

Supplementary material

Are depressive disorders caused by psychosocial stressors at work? A systematic review with metaanalysis

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Appendix 1. Literature search

1. PubMed 15.03.2019

(1,740 hits)

| Search | Query | Items found |
|--------|--|-------------|
| #5 | #4 AND Filters: Journal Article; Abstract; Publication date from 1980/01/01 to 2019/12/31; Humans; English; Adult: 19+ years | 1740 |
| #4 | #1 AND #2 AND #3 | 2098 |
| #3 | DESIGN ASPECTS | 3871179 |
| | ("cohort studies"[MeSH Terms]) OR ("prospective studies"[MeSH Terms]) OR ("longitudinal studies"[MeSH Terms]) OR ("cross over studies"[MeSH Terms]) OR ("controlled clinical trial"[Publication Type]) OR ("cohort"[Title/Abstract]) OR (prospective[Title/Abstract]) OR (longitudinal[Title/Abstract]) OR ("cross sectional studies"[MeSH Terms]) OR (case-control studies[MeSH Terms]) OR (cross-sectional[Title/Abstract]) OR (cross sectional[Title/Abstract]) OR (case-control[Title/Abstract]) OR (case control[Title/Abstract]) OR (case-referent[Title/Abstract]) OR (case referent[Title/Abstract]) OR ("surveys and questionnaires/epidemiology"[MeSH Terms]) OR (survey[Title/Abstract]) OR (case-crossover[Title/Abstract]) OR (case crossover[Title/Abstract]) OR ("case-only"[Title/Abstract]) OR (intervention[Title/Abstract]) | |
| #2 | ALL EXPOSURES | 4826310 |
| | ((job strain[Title/Abstract]) OR (job-strain[Title/Abstract]) OR (demand*[Title/Abstract]) OR (control[Title/Abstract]) OR (decision latitude[Title/Abstract]) OR (decision authority[Title/Abstract]) OR (skill discretion[Title/Abstract]) OR (isostrain[Title/Abstract]) OR (iso-strain[Title/Abstract]) OR (support[Title/Abstract]) OR (Karasek[Title/Abstract])) OR ((effort*[Title/Abstract]) OR (reward*[Title/Abstract]) OR (imbalance*[Title/Abstract]) OR ("effort-reward imbalance"[Title/Abstract]) OR "effort-reward-imbalance"[Title/Abstract]) OR (overcommitment[Title/Abstract]) OR (Siegrist[Title/Abstract])) OR ((organization*[Title/Abstract]) OR (organisation*[Title/Abstract]) OR (justice[Title/Abstract]) OR (injustice[Title/Abstract])) OR ((job insecurity[Title/Abstract]) OR (job security[Title/Abstract]) OR (downsizing[Title/Abstract]) OR (organisational change[Title/Abstract]) OR (organizational change[Title/Abstract]) OR (organisational restructur*[Title/Abstract]) OR (organizational restructur*[Title/Abstract])) OR ((work time[Title/Abstract]) OR (worktime[Title/Abstract]) OR (working time[Title/Abstract]) OR (work hours[Title/Abstract]) OR (workhours[Title/Abstract]) OR (working hours[Title/Abstract]) OR (work load[Title/Abstract]) OR (workload[Title/Abstract]) OR (working load[Title/Abstract]) OR (overtime[Title/Abstract]) OR (overload[Title/Abstract]) OR (time pressure[Title/Abstract]) OR (deadline[Title/Abstract])) OR ((conflict*[Title/Abstract]) OR (violence[Title/Abstract]) OR (threat*[Title/Abstract]) OR (bully*[Title/Abstract]) OR (harassment[Title/Abstract]) OR (mobbing[Title/Abstract])) OR ((emotional demands[Title/Abstract]) OR (emotional strain[Title/Abstract]) OR (social capital[MeSH Terms]) OR (social capital[Title/Abstract]) OR | |

