Sexual Stressors on Psychiatric Symptoms After Accounting for Predeployment Stressors: Findings From a U.S. National Guard Cohort	2015	J Trauma Stress		1			Sexual stressors
Meyer, S. R.; Decker, M. R.; Tol, W. A.; Abshir, N.;	Workplace and security stressors and mental health among migrant workers on the Thailand-Myanmar border	2016	Soc Psychiatry Psychiatr Epidemiol		1			sexual assult at the workplace only

Mar, A. A.; Robinson, W. C.								
Millegan, J.; Wang, L.; LeardMann, C. A.; Miletich, D.; Street, A. E.	Sexual Trauma and Adverse Health and Occupational Outcomes Among Men Serving in the U.S. Military	2016	J Trauma Stress		1			sexual asaut males in military
Miranda, H.; Punnett, L.; Gore, R. J.	Musculoskeletal pain and reported workplace assault: a prospective study of clinical staff in nursing homes	2014	Hum Factors			1		focus on pain and feelings of depression
Monteso-Curto, P.; Aguilar, C.; Lejeune, M.; Casado-Marin, L.; Casanova Garrigos, G.; Ferre-Grau, C.	Violence and depression in a community sample	2017	J Clin Nurs				1	Do not distinguish between dometic and workplace violence
Murdoch, M.; Pryor, J. B.; Polusny, M. A.; Gackstetter, G. D.	Functioning and psychiatric symptoms among military men and women exposed to sexual stressors	2007	Mil Med		1			Exposed to sexual stressors not violence
Niedhammer, I.; Lesuffleur, T.; Algava, E.; Chastang, J. F.	Classic and emergent psychosocial work factors and mental health	2015	Occup Med (Lond)		1			Verbal abuse
Ornstein, K.; Gaugler, J. E.; Devanand, D. P.; Scarmeas, N.; Zhu, C.; Stern, Y.	The differential impact of unique behavioral and psychological symptoms for the dementia caregiver: how and why do patients' individual symptom clusters impact caregiver depressive symptoms?	2013	Am J Geriatr Psychiatry	1				"Caregiver" is a relative
Pavao, J.; Turchik, J. A.; Hyun, J. K.; Karpenko, J.;	Military sexual trauma among homeless veterans	2013	J Gen Intern Med		1			exposure military sexual trauma

Saweikis, M.; McCutcheon, S.; Kane, V.; Kimerling, R.								
Pekurinen, V.; Willman, L.; Virtanen, M.; Kivimaki, M.; Vahtera, J.; Valimaki, M.	Patient Aggression and the Well-being of Nurses: A Cross-Sectional Survey Study in Psychiatric and Non-Psychiatric Settings	2017	Int J Environ Res Public Health		1			compare nurses' wellbeing in different settings
Richter, D.; Berger, K.	Post-traumatic stress disorder following patient assaults among staff members of mental health hospitals: a prospective longitudinal study	2006	Bmc Psychiatry			1		About PTSD
Roxburgh, A.; Degenhardt, L.; Copeland, J.	Posttraumatic stress disorder among female street-based sex workers in the greater Sydney area, Australia	2006	BMC Psychiatry			1		PTSD
Salas, M. L.; Quezada, S.; Basagoitia, A.; Fernandez, T.; Herrera, R.; Parra, M.; Munoz, D. M.; Weigl, M.; Radon, K.	Working Conditions, Workplace Violence, and Psychological Distress in Andean Miners: A Cross-sectional Study Across Three Countries	2015	Ann Glob Health		1			Do not distinguish between physical violence, sexual harassment and bullying
Shi, L.; Wang, L.; Jia, X.; Li, Z.; Mu, H.; Liu, X.; Peng, B.; Li, A.; Fan, L.	Prevalence and correlates of symptoms of post-Traumatic stress disorder among Chinese healthcare workers exposed to physical violence: A cross-sectional study	2017	BMJ Open			1		PTSD

Sun, T.; Gao, L.; Li, F. J.; Shi, Y.; Xie, F. Z.; Wang, J. H.; Wang, S.; Zhang, S.; Liu, W. H.; Duan, X. J.; Liu, X. Y.; Zhang, Z.; Li, L.; Fan, L. H.	Workplace violence, psychological stress, sleep quality and subjective health in Chinese doctors: a large cross-sectional study	2017	Bmj Open				1	multiple hierarchical linear reggression but no risk estimate
Terzoni, S.; Ferrara, P.; Cornelli, R.; Ricci, C.; Oggioni, C.; Destrebecq, A.	Violence and unsafety in a major Italian hospital: experience and perceptions of health care workers	2015	Med Lav			1		Prevalence of violence and levels of perceived unsafety
Tonso, M. A.; Prematunga, R. K.; Norris, S. J.; Williams, L.; Sands, N.; Elsom, S. J.	Workplace Violence in Mental Health: A Victorian Mental Health Workforce Survey	2016	Int J Ment Health Nurs				1	Only reprot proportions and no risk estimate
Viotti, S.; Gilardi, S.; Guglielmetti, C.; Converso, D.	Verbal Aggression from Care Recipients as a Risk Factor among Nursing Staff: A Study on Burnout in the JD-R Model Perspective	2015	Biomed Res Int				1	Do not report violence and the risk of burnout
Virtanen, Marianna; Vahtera, Jussi; Batty, G. David; Tuisku, Katinka; Pentti, Jaana; Oksanen, Tuula; Salo, Paula; Ahola, Kirsi; Kivimäki, Mika	Overcrowding in psychiatric wards and physical assaults on staff: Data-linked longitudinal study	2011	The British Journal of Psychiatry	1				Violence is the outcome

Appendix E: Rating of bias and confounding of each individual paper

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	19/6-2018
Raters A and B	LAR and NHE
Study population	Danish Prison personnel, N=1741
References	Andersen D et al 2017

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (61%)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 (covariates)
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.	X	High risk: unclear purpose with the possibility of many analyzes but little information is provided
		Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	19/6-2018
Raters A and B	LAR and JPB
Study population	Cohort of Randomly selected Residents of Australia (NSW), N=1466
References	Butterworth P et al, 2016

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (80 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: Self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.	X	High risk: unclear purpose with the possibility of many analyzes but little information is provided
		Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	19/6-2018
Raters A and B	LAR and NHE
Study population	Female nurses and nursing personnel, N=1044
References	Cavanaugh C et al 2014

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	0 (no explanation on how the study was done)
Response rate	1 (81 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0
Statistical modelling	0 (were depressed at baseline excluded?)
Completeness of reporting sum score (0-8)	5

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed ***Socio-economic status?***
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	1.10.2018
Raters A and B	LAR and JPB
Study population	Drivers and conductors working with road passenger transport
References	Couto and Lawoko 2011

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (100%)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	x	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	20/6-2018
Raters A and B	LAR and NHE
Study population	FHP workers (physicians, nurses, nursing assistants and community health workers (CHW)
References	Da Silva et al 2015

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (93 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	11.07.2018
Raters A and B	LAR and NHE
Study population	Home care workers
References	Dement J.M. et al 2014

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (not relevant, register based)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias		High risk: self-reported outcome and exposure
	X	Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome	X	High risk: fx job-exposure matrix,
		Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	4.7.2018
Raters A and B	LAR and JPB
Study population	Nurses aides
References	Eriksen W et al 2008

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (62%)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	8.8.2018
Raters A and B	LAR and ABB
Study population	Nurses
References	Estryn-Behar M et al 2008

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	0 mail in all countries?
Response rate	1 (51%)
Exposure ascertainment	1
Outcome ascertainment	0 – missing details about questions
Data analyses	0 – covariates?
Statistical modelling	1
Completeness of reporting sum score (0-8)	5

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	01.10.2018
Raters A and B	LAR and JPB
Study population	Otorhinolaryngologists and nurses
References	Fang et al 2018

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (83.6 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 (confounders?)
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	10.07.2018
Raters A and B	LAR and NHE
Study population	Home care workers
References	Geiger-Brown J et al 2008

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (88% in wave 1, 95% in wave 2)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed (analyses are cross-sectional in spite of follow-up design with two data waves)
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	25-07-2018
Raters A and B	ABB and JPB
Study population	School Teachers in Finland n=4988
References	Gluschkoff K et al

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (80 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias		High risk: self-reported outcome and exposure
	X	Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	25-07-2018
Raters A and B	ABB and NHE
Study population	Physicians in China n=2641
References	Gong Y et al. 2014

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 – confounders are not mentioned, but it is stated that OR are adjusted?
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: Self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	x	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	26-07-2018
Raters A and B	ABB and NHE
Study population	Emergency department workers n=444
References	Hamdan et al., 2017

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	0 (unclear how they chose these people)
Response rate	1
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 – lack of information on adjustments
Statistical modelling	1
Completeness of reporting sum score (0-8)	6

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	11.07.2018
Raters A and B	LAR and ABB
Study population	Random sample of Danish citizens/only employees included
References	Hogh A et al 2003

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (90% in 1990, and 84% at follow up in 1995)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	x	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	31-07-2018
Raters A and B	ABB and NHE
Study population	N= 343 Nurses (female and male)
References	Jaradat et al., 2016

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	0 – missing description of selection of nurses
Response rate	1
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	x	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	31-07-2018
Raters A and B	ABB and NHE
Study population	N=161 substitute drivers (all male)
References	Jung et al., 2015

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	ABB 0 – Not mentioned in 'method' that this is a cross-sectional study – only mentioned under limitations in the discussion, NHE 1
Definition of study population	1
Recruitment procedure	1
Response rate	0 – not mentioned
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	ABB 6, NHE 7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls Seems like more than 1000 drove by, but only 161 completed the qustionaire = high non-response
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	x	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	02.10.2018
Raters A and B	LAR and JPB
Study population	Police officers and security guards
References	Leino et al 2011

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	0
Definition of study population	1
Recruitment procedure	1
Response rate	1 (58 %)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	x	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	8.8.2018
Raters A and B	LAR and ABB
Study population	Random sample of the working-age population in Denmark
References	Madsen I E H et al 2011

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 60-80 % (3 different studies)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias		High risk: self-reported outcome and exposure
	X	Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	X	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	22/6-2018
Raters A and B	LAR and JPB
Study population	Italian Health Care workers
References	Magnavita N and Heponiemi T 2012

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (80.1 %)
Exposure ascertainment	0 Not described sufficiently
Outcome ascertainment	0 Not described sufficiently (GHQ12 - which items?)
Data analyses	0 (repeated observations)
Statistical modelling	1
Completeness of reporting sum score (0-8)	5

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	X	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	X	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.	X	High risk: unclear purpose with the possibility of many analyzes but little information is provided *Not all results are reported (threats for example)*
		Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Major confounding factors/effect modifiers not or partially assessed No adjustment for somatisation
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	02.10.2018
Raters A and B	LAR and JPB
Study population	Hospital staff in cardiology and oncology
References	Maran et al 2018

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	0
Definition of study population	1
Recruitment procedure	1
Response rate	0
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 (confounding?)
Statistical modelling	1
Completeness of reporting sum score (0-8)	5

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	x	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	x	High risk: Major confounding factors/effect modifiers not or partially assessed
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	02.10.2018
Raters A and B	LAR and JPB
Study population	Representative sample of actively working population age
References	Park et al 2013

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	0 (explained a little in words)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias	X	High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).		High risk: Major confounding factors/effect modifiers not or partially assessed
	x	Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	9.7.2018
Raters A and B	LAR and ABB
Study population	Employees at a pediatric state psychiatric hospital
References	Ryan E.P. et al 2008

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	0 part of another study?
Definition of study population	1
Recruitment procedure	0 how were they asked
Response rate	0 only separately from each group?
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 no explanation of covariates
Statistical modelling	1
Completeness of reporting sum score (0-8)	4

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
		Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
	X –	Uncertain/To be discussed **missing overall response rate**
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X –	High risk: Major confounding factors/effect modifiers not or partially assessed **no mentioning of confounders?**
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters

B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007

C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

A. Article and rater identification	
Date for assessment	9.7.2018
Raters A and B	LAR, ABB and JPB
Study population	Patients from The Danish Psychiatric Central Research Register (N 14 166) and matched controls from Statistics Denmark's Integrated Database for Labour Market research (N 58 060)
References	Wieclaw J et al 2006

B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 not relevant
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	1
Statistical modelling	1
Completeness of reporting sum score (0-8)	8

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	X	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias		High risk: self-reported outcome and exposure
	X	Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome	X	High risk: the study apply a job-exposure matrix providing probability of exposure
		Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	X	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	X	High risk: Health care workers with a high risk of exposure may anything equal have a greater chance to be treated in the hospital system
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

Appendix: Assessment of completeness of reporting and bias for each included study by two independent reviewers

A. Study population, included papers and raters
B. Completeness of reporting adapted from Bonzini M et al Occup Environ Med 2007
C. Assessment of bias and confounding (adapted from Shamliyan TA et al J Clin Epidemiol 2011 and Iljaz S Scan J Work Environ Health 2013 for purposes of specific needs for this review)