| | | |
|-----------|---|------|
| | (meaning*[Title/Abstract]) OR (resource*[Title/Abstract]) OR (person-related[Title/Abstract]) OR (caregivers[MeSH Terms]) OR (caregiver*[Title/Abstract]) OR ("shift work schedule"[MeSH Terms]) OR (shift*[Title/Abstract])) | |
| #1 | DEPRESSION AND (OCCUPATIONAL STRESS OR WORK-RELATEDNESS) | 7891 |
| | <p>(((("depression/classification"[MeSH Major Topic]) OR ("depression/diagnosis"[MeSH Major Topic]) OR ("depression/etiology"[MeSH Major Topic]) OR ("depression/prevention and control"[MeSH Major Topic]) OR ("depression/psychology"[MeSH Major Topic]) OR ("depression/statistics and numerical data"[MeSH Major Topic]) OR ("depression/epidemiology"[MeSH Major Topic]) OR ("depressive disorder/classification"[MeSH Major Topic]) OR ("depressive disorder/diagnosis"[MeSH Major Topic]) OR ("depressive disorder/epidemiology"[MeSH Major Topic]) OR ("depressive disorder/etiology"[MeSH Major Topic]) OR ("depressive disorder/prevention and control"[MeSH Major Topic]) OR ("depressive disorder/statistics and numerical data"[MeSH Major Topic]) OR ("depressive disorder/psychology"[MeSH Major Topic]))) NOT ("stress disorders, post traumatic"[MeSH Major Topic])) AND (((depression[Title/Abstract]) OR (depressive[Title/Abstract]) OR (antidepress*[Title/Abstract]) OR (anti-depress*[Title/Abstract])) NOT ((posttraumatic[Title/Abstract]) OR (post-traumatic[Title/Abstract]) OR (postpartum[Title/Abstract]) OR (pregnancy[Title/Abstract]) OR (perinatal[Title/Abstract]) OR (maternal[Title/Abstract]))) AND (((("occupational stress/analysis"[MeSH Terms]) OR ("occupational stress/classification"[MeSH Terms]) OR ("occupational stress/complications"[MeSH Terms]) OR ("occupational stress/diagnosis"[MeSH Terms]) OR ("occupational stress/epidemiology"[MeSH Terms]) OR ("occupational stress/etiology"[MeSH Terms]) OR ("occupational stress/prevention and control"[MeSH Terms]) OR ("occupational stress/psychology"[MeSH Terms]) OR ("occupational stress/statistics and numerical data"[MeSH Terms])) OR ("workplace/psychology"[MeSH Terms]) OR ("stress, psychological/adverse effects"[MeSH Terms]) OR ("stress, psychological/epidemiology"[MeSH Terms]) OR ("stress, psychological/psychology"[MeSH Terms]) OR ("work/adverse effects"[MeSH Terms]) OR ("work/psychology"[MeSH Terms]) OR ("occupations/adverse effects"[MeSH Terms]) OR ("occupations/psychology"[MeSH Terms]) OR ("occupations/epidemiology"[MeSH Terms]) OR (employment[MeSH Terms]) OR (work*[Title/Abstract]) OR (occupation*[Title/Abstract]) OR (job*[Title/Abstract]) OR (employment[Title/Abstract]))))</p> | |

2. PsycNet 19.03.2019
(1,227 hits)

| Search | Query | Items found |
|--------|--|-------------|
| | Depression AND (occupational stress OR work-relatedness) AND all exposures AND design aspects (with filters) | 1227 |
| | <p>(((((((AnyField:(((Index Terms: (major depression)) OR (MeSH: (depressive disorder)) OR (MeSH: (depression)))) AND -((MeSH: (stress disorders, post traumatic)) OR (Index Terms: (posttraumatic stress disorder)))))) AND (((title:(depression)) OR (title:(depressive)) OR (title:(antidepress*)) OR (title:(anti-depress*)) OR ((abstract:(depression)) OR (abstract:(depressive)) OR (abstract:(antidepress*)) OR (abstract:(anti-depress*)))) AND - (((title:(posttraumatic)) OR (title:(post-traumatic)) OR (title:(postpartum)) OR (title:(pregnancy)) OR (title:(perinatal)) OR (title:(maternal))) OR ((abstract:(posttraumatic)) AnyField:(OR) (abstract:(post-traumatic)) OR (abstract:(postpartum)) OR (abstract:(pregnancy)) AnyField:(OR) (abstract:(perinatal)) OR (abstract:(maternal)))))) AND (((MeSH:(occupational stress)) OR ((IndexTerms:(occupational stress))) OR ((MeSH:(workplace))) OR ((IndexTerms:(psychological stress))) OR ((MeSH:(psychological stress))) OR ((MeSH:(work))) OR ((MeSH:(occupations))) OR ((MeSH:(employment))) OR ((title:(work*)) OR ((abstract:(work*)) OR ((title:(occupation*)) OR ((abstract:(occupation*)) OR ((title:(job*)) OR ((abstract:(job*)) OR ((title:(employment)) OR ((abstract:(employment)))))) AND (((title:(job strain)))) OR (((abstract:(job strain)))) OR (((title:(job-strain)))) OR (((abstract:(job-strain)))) OR (((title:(\"effort-reward imbalance\")))) OR (((abstract:(\"effort-reward imbalance\")))) OR (((title:(\"effort-reward-imbalance\")))) OR (((abstract:(\"effort-reward-imbalance\")))) OR (((title:(effort*))) OR (((abstract:(effort*))) OR (((title:(reward*))) OR (((abstract:(reward*))) OR (((title:(imbalance*))) OR (((abstract:(imbalance*))) OR (((title:(overcommitment)))) OR (((abstract:(overcommitment)))) OR (((title:(Siegrist)))) OR (((abstract:(Siegrist)))) OR (((title:(organization*))) OR ((title:(organisation*))) OR (((abstract:(organization*))) OR ((abstract:(organisation*))) OR (((title:(justice)) OR ((title:(injustice)))) OR (((abstract:(justice)) OR ((abstract:(injustice)))) OR (((title:(\"job insecurity\"))) OR ((title:(\"job security\"))) OR (((abstract:(\"job insecurity\"))) OR ((abstract:(\"job security\"))) OR (((title:(downsizing)))) OR (((abstract:(downsizing)))) OR (((title:(\"worktime\"))) OR ((title:(worktime)) OR ((title:(\"working time\"))) OR ((title:(workhours)) OR ((title:(\"working hours\"))) OR ((title:(\"work load\"))) OR ((title:(workload)))) OR (((abstract:(\"worktime\"))) OR ((abstract:(worktime)) OR ((abstract:(\"working time\"))) OR ((abstract:(workhours)) OR ((abstract:(\"working hours\"))) OR ((abstract:(\"work load\"))) OR ((abstract:(workload)))) OR (((title:(overtime)) OR ((title:(overload)) OR ((title:(\"time pressure\"))) OR ((title:(deadline)))) OR (((abstract:(overtime)) OR ((abstract:(overload)) OR ((abstract:(\"time pressure\"))) OR ((abstract:(deadline)))) OR (((title:(conflict*)) OR ((title:(violence)) OR ((title:(threat*)) OR ((title:(bully*)) OR ((title:(harassment)) OR ((title:(mobbing)))) OR (((abstract:(conflict*)) OR ((abstract:(violence)) OR ((abstract:(threat*)) OR ((abstract:(bully*)) OR ((abstract:(harassment)) OR ((abstract:(mobbing)))))) OR (((title:(emotional demands)) OR ((title:(\"emotional strain\"))) OR ((title:(\"social capital\"))) OR</p> | |

| | | |
|--|---|--|
| | <p>(((abstract:(emotional demands))) OR ((abstract:("emotional strain"))) OR ((abstract:("social capital")))) OR (((title:(meaning*)) OR ((title:(resource*)) OR ((title:("person-related")))) OR ((abstract:(meaning*)) OR ((abstract:(resource*)) OR ((abstract:("person-related")))) OR (((title:(caregiver*)) OR ((abstract:(caregiver*)) OR (((title:(shift*)) OR ((abstract:(shift*))) OR (((IndexTerms:("social capital"))))))))</p> <p>AND</p> <p>((((MeSH: (cohort studies))) OR ((title: (cohort))) OR((abstract: (cohort))) OR ((MeSH: (prospective studies))) OR ((Index Terms: (prospective studies))) OR ((title: (prospective))) OR ((abstract: (prospective))) OR((MeSH: (longitudinal studies))) OR ((Index Terms: (longitudinal studies))) OR((title: (longitudinal))) OR ((abstract: (longitudinal))) OR ((MeSH: (cross over studies))) OR ((MeSH: (controlled clinical trials))) OR ((MeSH: (cross sectional studies))) OR ((MeSH: (case-control studies))) OR ((title: ("cross sectional")) OR(title: ("cross-sectional"))))</p> <p>OR</p> <p>((abstract: ("cross sectional")) OR (abstract: ("cross-sectional"))) OR ((title: ("case-control")) OR (title: ("case control"))) OR ((abstract: ("case-control")) OR (abstract: ("case control"))) OR ((title: ("case-referent")) OR(title: ("case referent"))) OR ((abstract: ("case-referent")) OR (abstract: ("case referent"))) OR ((MeSH: (surveys)) AND (MeSH: (questionnaires))) OR ((title: (survey))) OR ((abstract: (survey))) OR ((title: ("case-crossover")) OR (title: ("case crossover"))) OR ((abstract: ("case-crossover")) OR (abstract: ("case crossover")))OR ((title: ("case-only")) OR ((abstract: ("case-only"))) OR ((title: (intervention)))OR ((abstract: (intervention))))</p> <p>AND</p> <p>Any Field: "Peer Reviewed Journal" AND Population Group: Human AND Age Group: Adulthood (18 yrs & older) AND Year: 1980 To 2019</p> | |
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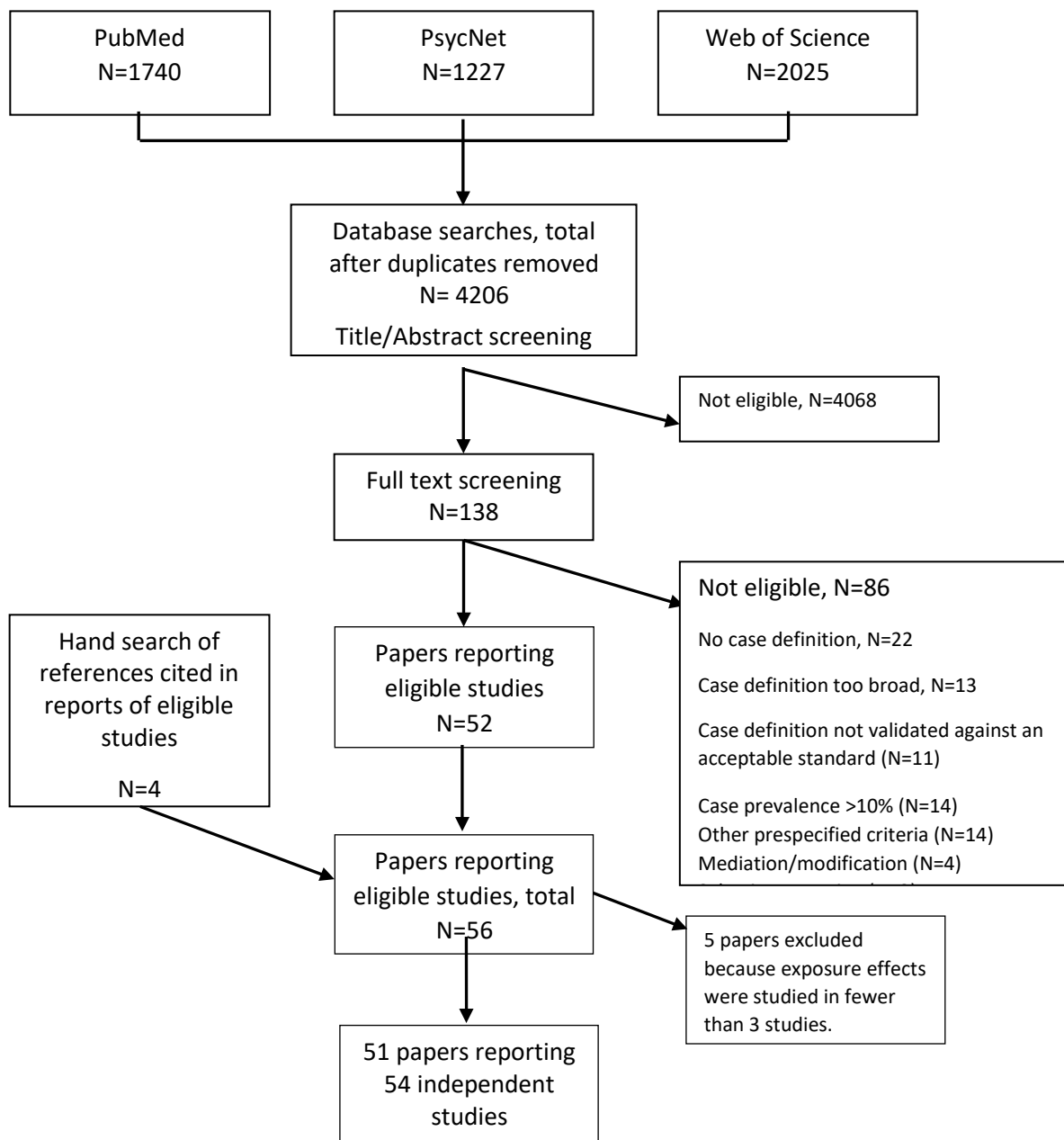
**3. Web of Science Core Collection 21.03.2019,
(2,025 hits)**