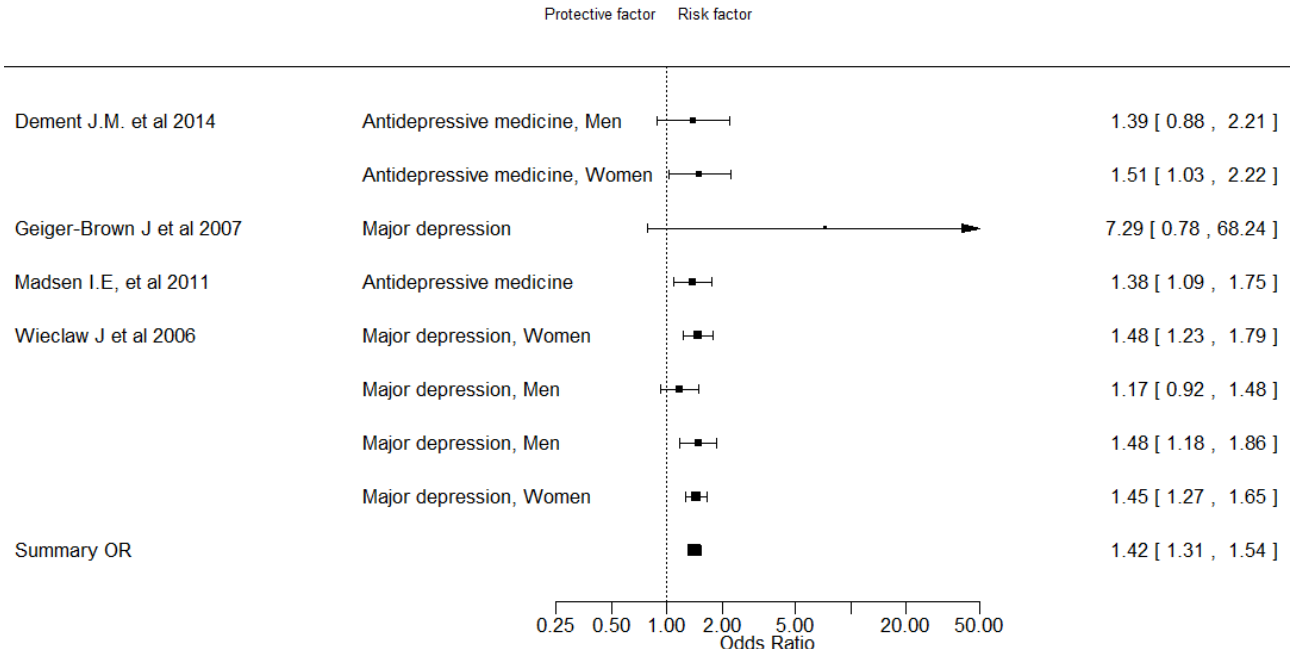
A. Article and rater identification	
Date for assessment	9.7.2018
Raters A and B	LAR and ABB
Study population	Physicians working in emergency departments in Pakistan
References	Zafar W et al 2016

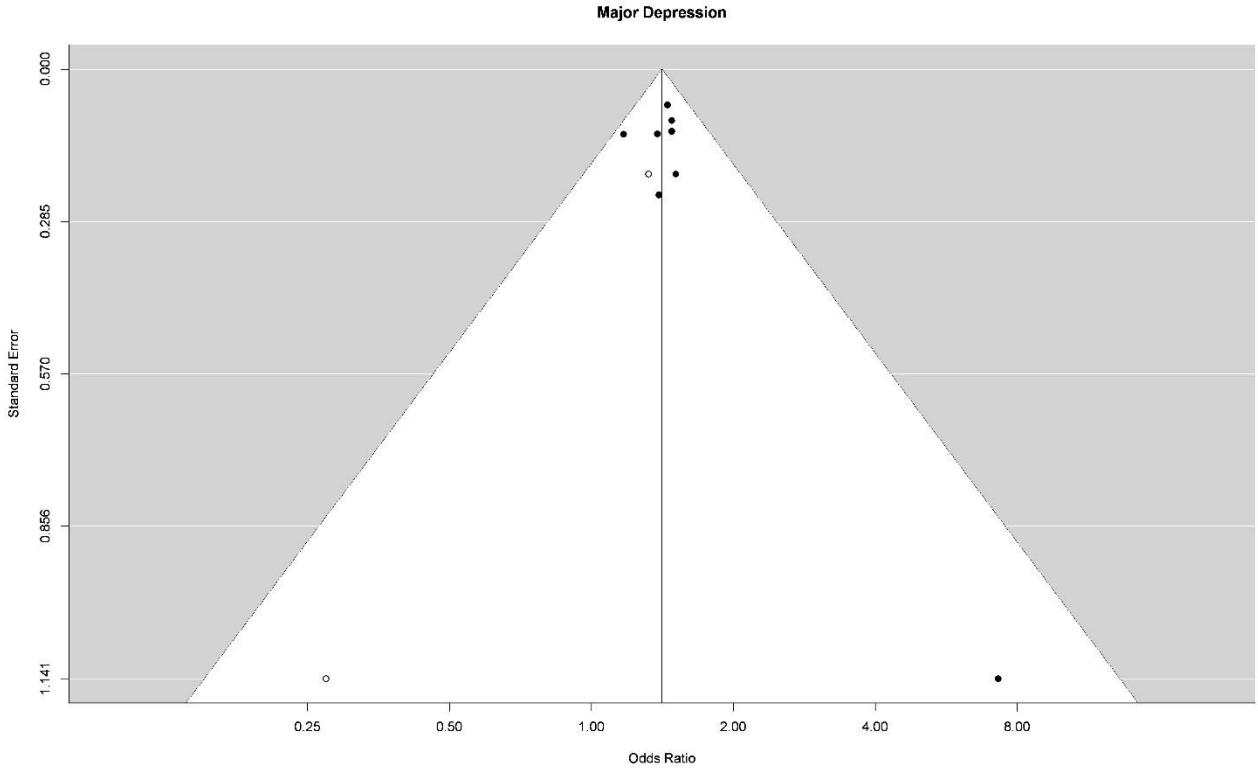
B. Completeness of reporting (is adequate information provided or not? No assessment of quality)	Each issue is rated with 1 (adequate information) or 0 (no sufficient description), if 0 indicate briefly the main reason
Study design	1
Definition of study population	1
Recruitment procedure	1
Response rate	1 (92.2%)
Exposure ascertainment	1
Outcome ascertainment	1
Data analyses	0 explanation of covariates?
Statistical modelling	1
Completeness of reporting sum score (0-8)	7

C. Assessment of bias and confounding	Check	High risk (likely risk of bias not addressed) Low risk (best practice) Uncertain risk (information not provided) If high risk: Justify your decision by short statements or quotes from the study
Selection bias		High risk: loss to follow-up larger than 20% or differ more than 10% between exposed and unexposed and/or non-response more than 20% or non-response differed by more than 10% in cases and controls
	x	Low risk: Loss to follow-up less than 20% with no difference between groups and/or non-response less than 20% with no difference between cases and controls
		Uncertain/To be discussed
Common method bias	x	High risk: self-reported outcome and exposure
		Low risk: information obtained independently of each other, not person specific information
		Uncertain/To be discussed
Non-differential misclassification of exposure and/or outcome		High risk: fx job-exposure matrix,
	x	Low risk: pay-roll data, reported data
		Uncertain/To be discussed
Selective reporting of results in studies with many analyses.		High risk: unclear purpose with the possibility of many analyzes but little information is provided
	x	Low risk:
		Uncertain/To be discussed
Confounding (gender, age and social economic class or level of education).	x	High risk: Major confounding factors/effect modifiers not or partially assessed **Not really explained?**
		Low risk: Confounding factors adequately accounted for by design and/or analysis
		Uncertain: adjustment for confounding factors not reported

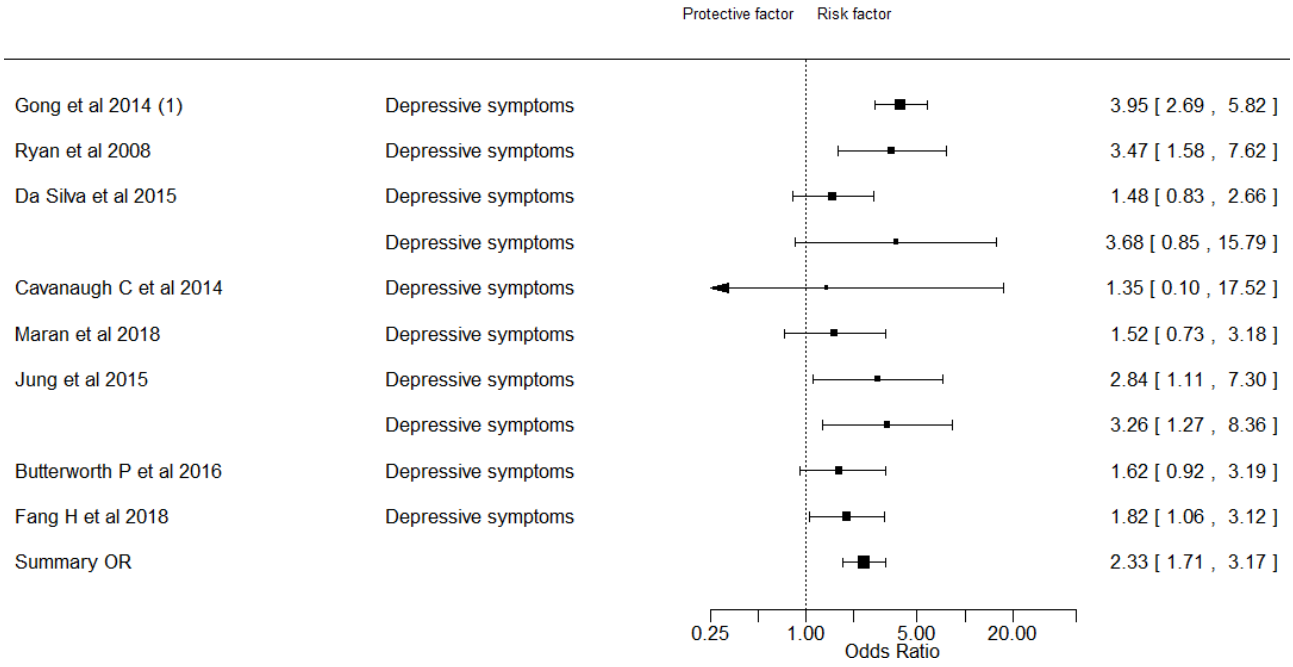
Appendix F: Forest and funnel plots

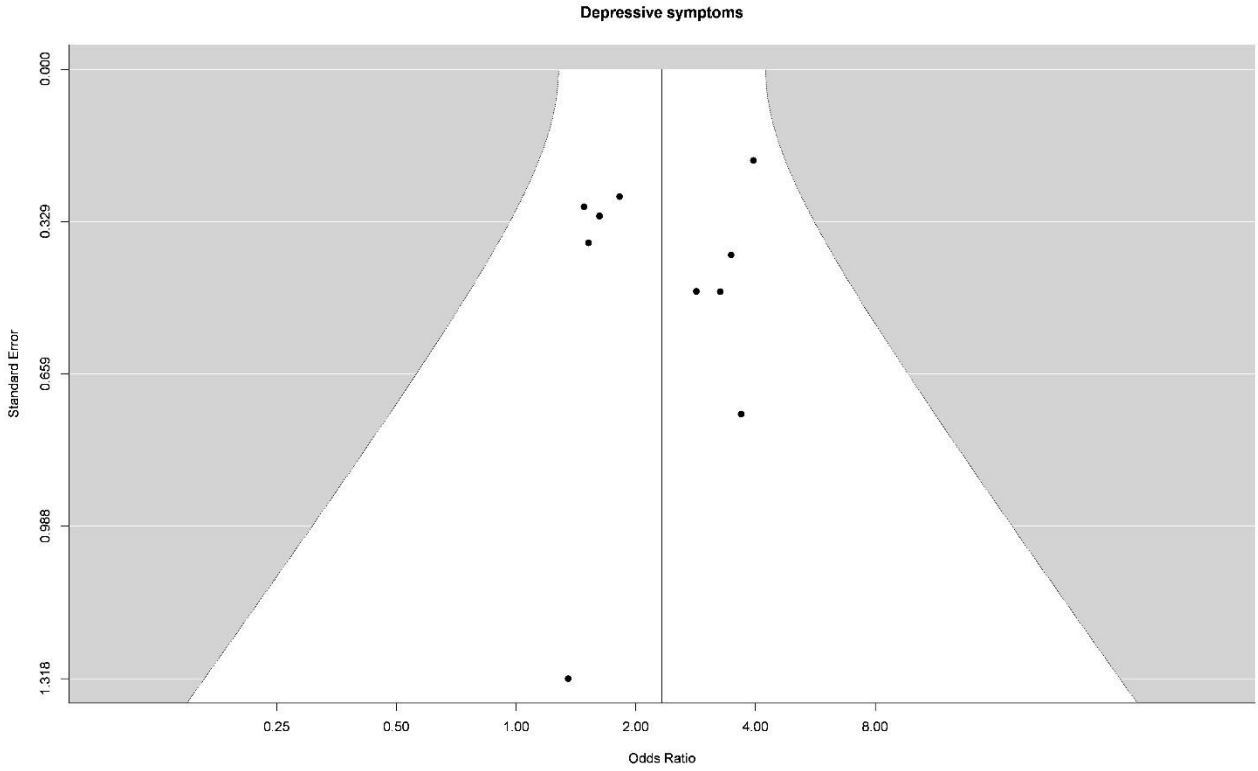
Major depression:



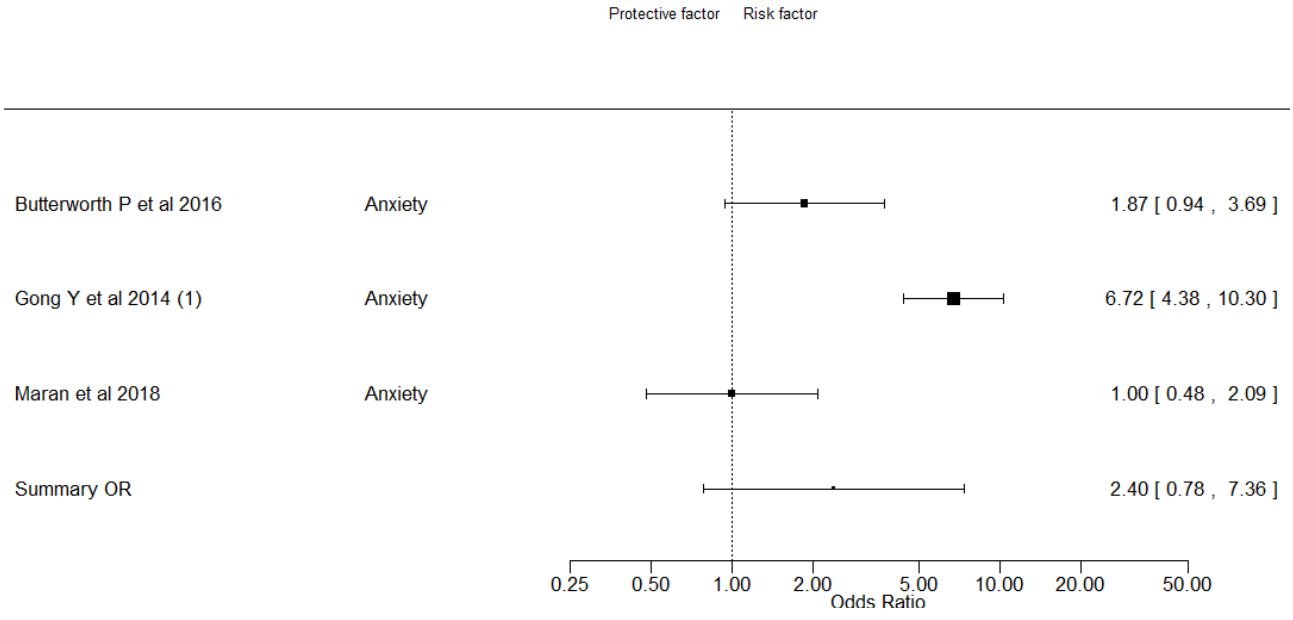


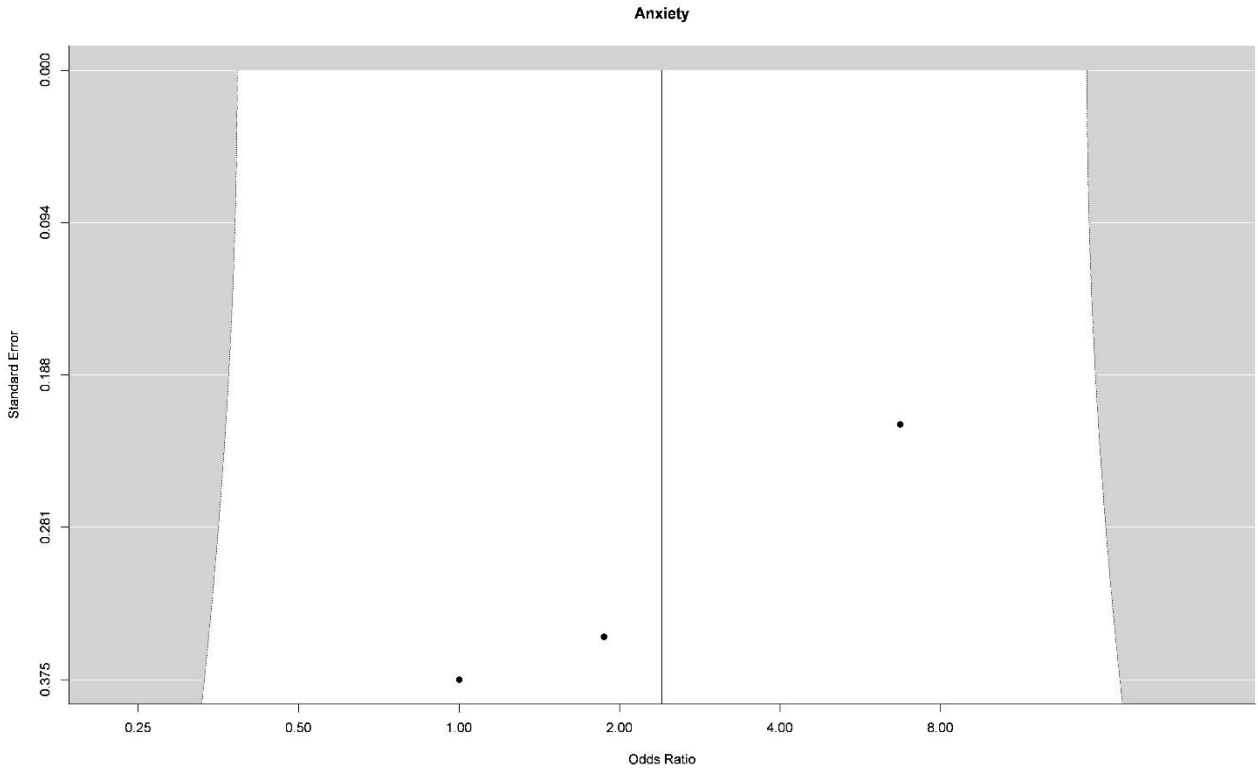
Depressive symptoms:



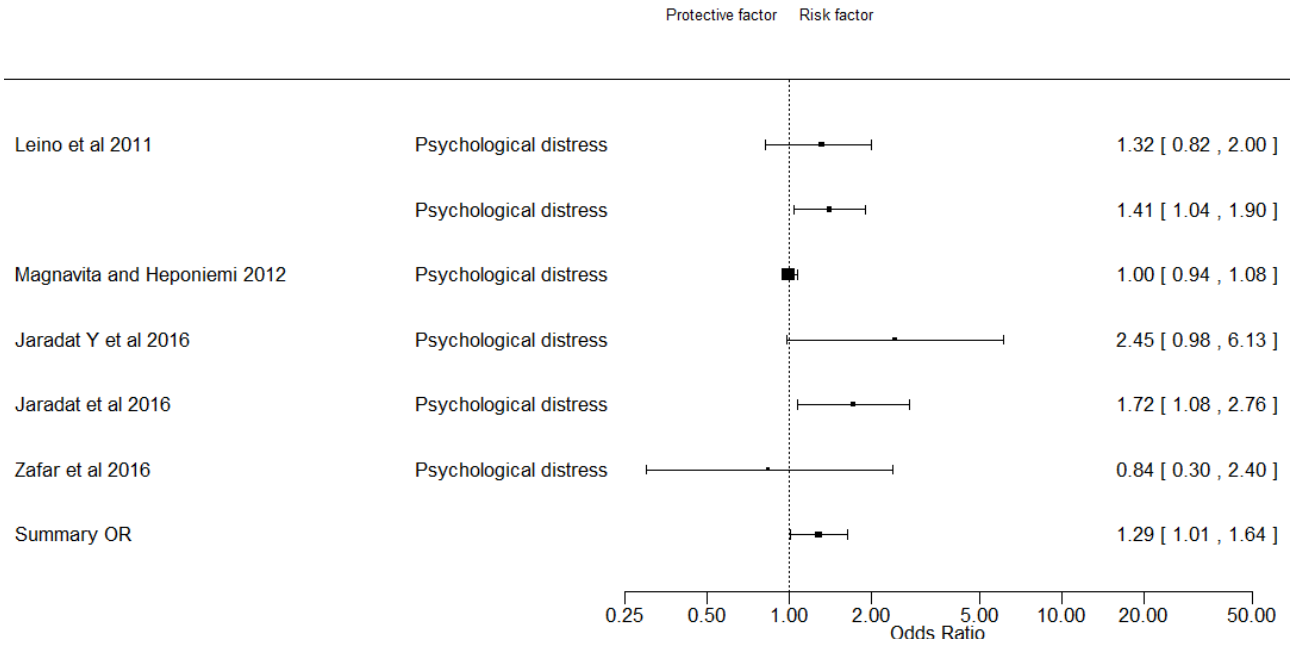


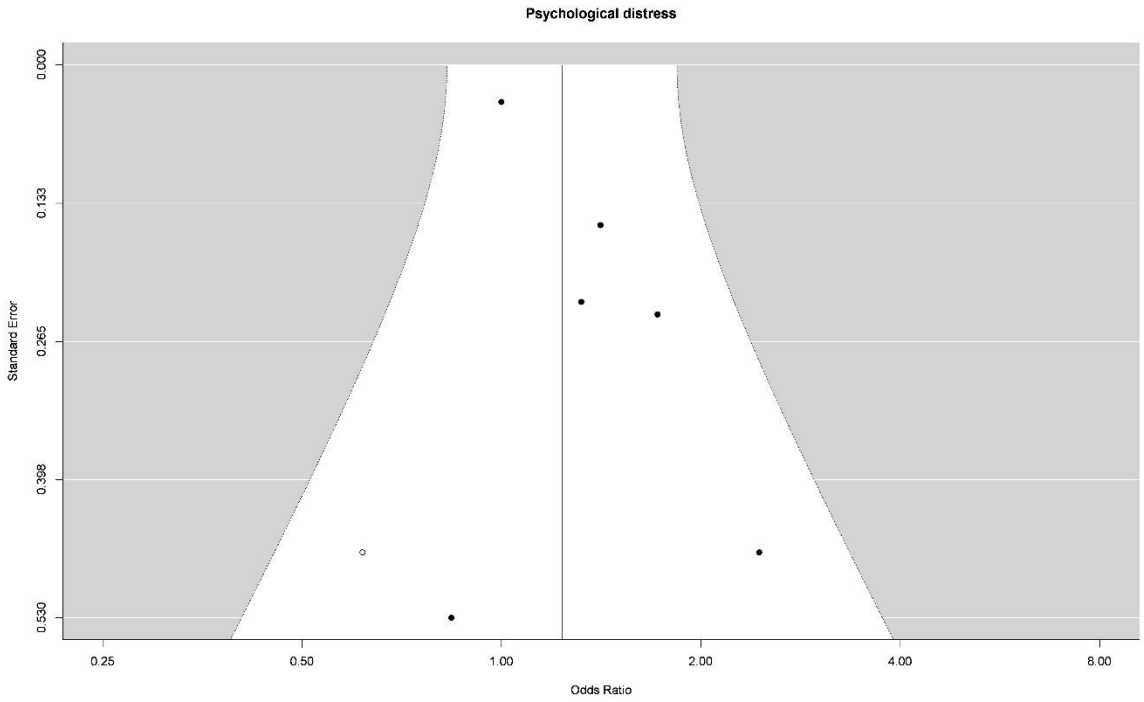
Anxiety:


Protective factor
Risk factor
Butterworth P et al 2016
Anxiety
1.87 [0.94 , 3.69]
Gong Y et al 2014 (1)
Anxiety
6.72 [4.38 , 10.30]
Maran et al 2018
Anxiety
1.00 [0.48 , 2.09]
Summary OR
2.40 [0.78 , 7.36]
0.25
0.50
1.00
2.00
5.00
10.00
20.00
50.00
Odds Ratio

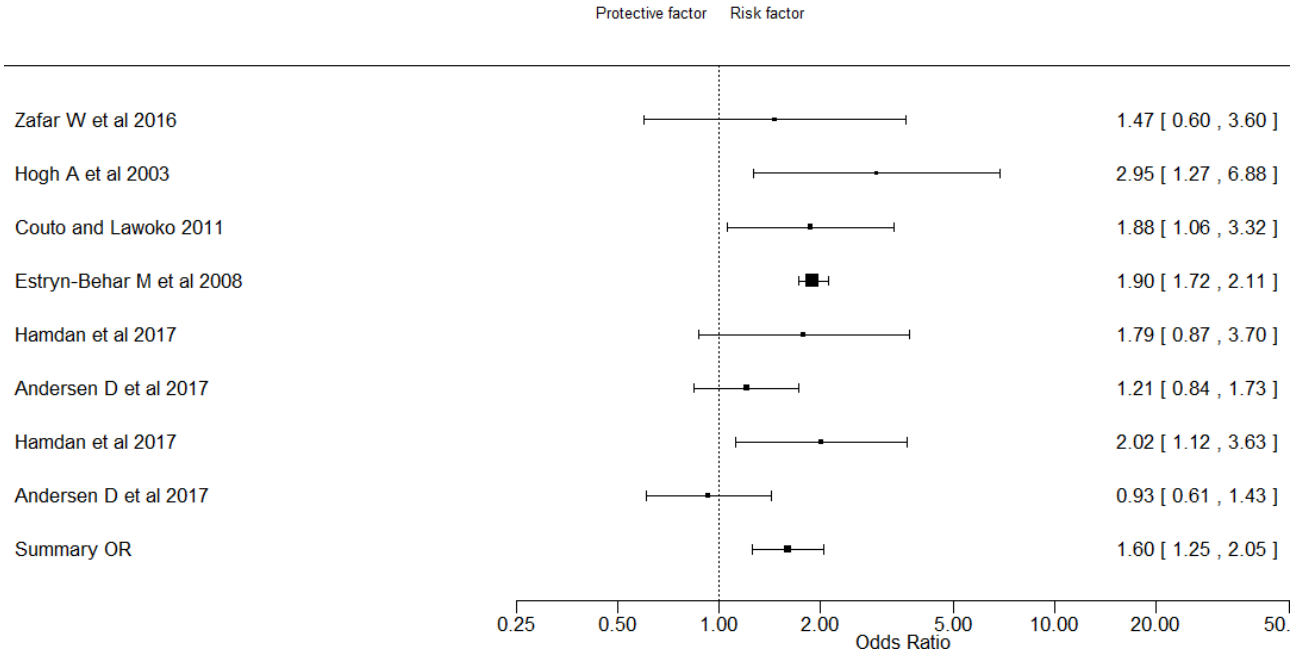

Anxiety
Standard Error
0.000
0.094
0.188
0.281
0.375
0.25
0.50
1.00
2.00
4.00
8.00
Odds Ratio

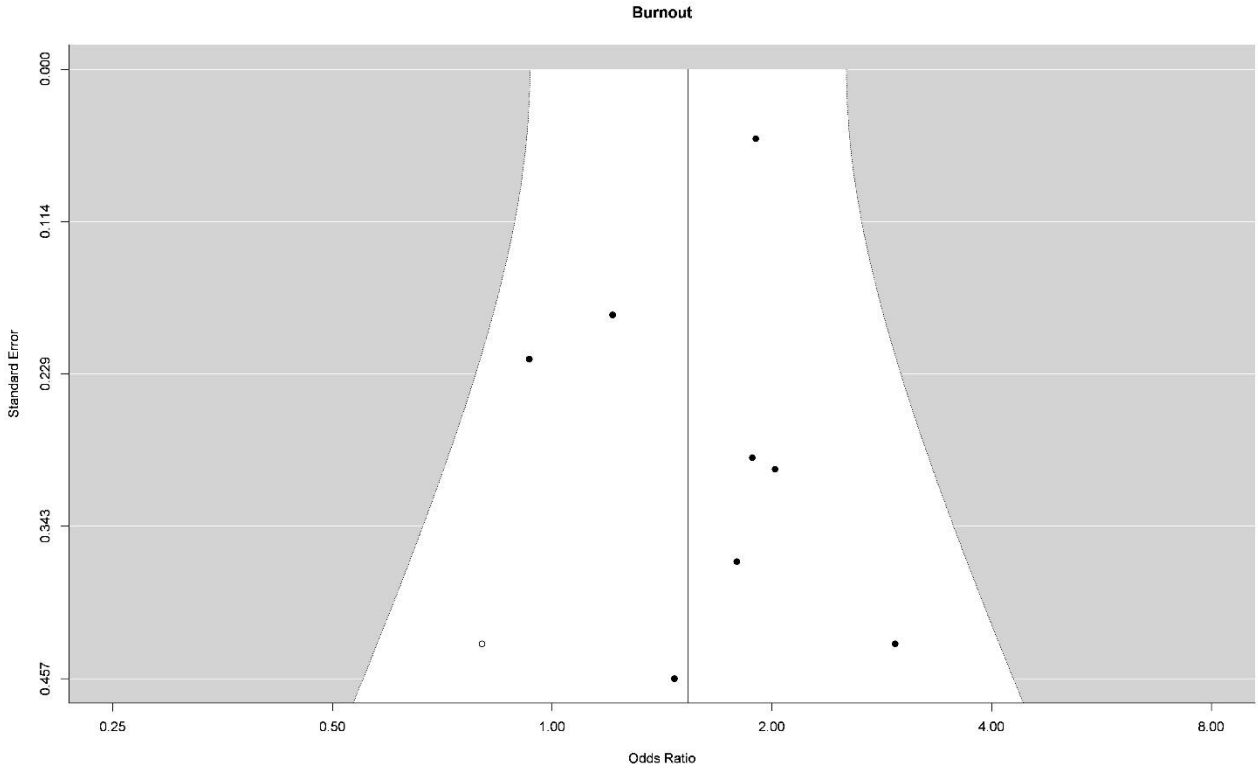
Psychological distress:



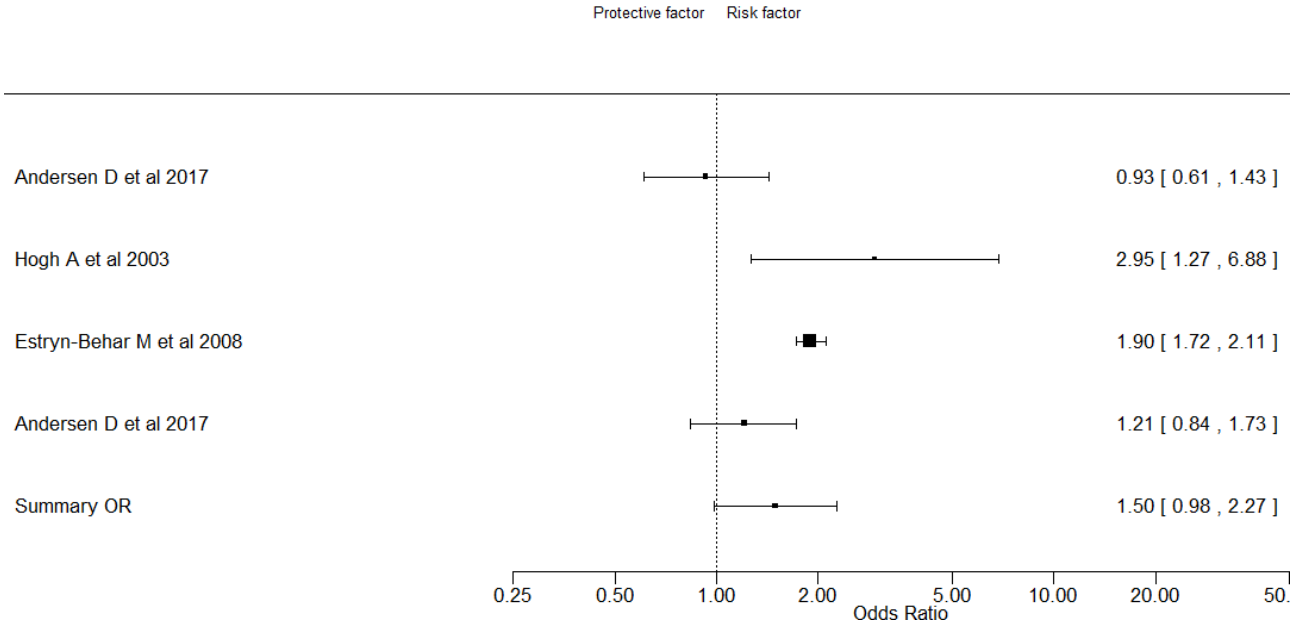


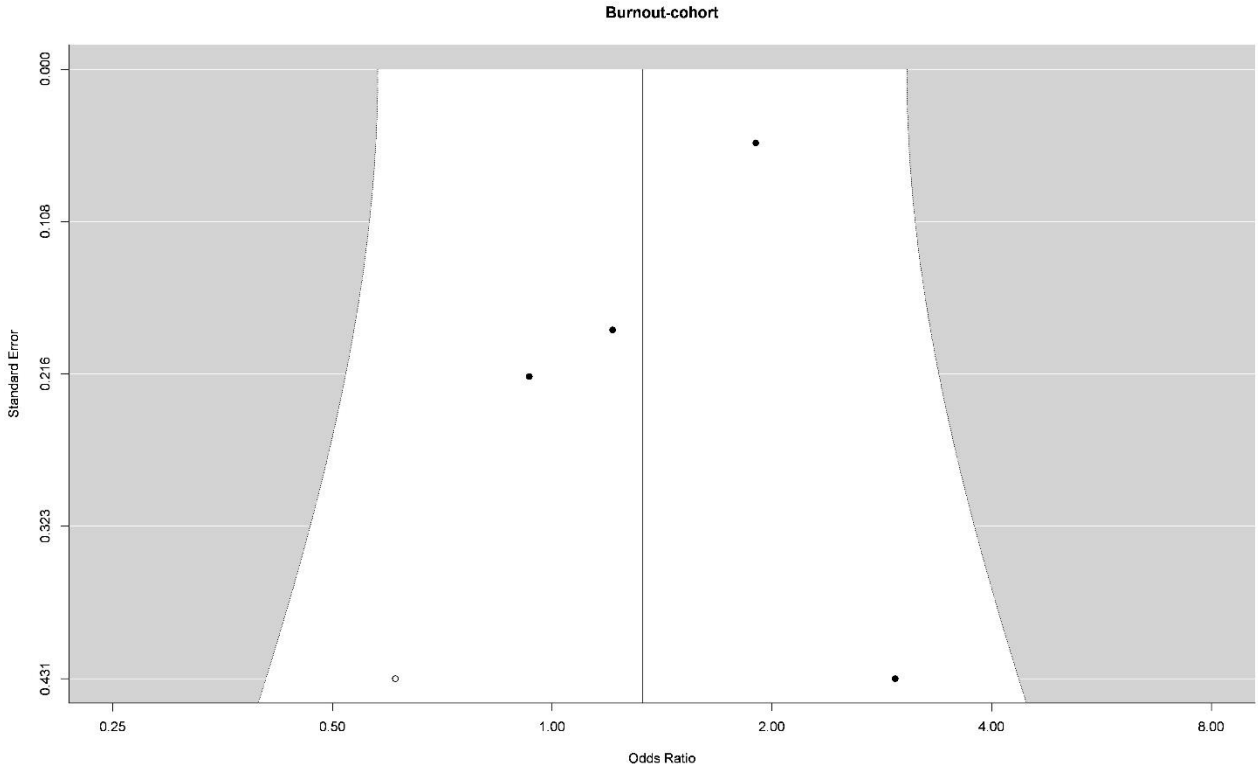
Burnout


Protective factor
Risk factor
Zafar W et al 2016
1.47 [0.60 , 3.60]
Hogh A et al 2003
2.95 [1.27 , 6.88]
Couto and Lawoko 2011
1.88 [1.06 , 3.32]
Estryn-Behar M et al 2008
1.90 [1.72 , 2.11]
Hamdan et al 2017
1.79 [0.87 , 3.70]
Andersen D et al 2017
1.21 [0.84 , 1.73]
Hamdan et al 2017
2.02 [1.12 , 3.63]
Andersen D et al 2017
0.93 [0.61 , 1.43]
Summary OR
1.60 [1.25 , 2.05]
0.25
0.50
1.00
2.00
5.00
10.00
20.00
50.
Odds Ratio

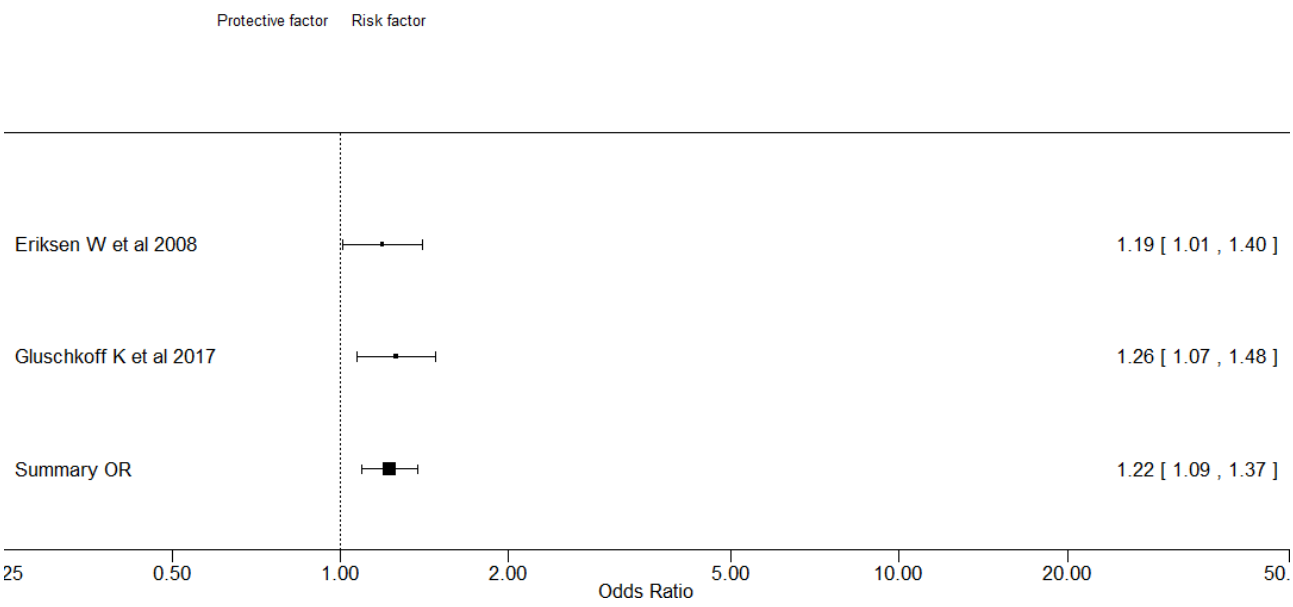

Burnout
Standard Error
0.000
0.114
0.229
0.343
0.457
0.25
0.50
1.00
2.00
4.00
8.00
Odds Ratio