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|------|---|-----------|
| # 26 | (#21 AND #20) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article) Refined by: WEB OF SCIENCE CATEGORIES: (PUBLIC ENVIRONMENTAL OCCUPATIONAL HEALTH) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1980-2019</i> | 2,025 |
| # 25 | (#21 AND #20) AND LANGUAGE: (English) AND DOCUMENT TYPES: (Article) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1980-2019</i> | 10,078 |
| # 24 | #21 AND #20 Refined by: DOCUMENT TYPES: (ARTICLE) AND LANGUAGES: (ENGLISH) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 10,078 |
| # 23 | #21 AND #20 Refined by: DOCUMENT TYPES: (ARTICLE) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 10,475 |
| # 22 | #21 AND #20 DEPRESSION AND EXPOSURES AND DESIGN ASPECTS <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 11,501 |
| # 21 | #19 AND #10 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 23,793 |
| # 20 | TOPIC: (cohort) OR TOPIC: ("controlled clinical trial") OR TOPIC: (prospective) OR TOPIC: (longitudinal) OR TOPIC: ("cross-sectional") OR TOPIC: ("cross sectional") OR TOPIC: ("case-control") OR TOPIC: ("case control") OR TOPIC: ("case-referent") OR TOPIC: ("case referent") OR TOPIC: (survey) OR TOPIC: ("case-crossover") OR TOPIC: ("case crossover") OR TOPIC: ("case-only") OR TOPIC: (intervention) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019 DESIGN ASPECTS</i> | 3,092,569 |
| # 19 | #18 OR #17 OR #16 OR #15 OR #14 OR #13 OR #12 OR #11 EXPOSURES <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 9,364,301 |
| # 18 | TOPIC: (shift*) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 796,947 |
| # 17 | TOPIC: ("emotional demands") OR TOPIC: ("emotional strain") OR TOPIC: ("social capital") OR TITLE: (meaning*) OR TOPIC: (resource*) OR TOPIC: ("person-related") OR TOPIC: (caregiver*) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 777,059 |
| # 16 | TOPIC: (conflict*) OR TOPIC: (violence) OR TOPIC: (threat*) OR TOPIC: (bully*) OR TOPIC: (harassment) OR TOPIC: (mobbing) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 614,189 |
| # 15 | TOPIC: ("work time") OR TOPIC: (worktime) OR TOPIC: ("working time") OR TOPIC: ("work hours") OR TOPIC: (workhours) OR TOPIC: ("working hours") OR TOPIC: ("work load") OR TOPIC: (workload) OR TOPIC: ("working load") OR TOPIC: (overtime) OR TOPIC: (overload) OR TOPIC: ("time pressure") OR TOPIC: (deadline) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 120,380 |