Burnout, cohort studies

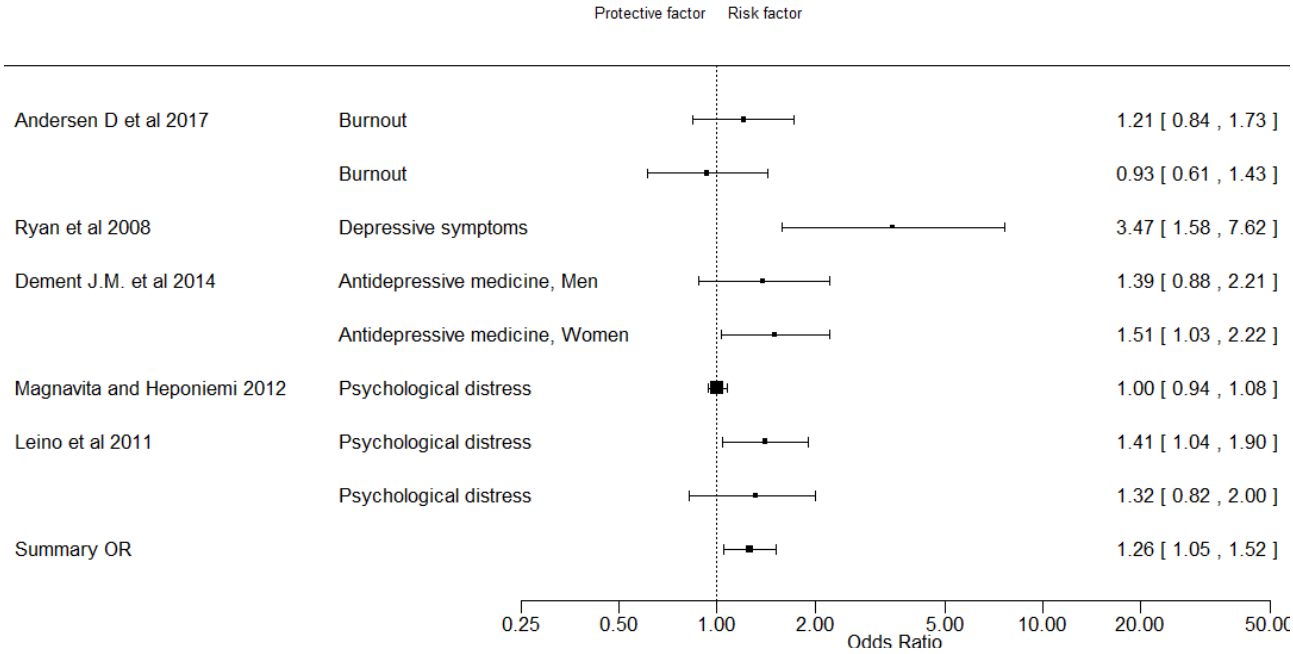


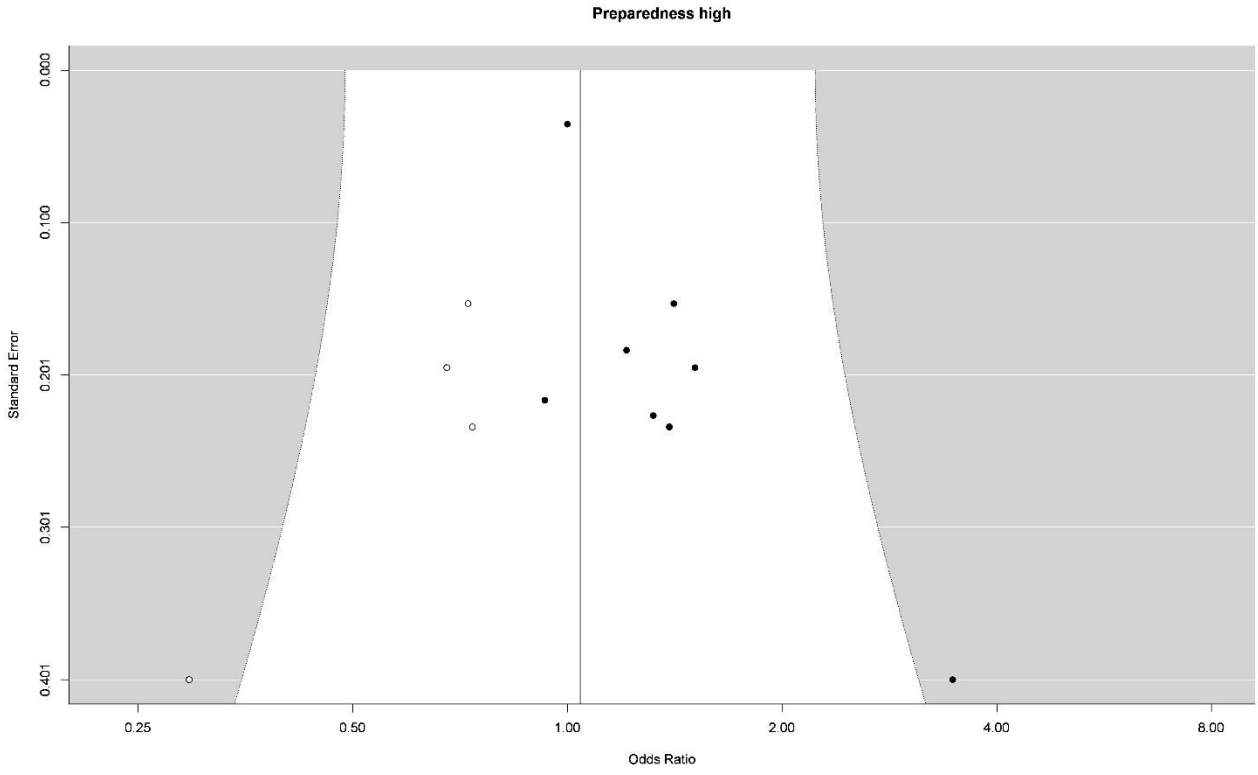


Sleep problems, cohorts

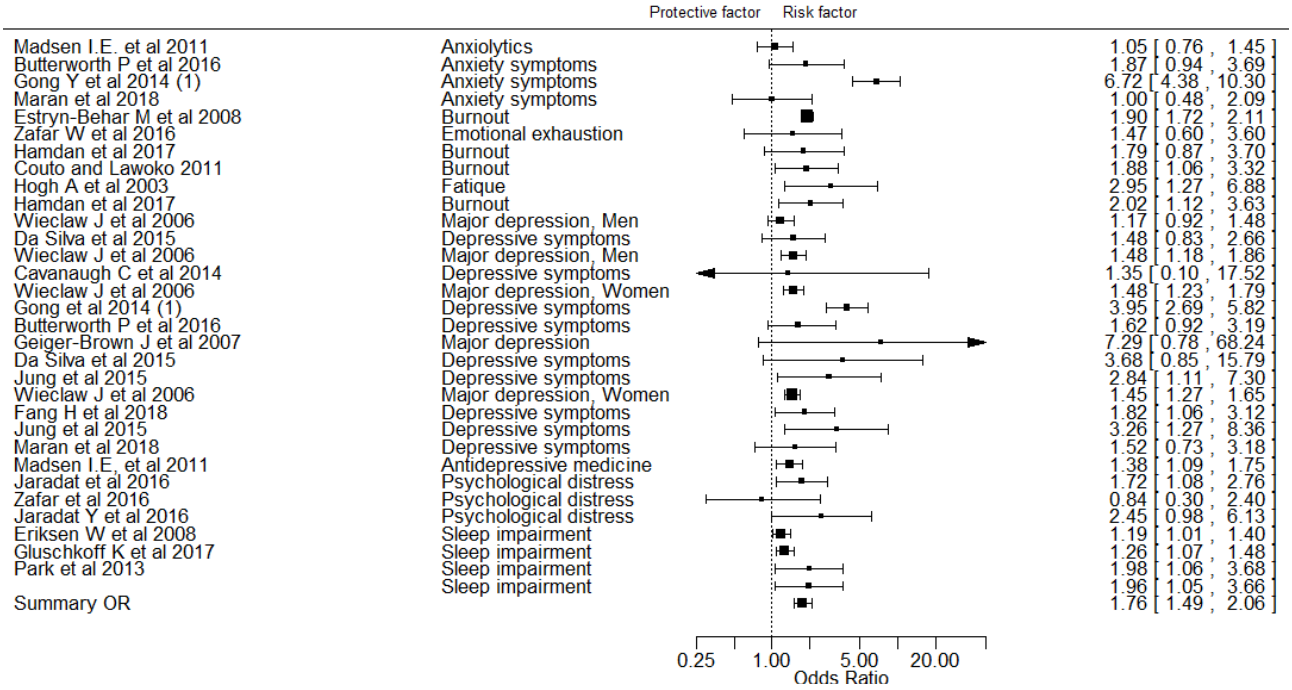


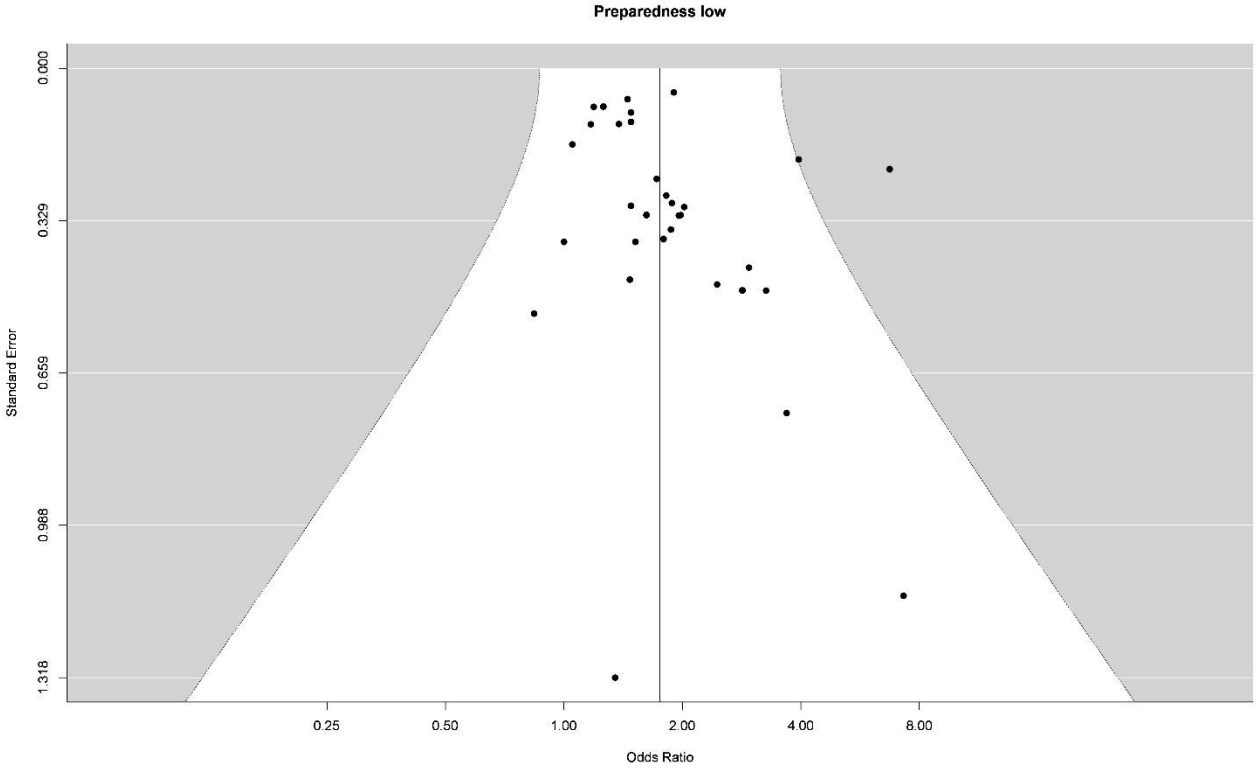
High level of preparedness



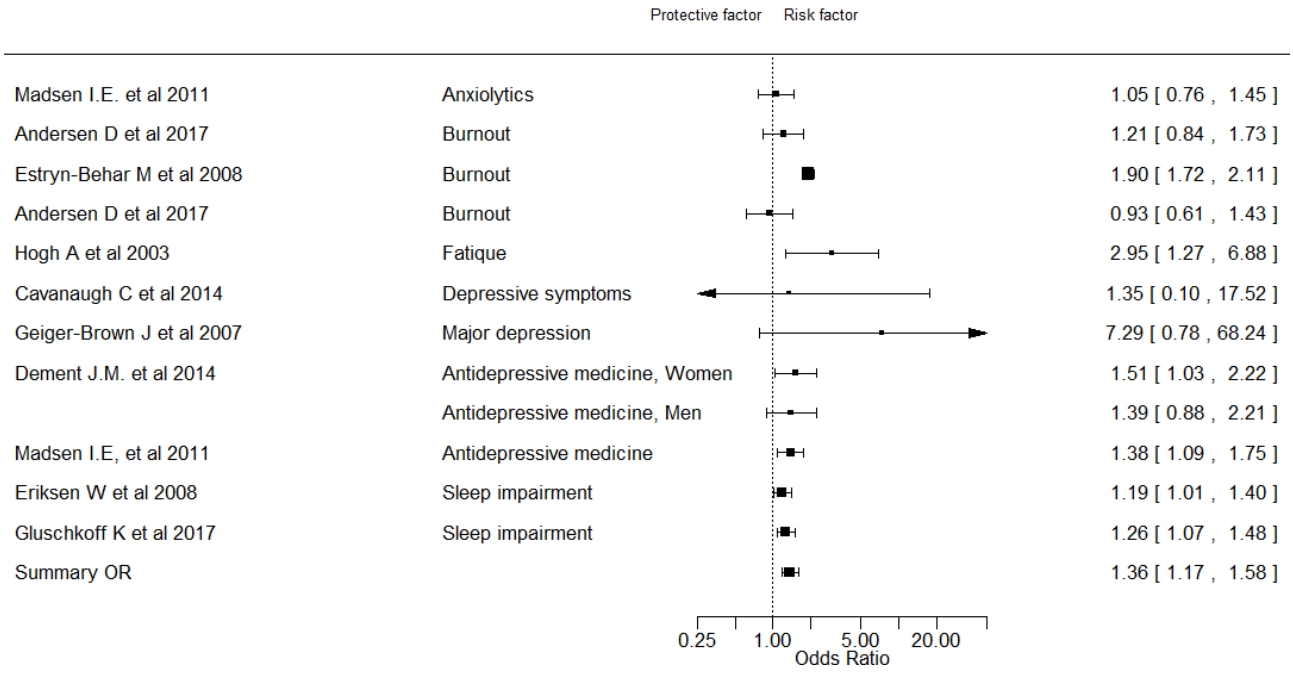


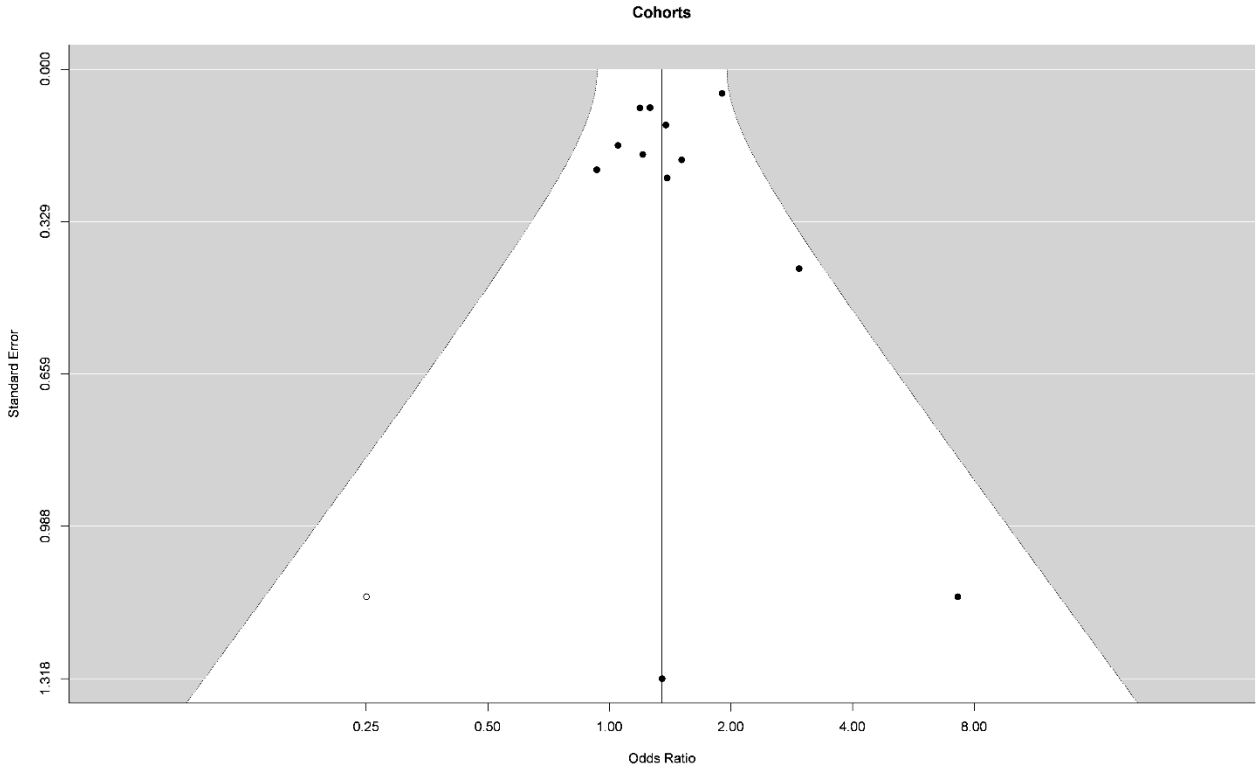
Low level of preparedness



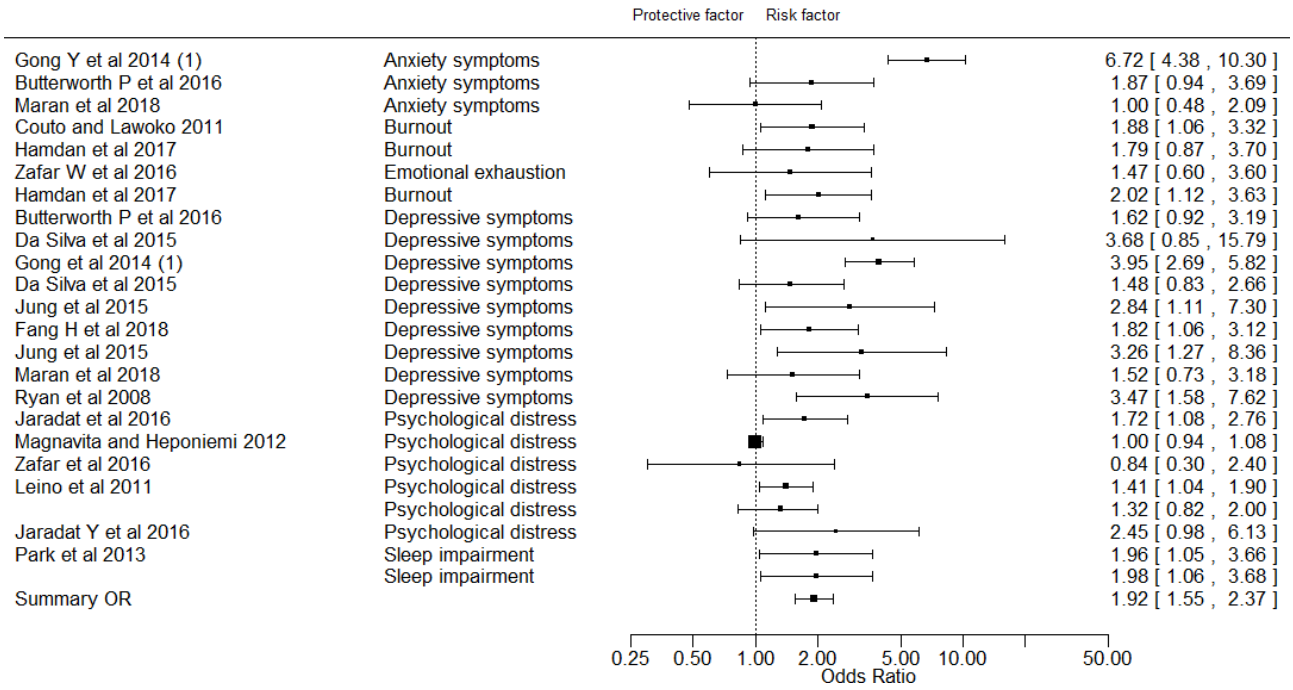


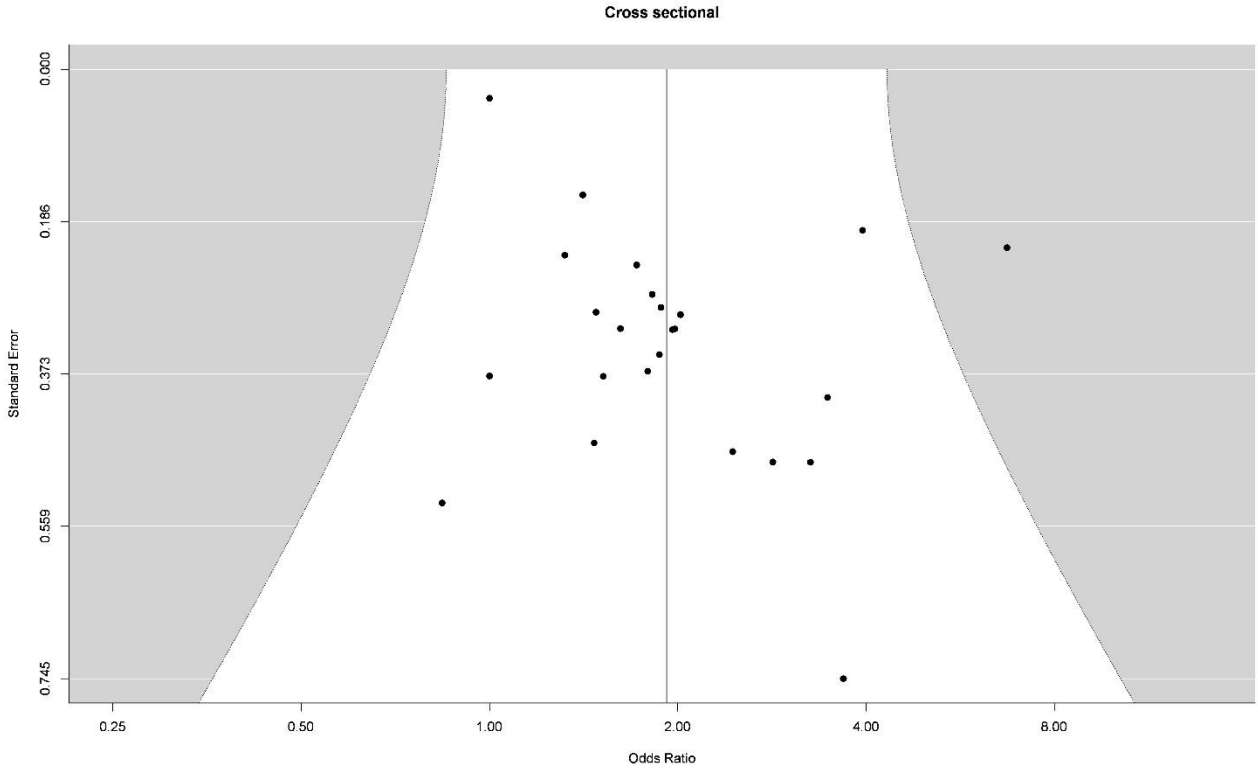
Cohort studies



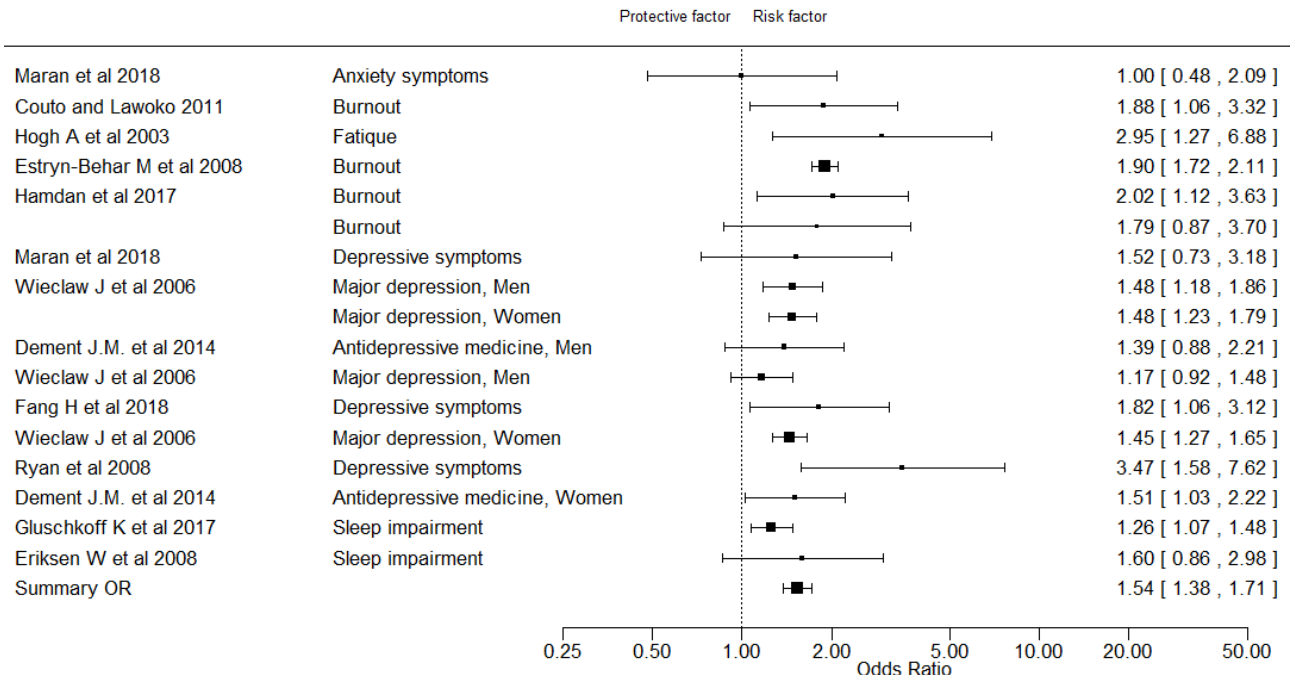


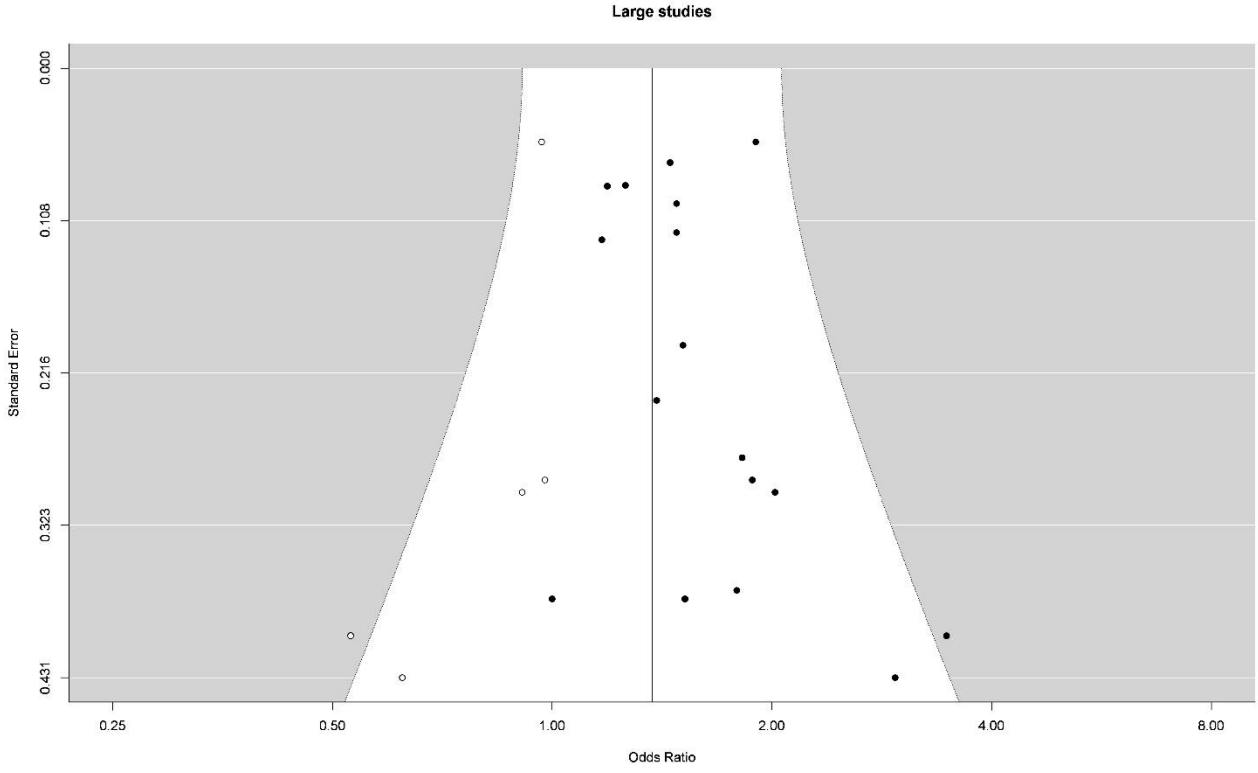
Cross-sectional studies



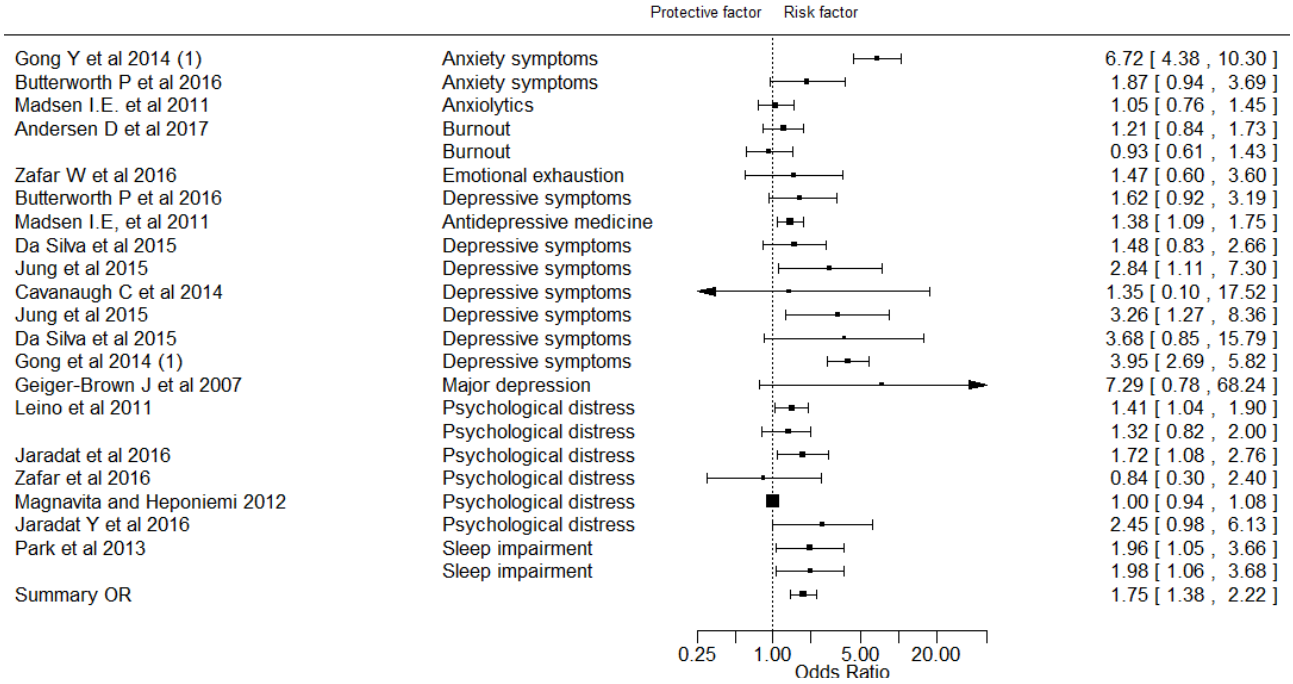


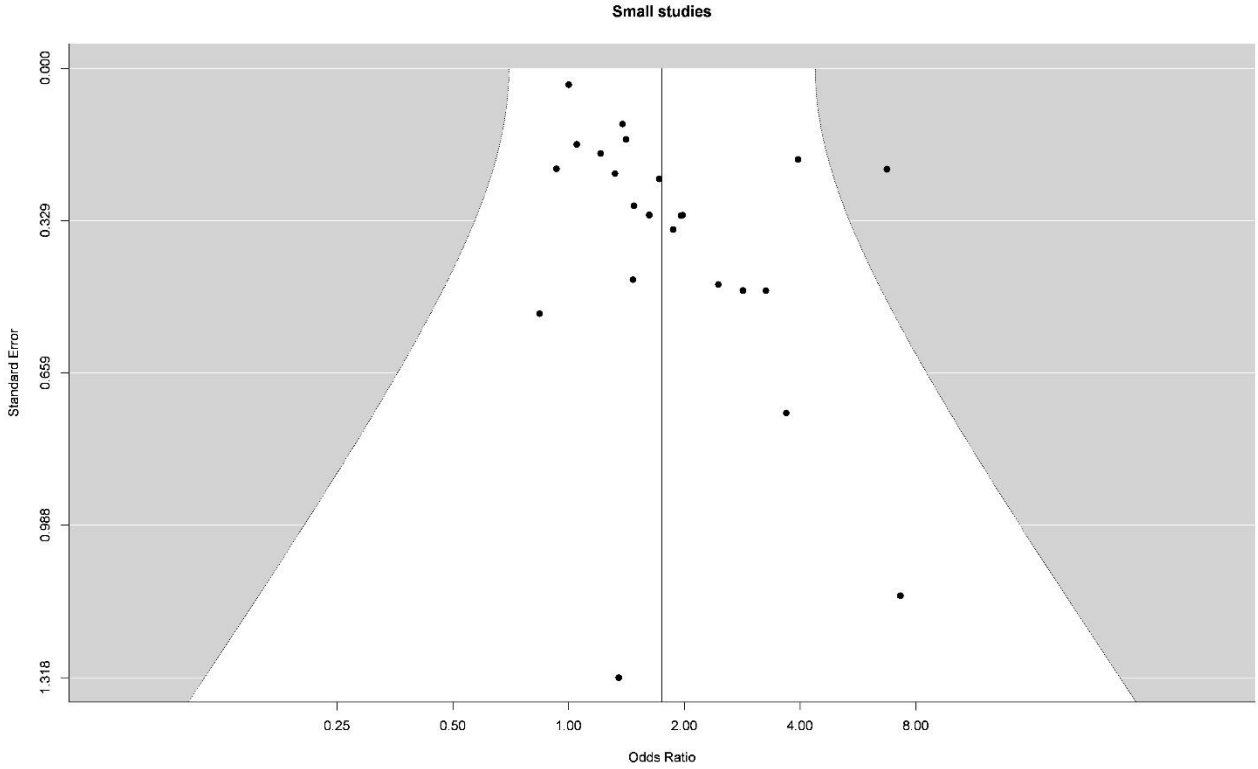
Population size above 3500 persons



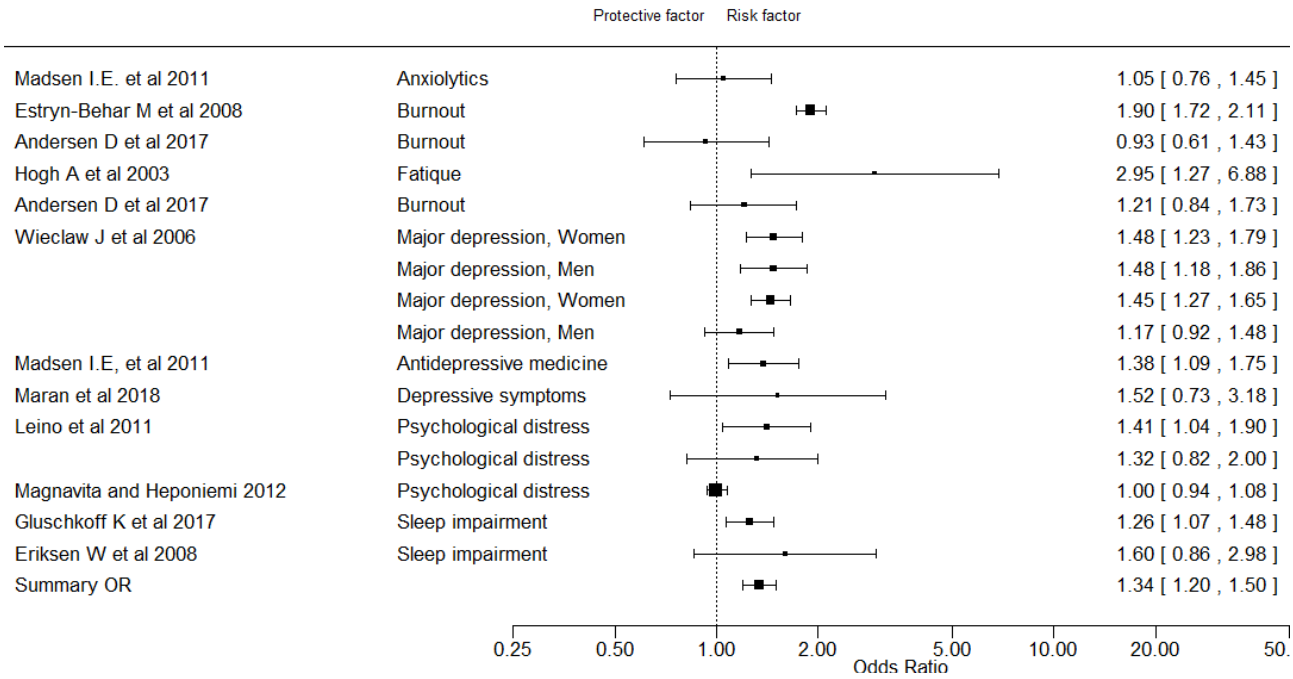


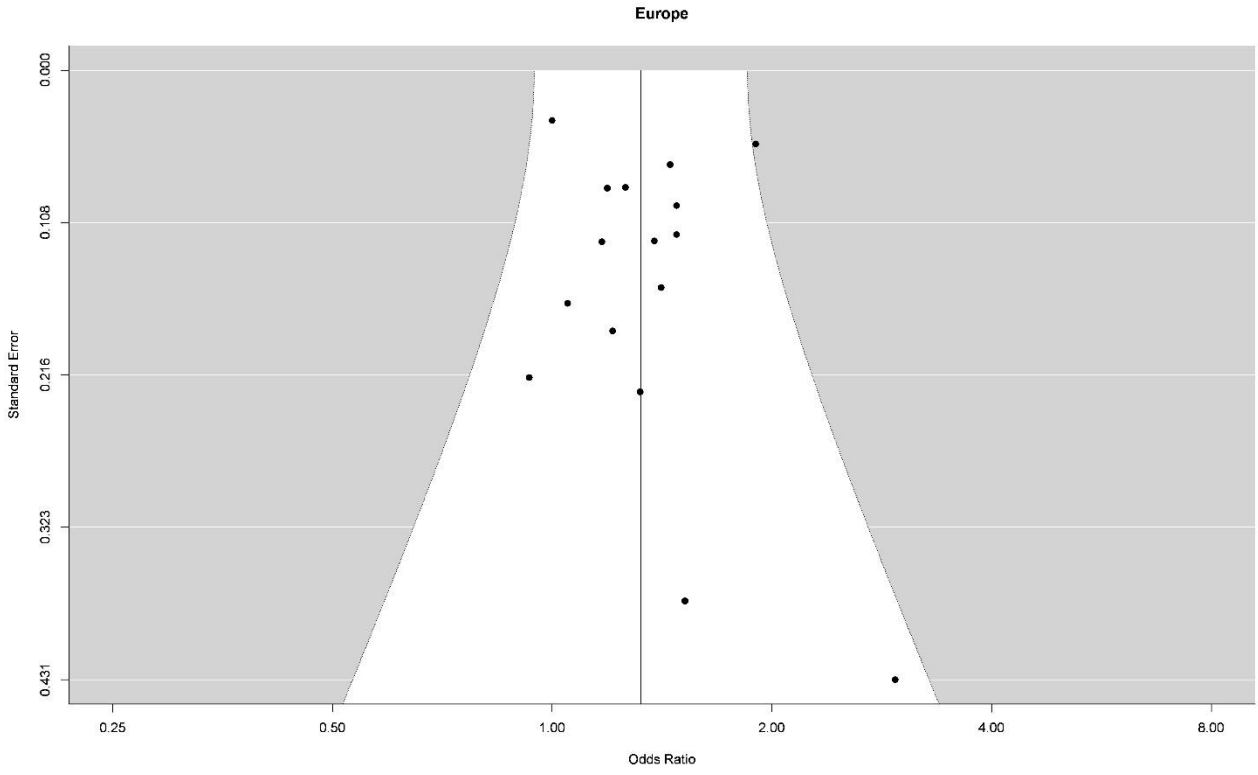
Population size below 3500 persons



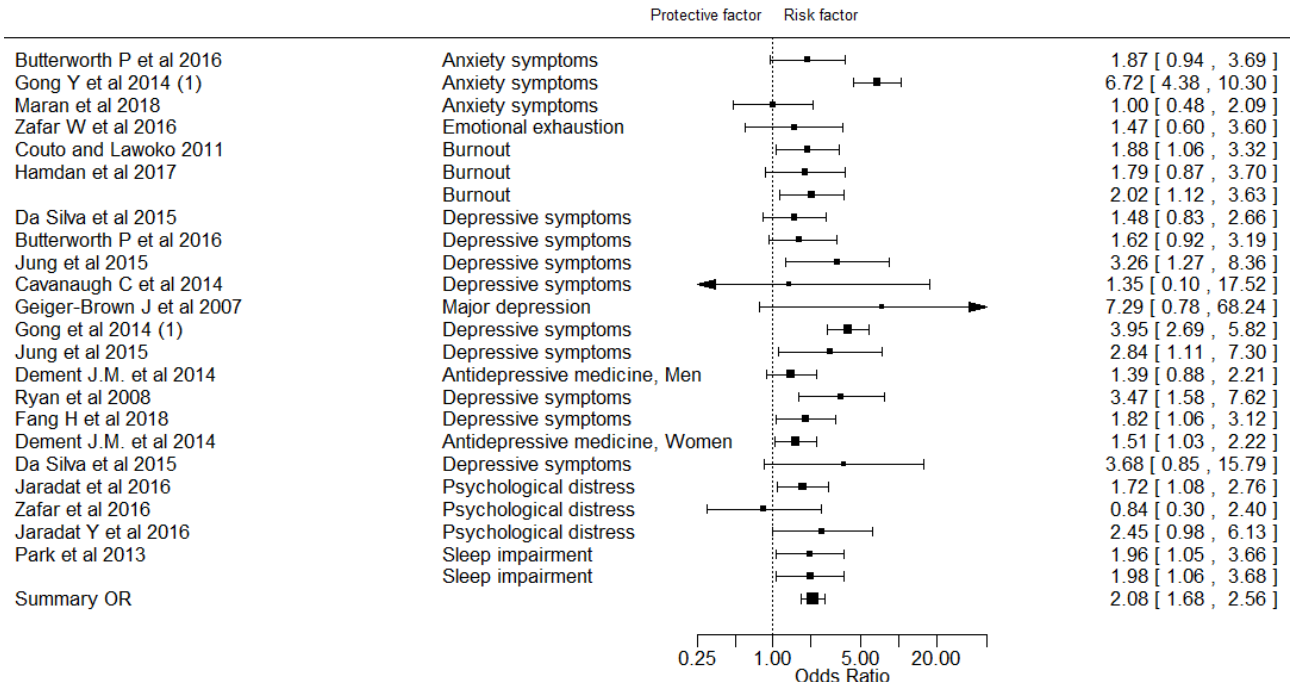


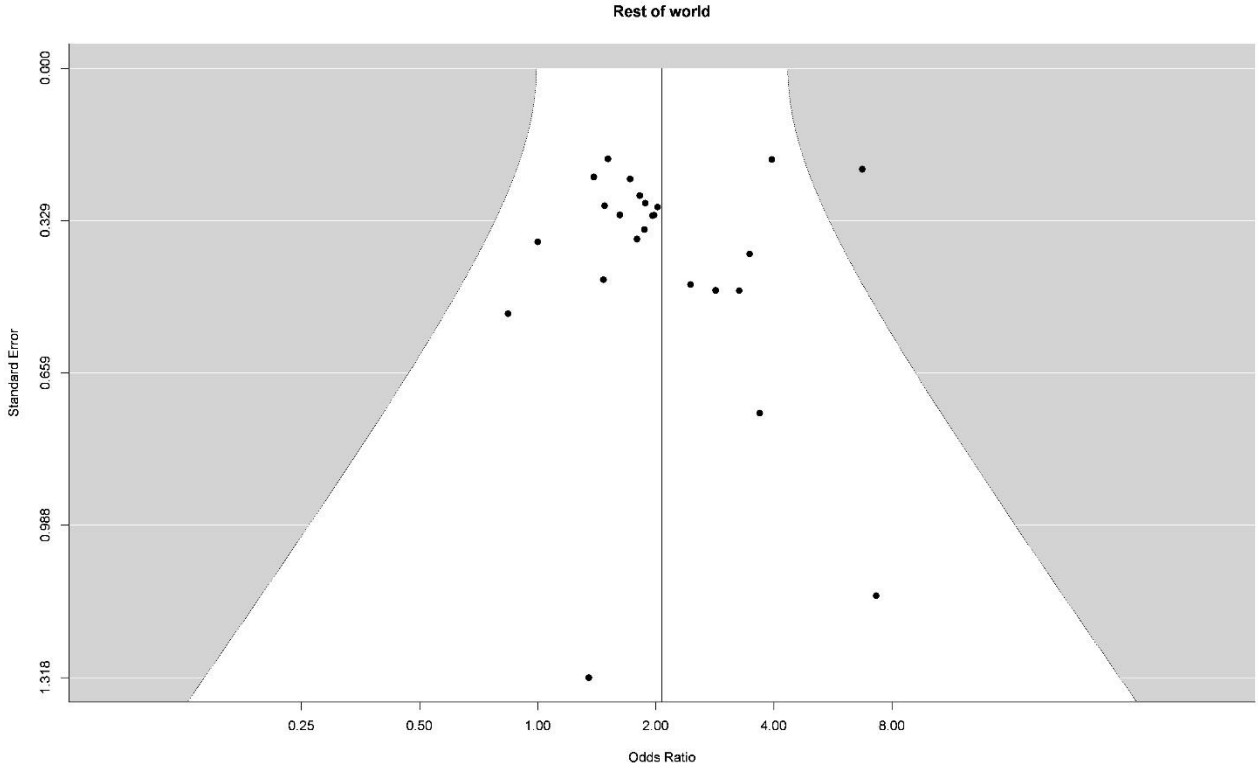
European studies:





Rest of the world (except Europe)





Appendix G: DASAM criteria for epidemiologic evidence

Criteria provided by the Danish Society of Occupational Medicine(DASAM) for degree of evidence of a causal association between an exposure to a specific risk factor and a specific outcome.

The following categories are used.
+++ strong evidence of a causal association
++ moderate evidence of a causal association
+ limited evidence of a causal association
0 insufficient evidence of a causal association - evidence suggesting lack of a causal association

Strong evidence of a causal association (+++): A causal relationship is very likely. A positive relationship between exposure to the risk factor and the outcome has been observed in several epidemiological studies. It can be ruled out with reasonable confidence that this relationship is explained by chance, bias or confounding.

Moderate evidence of a causal association (++): A causal relationship is likely. A positive relationship between exposure to the risk factor and the outcome has been observed in several epidemiological studies. It cannot be ruled out with reasonable confidence that this relationship can be explained by chance, bias or confounding, although this is not a very likely explanation.