| | | |
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| # 14 | TOPIC: ("job insecurity") OR TOPIC: ("job security") OR TOPIC: (downsizing) OR TOPIC: ("organizational change") OR TOPIC: ("organisational change") OR TOPIC: (organizational restructur*) OR TOPIC: (organisational restructur*) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 16,059 |
| # 13 | TOPIC: (organization*) OR TOPIC: (organisation*) OR TOPIC: (justice) OR TOPIC: (injustice) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 779,452 |
| # 12 | TOPIC: (effort*) OR TOPIC: (reward*) OR TOPIC: (imbalance*) OR TOPIC: ("effort-reward imbalance") OR TOPIC: ("effort-reward-imbalance") OR TOPIC: (overcommitment) OR TOPIC: (Siegrist) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 633,810 |
| # 11 | TOPIC: ("job strain") OR TOPIC: ("job-strain") OR TOPIC: (demand*) OR TOPIC: (control) OR TOPIC: ("decision latitude") OR TOPIC: ("decision authority") OR TOPIC: ("skill discretion") OR TOPIC: (isostrain) OR TOPIC: ("iso-strain") OR TOPIC: (support) OR TOPIC: (Karasek) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 6,877,466 |
| # 10 | #9 AND #8 DEPRESSION AND WORK-RELATEDNESS NOT (PTSD OR PREGNANCY) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 40,941 |
| # 9 | #4 NOT #7 DEPRESSION NOT (PTSD OR PREGNANCY) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 464,481 |
| # 8 | TOPIC: (work*) OR TOPIC: (occupation*) OR TOPIC: (job*) OR TOPIC: (employment) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 3,143,575 |
| # 7 | #6 OR #5 <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 717,959 |
| # 6 | TOPIC: (postpartum) OR TOPIC: (pregnancy OR pregnant) OR TOPIC: (perinatal) OR TOPIC: (maternal) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 646,835 |
| # 5 | TOPIC: (post-traumatic) OR TOPIC: (posttraumatic) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 73,272 |
| # 4 | #3 OR #2 OR #1 DEPRESSION <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 508,689 |
| # 3 | TOPIC: (anti-depress*) OR TOPIC: (antidepress*) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 74,712 |
| # 2 | TOPIC: (depressive) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 126,988 |
| # 1 | TOPIC: (depression) <i>Indexes=SCI-EXPANDED, SSCI, A&HCI Timespan=1900-2019</i> | 426,983 |

Appendix 2. Flow chart and selection of studies

This Appendix includes a flow chart of the literature search and information on reasons for excluding studies that were selected for full text reading. Some studies could have been excluded for more than one reason, but we only report one reason for each. We list excluded studies by reason for exclusion, and also by first author.



Flow-diagram for literature search

Excluded studies by reason for exclusion

1. *No case definition*

Twenty-two studies were excluded because there was no case definition indicative of a depressive disorder [1-22].

2. *Case definition too broad*

Thirteen studies were excluded because the case definition included subthreshold cases of depression (e.g. minor depression), mixed diagnoses (e.g. major depression *and* anxiety disorders), or non-specific case definitions (e.g. mental distress, use of psychotropic drugs) [23-35].

We accepted affective disorders (ICD F30-F39) or subsets thereof as a combined outcome because depressive episodes account for the large majority of cases in this diagnostic group [36, 37]. This was a post hoc decision and applied to four studies [38-41].