Limited evidence of a causal association (+): A causal relationship is possible. A positive relationship between exposure to the risk factor and the outcome has been observed in several epidemiological studies. It is not unlikely that this relationship can be explained by chance, bias or confounding.

Insufficient evidence of a causal association (0): The available studies are of insufficient quality, consistency, or statistical power to permit a conclusion regarding the presence or absence of a causal association.

Evidence suggesting lack of a causal association (-): Several studies of sufficient quality, consistency and statistical power indicate that the specific risk factor is not causally related to the specific outcome.

Comments: The classification does not include a category for which a causal relation is considered as established beyond any doubt. The key criterion is the epidemiological evidence. The likelihood that chance, bias and confounding may explain observed associations are criteria that encompass criteria such as consistency, number of ‘high quality’ studies, types of design etc. Biological plausibility and contributory information may add to the evidence of a causal association.

Appendix H: Danish version of the call (Udredningsopslag om psykiske sygdomme efter vold og trusler)

Udredninger om erhvervssygdomme – projektopslag

Arbejdsmiljøforskningsfonden 2017

Udredning af sammenhængen mellem vold og trusler på arbejdet og udvikling af psykisk sygdom (andre psykiske sygdomme end posttraumatisk belastningsreaktion/PTSD)

Arbejdsmarkedets Erhvervssikring og Erhvervssygdomsudvalget har vurderet, at der er behov for en udredning i form af et videnskabeligt referencedokument om årsagssammenhæng mellem vold og trusler på arbejdspladsen samt udvikling af psykisk sygdom.

Posttraumatisk belastningsreaktion (PTSD) (herunder *delayed-onset* PTSD) er allerede optaget på erhvervssygdomsfortegnelsen efter traumatiske begivenheder eller situationer af kortere eller længere varighed af en exceptionelt truende eller katastrofeagtig natur. Posttraumatisk belastningsreaktion er omfattet af fortegnelsen, når symptomer på sygdommen opstår senest inden for 6 måneder, og sygdommen er fuldt til stede inden for få år. Tilsvarende er depression i nær tidsmæssig sammenhæng med belastningen optaget på fortegnelsen. Belastningen ved den diagnose skal være krigsdeltagelse, som har indebåret enten traumatiske begivenheder og/eller situationer af kortere eller længere varighed af en exceptionelt truende eller katastrofeagtig natur.