3. *Case definition not validated against an acceptable standard*

Eleven studies were excluded because their diagnostic instruments had not been validated against an acceptable standard method (semi-structured interview) for diagnosing depressive episode.

Seven studies used the Symptom Check List Core Depression (SCL-CD6) instrument to define depression cases [42-48].

One study used the General Well-being Schedule, subscale of depression [49].

One study used a single non-standard questionnaire item and the WHO Health and Work Performance Questionnaire) to define depression [50].

One study used a single non-standard questionnaire item (yes/no) to define depression [51].

One study used Spielberger's State-Trait Depression Scales [52].

4. *Case prevalence above 10% or unreported*

We excluded 14 studies of unselected working populations with depression prevalence at baseline above 10% because such a high prevalence in an unselected working population is unlikely (see Introduction section) and suggests a high rate of false positive diagnoses. If the baseline prevalence was not reported, we used the follow-up prevalence. Some characteristics for these studies are presented in Table A2.1. Of the 14 studies excluded because of high prevalence rates, six would have been excluded also for other reasons: overlap with other studies included in the review (Griffin 2002 [70], Niedhammer 1998 [78], and Virtanen 2015 [80]); mediation study or no usable risk estimates reported (Ahola 2007 [67], Amagasa 2012 [69]); or relating only to a risk factor (organizational change) for which there were too few studies for meaningful assessment (Netterstrom 2010 [77]).

5. *Other studies which did not fulfil predefined inclusion criteria.*

We excluded 14 other studies which did not fulfil inclusion criteria:

Three studies were excluded because they focused on exposures that were not included this review (social capital, but not work-related [53], weekend work [54], no relevant exposure specification [55]).

Table A2.1. Studies excluded from the review because of high baseline prevalence (%) of measures of depression. Prevalence rates in brackets are calculated or estimated from available information or cross-sectional follow-up panels if not specifically reported at baseline. M=male, F=Female.

| First Author Year Reference | Diagnostic Instrument | Cut-off | Population | Prevalence |
|------------------------------------|------------------------------|-----------------------------|-----------------------------|---|
| Ahola 2007 [67] | BDI SF form 13 | 5+ | Dentists | 27% |
| Amagasa 2012 [68] | CES-D 20 | 16+ | Clerical workers | Not reported, most likely >10% ^a |
| Clays 2007 [69] ^f | CES-D SF 11 | 80th percentile (score ≥19) | Middle-aged workers | 25% |
| Griffin 2002 [70] | GHQ30, 4 items on depression | Upper quartile | Civil servants | (25%) ^b |
| Godin 2005 [71] ^f | SCL-90, 16 items | Upper quartile | Workers in four enterprises | (25%) ^b |
| Kato 2014 [72] ^f | CES-D 20 | 16+ | Workers in two factories | 24% |
| Kim 2017 [73] ^f | CES-D 11 | 16+ (adjusted to CES-D 20) | General working population | (11%) ^c |
| Kim and Kim 2018 [74] ^f | BDI II | 20+ | Automobile sales workers | 16% |
| Meneton 2017 [75] ^f | CES-D 20 | M:17, F:23 | Workers in a large company | 24% |
| Nakata 2011 [76] ^f | CES-D 20 | 16+ and 25+ | Full-time employees | 16+: 31%, 25+: 12% |
| Netterstrom 2010 [77] | MDI | 20 | Civil servants | (12 %) ^d |
| Niedhammer 1998 [78] | CES-D 20 | M:17, F:23 | Workers in a large company | (M: 25%, F: 28%) ^e |
| Tomioka 2011 [79] ^f | CES-D 20 | 16+ | Physicians | Total: 28% |
| Virtanen 2015 [80] | CES-D 20 | 16+ | Civil servants | 14% |

^a Prevalence of CES-D 20 score 16+ among employees in 20 randomly selected companies in Japan was 45%. [81]. All other studies but one in the present review, using the same criterion, had prevalence above 10%

^b According to the quartile cut-off level.

^c Based on information on supposedly successive exclusions (414/3790), page 664.

^d Based on information on supposedly successive exclusions (82/685), page 446.

^e 1-year follow-up prevalence, no information at baseline. The material overlaps with Meneton et al. 2017.

^f Study excluded only because of high prevalence of depression

Two studies were excluded because their outcome measures were not included in this review (sickness absence [56] and administrative health claims [57]).

Seven studies were excluded because they were cross-sectional investigations of exposures other than shift work or work hours ([58-64]).

One study was excluded because risk estimates were not reported with confidence limits or information allowing the calculation of such limits [65].

One intervention study was excluded because the intervention aimed to improve individual coping with work stress and not to reduce work stress [66].

6. *Studies on effect mediation and effect modification*

We excluded four studies which specifically aimed to study whether the relation between an exposure and a measure of depression was mediated [82, 83] or modified by a third factor [84, 85]. We consider that such studies are seldom made or published if the exposure and the outcome are not associated in the absence of the third factor. The main associations between exposure and outcome may therefore be considered as selected results that are likely to inflate the overall association in reviews of main effects. The decision to exclude these studies was taken during the selection process. Two other studies examined whether there was effect modification by gender (Wege et al. 2018 [86]) and by occupational group (Rugulies et al. 2013 [87]). These studies were not excluded because we considered that the additional modification analyses followed naturally from the analyses of the main effects.

7. *Selective reporting*

We excluded three studies due to selective reporting [88-90]. In the study by Siegrist et al. 2012 [88] on the association of depression with job strain variables and effort-reward-imbalance, the authors state: "With regard to the job strain model, the measurement was restricted to the control dimension. This decision was based on evidence that the predictive power of control exceeded the power of demand in several studies", supplied with a reference to an internal report on results in one of the sub-studies of that study. The reason for excluding effects of demands from the study indicates a prior knowledge of positive associations of depression with control and effort-reward-imbalance. We therefore excluded this study. The other two studies were based on the same material. The decision to exclude these studies was taken during the selection process.

8. *Overlapping studies*

We excluded five studies because their material, exposure and outcome variables were partly overlapping with another study and contained no additional information of relevance for this review. One study by Oksanen et al. 2010 [91] was excluded due to overlap with a study by Kouvanen et al. 2008 [92]; one study by Sinokki et al. 2009 [93] was excluded due to overlap with another study by Sinokki et al. 2009 [94]; one study of Virtanen et al 2011 [95] was excluded due to overlap with another study by Virtanen et al. 2012 [96]; one study by Wang et al. 2011 [97] was excluded due to overlap with a study by Shields 2006 [98] (see below); one study of Stoetzer et al. 2009 [99] was excluded due to overlap with a study by Fandino-Losada et al. 2013 [100].

We did not exclude overlapping studies if each of them contributed different relevant information. Where that occurred, we chose the results which in our view gave the most reliable information on the relation between exposure and the measure of depression.

Studies on bullying

We included overlapping studies on bullying [101-103] because exposure variables differed between these studies (bullying at work-unit level [101] or individual level [102, 103], bullying assessed by a general definition [101, 103] or by specific aspects of bullying [102]).

Studies from the Canadian National Population Health Survey (CNHPS)

We included six partly overlapping studies from the longitudinal Canadian National Population Health Survey (CNHPS) [97, 98, 104-107]. The CNHPS has had seven examination cycles (Cycle 1:1994/1995, Cycle 2: 1996/97, Cycle 3: 1998/1999, Cycle 4:2000/01, Cycle 5:2002/3, Cycle 6: 2004/5, Cycle 7: 2006/07). Exposure was assessed by an abbreviated job content questionnaire (JCQ 12), which was administered at cycles 1, 4, 5 and 6. Depression during the previous 12 months was assessed by CIDI-SFMD interview at all cycles.

Two studies examined effects of support [98, 105]. We used results from Shields et al. 2006 [98] because support was specified as colleague and supervisor support, and for men and women separately.

Three of the studies examined effects of job strain on depression [97, 98, 104]. One reported the two-year incidence from cycle 1 to cycle 2 [104]. One reported on two pooled sets of baseline follow-ups (cycle 1 to 2 and cycle 4 to 5) [98]. One reported baseline job strain for cycle 4 and incident depression at cycle 5, 6 and 7 [97]. In all the three studies, adjustments were made for large sets of partly overlapping but not identical potential confounders. The results for the relation between job strain and depression were somewhat different for the three studies (Table A2.2). Neither of the two latter studies referred to any of the previous studies or discussed the different results. We chose the study of Shields et al. 2006 [98] to be included in this review because it had more observations than the Shields 1999 study [104] and a shorter time span between exposure assessment and the occurrence of the outcome than the study by Wang et al. 2011 [97].

Table A2.2 Associations between job strain at baseline and depression at follow-up (CIDI-SFMD) in three overlapping studies from the longitudinal Canadian National Population Health Survey (CNHPS). Odds Ratios (OR) and 95% Confidence Interval (CI)

| Association | Gender | Shields 1999 [104] OR (95% CI) ^a | Shields 2006 [98] OR (95% CI) ^b | Wang et al. 2011 [97] OR (95% CI) ^c |
|-----------------|--------|--|---|---|
| Crude | Men | not reported | 3.3 (1.9-5.8) | not reported |
| | Women | not reported | 2.0 (1.3-3.0) | not reported |
| Adjusted | Men | 3.3 (1.3-8.5) | 2.9 (1.5-5.4) | 1.34 (0.87-2.06) |
| | Women | 2.1 (1.1-4.0) | 1.2 (0.8-1.9) | 1.54 (1.17-2.03) |

^a Job-strain ratio upper quartile (>1.18) vs the three lower quartiles.