Siden posttraumatisk belastningsreaktion (PTSD) blev optaget på erhvervssygdomsfortegnelsen, er der tilkommet en del nye undersøgelser vedrørende vold og trusler og efterfølgende psykisk sygdom, også ud over posttraumatisk belastningsreaktion.

Der ønskes via det videnskabelige referencedokument en oversigt over sammenhængen mellem vold og trusler på arbejdet og efterfølgende psykisk sygdom for så vidt angår andre sygdomme end posttraumatisk belastningsreaktion (PTSD). Der ønskes en udredning og beskrivelse af eksponeringen, herunder varighed. Der ønskes også en udredning vedrørende den tidsmæssige sammenhæng.

Vold skal tolkes bredt og dækker over alt fra grove overfald med brug af våben til slag, spark, spyt og kradseri, eller at man får kastet ting efter sig. Det vil være relevant at få beskrevet, om volden er rettet direkte mod tilskadekomne, i modsætning til at være vidne til vold eller få genfortalt, at andre har været udsat for vold.

Trusler skal forstås mere uddybende, så også truende adfærd og forfølgelse er at betegne som en trussel.

Opgaverammen

Det videnskabelige referencedokument skal på baggrund af en primært epidemiologisk baseret gennemgang af de væsentligste nyere danske og internationale forskningsresultater på området nærmere belyse, sammenfatte og vurdere viden om årsagssammenhæng mellem eksponering i arbejdsmiljøet i form af vold og trusler og risikoen for udvikling af psykisk sygdom som følge heraf. Dokumentet skal beskrive andre psykiske sygdomme end posttraumatisk belastningsreaktion (PTSD). Dokumentet bør indeholde en beskrivelse af den statistiske sammenhæng, karakteren og varigheden

af eksponeringen, eventuelle konkurrerende faktorer samt en evidensvurdering. Der lægges vægt på påvirkning og en eventuel dosisresponssammenhæng.
Følgende ønskes oplyst:

Om sygdommen:
- Diagnostisk afgrænsning og præcisering af sygdommen hos udsatte grupper
- Oplysning om, hvorledes diagnosen er stillet
- En vurdering af validiteten af undersøgelsesresultaterne
- Oplysninger om sværhedsgrad af sygdommen eller symptomerne

Om påvirkningen:
- En beskrivelse af volden og truslernes omfang og hyppighed
- En beskrivelse af hvem der udøvede volden fx indsatte, psykisk syge, demente, børn (alder og gerne fysisk størrelse nævnes) eller andre
- Påvirkningens mere konkrete karakter og omfang
- En beskrivelse af om påvirkningen var rettet mod tilskadekomne
- Påvirkningens varighed over tid
- En eventuel sammenhæng mellem påvirkningens karakter og omfang og varighed og risikoen for udvikling af psykisk sygdom

Om årsagssammenhængen:
- En sammenfattende beskrivelse og vurdering af dosiseffektsammenhænge
- Beskrivelse og vurdering af tidspunktet for sygdomsdebut i forhold til eksponering
- En vurdering af sygdomsprognosen samt eksponeringens betydning for prognosen

Om konkurrerende og forudbestående sygdomme/forhold:
- Beskrivelse af konkurrerende eller forudbestående psykiske sygdommes betydning for sygdomsudviklingen
- Beskrivelse af ikke-arbejdsmæssige påvirkninger (fx i fritid eller andet)
- Beskrivelse af evt. betydning af arv, køn, alder, tidligere traumer og andre sygdomme
- Om muligt en kvantitativ vurdering af, hvilken rolle de arbejdsmæssige påvirkninger spiller for sygdommens udvikling i forhold til ikke-arbejdsmæssige forhold

Sammenfatning:
- Beskrivelse og vurdering af pålideligheden af eksponerings- og sygdomsdokumentation i den enkelte artikel
- En sammenfattet og gradueret vurdering af evidensen (se særlige retningslinjer for udredning om erhvervssygdom)
- Opgaven skal indeholde et dansk resumé rettet til lægmand

Såfremt litteraturen findes mangelfuld til belysning af de ønskede årsagssammenhænge, bedes dette oplyst og præciseret.

Hvis det vurderes, at yderligere forskning bør iværksættes, er det ønskeligt, at der peges mod relevante mål for yderligere forskning i den samlede konklusion.

Særlige retningslinjer

Ved udarbejdelse af udredningen skal de særlige retningslinjer for udarbejdelse og kvalitetsgodkendelse af udredninger i form af referencedokumenter på erhvervssygdomsområdet overholdes

Frist for ansøgning

Ansøgninger skal være Arbejdsmiljøforskningsfonden i hænde senest den 4. september 2017 kl. 12.00. Det bemærkes, at ansøgninger, som modtages efter fristen vil blive afvist fra behandling i fonden.