^b Job-strain ratio high (>1.2) vs low (<0.8)

^c Job-strain ratio >1.0 vs ≤1.0

Two CNPHS studies reporting on effects of stable and changing exposures had a similar design and were based on overlapping materials (Shields 2006 [98] and Wang et al. 2009 [106]). We report results only from the latest study [106].

Studies from the Canadian Alberta Cohort

One 1-year follow-up study of Wang et al., 2012 [108] overlapped another study on the same material but with four annual follow-ups (Nigatu et al 2018 [109]). We used the results for support and job insecurity from Wang et al., 2012 [108], because they were not reported in the study by Nigatu et al. [109], and results for job strain and effort-reward-imbalance from the study by Nigatu et al. [109] because of more annual follow-ups.

Studies from the Danish DWECS cohort

Use of antidepressants in relation to emotional demands was reported by Madsen et al. 2010 [110] for DWECS 2000, and by Hanson et al. 2013 [111] in a combined study of the Swedish SLOSH cohort and the DWECS 2005 cohort. We report DWECS-results on emotional demands only for the DWECS 2005 cohort.

Studies from the Whitehall II cohort

Virtanen et al (2012) [96] reported associations of job strain (quadrant analysis), social support and work hours measured in 1991-1993 (phase 3) with depression (UM-CIDI) in 1997-1999 (phase 5), adjusted for age and sex. Stansfeld et al 2012 [112] reported associations of job strain (difference analysis) and social support measured 1988-1993 (phase 1, 2 and 3) with depression (UM-CIDI) in 1997-1999 (phase 5), adjusted for a large set of potential confounders, including psychological distress (GHQ-30) at baseline. We

therefore included results for job strain and social support from the study by Stansfeld et al 2012 [112] and not from the study of Virtanen et al 2012 [96].

The study of Virtanen et al 2012 [96] reported results for the job strain quadrants “active jobs” (high demands in the absence of low control) and “passive jobs” (low control in the absence of high demands), adjusted for age and sex. These results reflect the mutually adjusted effects of high demands and low control (median splits) if they do not interact. We included these results because they have not been reported elsewhere. From this study we also report effects of work hours. It should be noted that the results for job strain differed markedly for these two Whitehall studies. In the study by Stansfeld et al. 2012 [112] job strain (upper tertile of the difference between demands and control compared to the lower tertile) in phase 3 was associated with UM-CIDI depression in phase 5 with an OR=1.96 (95% CI: 1.28 -3.00), adjusted for age and sex (Table 2 in that study). In the study of Virtanen et al. 2012 [96] the quadrant of high strain compared to low strain in phase 3 was associated with UM-CIDI depression in phase 5 with an OR=1.04 (95% CI: 0.46-2.39), adjusted for age and sex (Table 1 in that study).

Excluded studies by author

Table A2.3 shows reasons for exclusions (n=86) ordered by first author. Exclusion category refers to subheadings (numbered 1 to 8) specified above.

Table A2.3 List of studies excluded after full text reading (n=86). Reasons for exclusion. Sorted by first author. Exclusion category, see text and table footnote

| | First author, year | Exclusion category | Reason for exclusion |
|----|----------------------------|---------------------------|--|
| 1 | Ahlin, 2018 [43] | 3 | Case definition not validated against an acceptable standard |
| 2 | Ahlin, 2018 [42] | 3 | Case definition not validated against an acceptable standard |
| 3 | Ahola, 2007 [67] | 4 | Case prevalence above 10% |
| 4 | Ahola, 2012 [66] | 5 | Intervention study to increase coping capability |
| 5 | Airila, 2014 [23] | 2 | Case definition too broad |
| 6 | Albrecht, 2017 [44] | 3 | Case definition not validated against an acceptable standard |
| 7 | Alterman, 2008 [58] | 5 | Cross-sectional, exposure not shift work or work hours |
| 8 | Amagasa, 2012 [68] | 4 | Case prevalence above 10% |
| 9 | Amagasa, 2013 [49] | 3 | Case definition not validated against an acceptable standard |
| 10 | Andrea, 2009 [24] | 2 | Case definition too broad |
| 11 | Andreeva, 2015 [45] | 3 | Case definition not validated against an acceptable standard |
| 12 | Andreeva, 2017 [46] | 3 | Case definition not validated against an acceptable standard |
| 13 | Barrech, 2017 [1] | 1 | No case definition |
| 14 | Berthelsen, 2015 [25] | 2 | Case definition too broad |
| 15 | Brenner, 2014 [47] | 3 | Case definition not validated against an acceptable standard |
| 16 | Burns, 2016 [26] | 2 | Case definition too broad |
| 17 | Butterworth, 2016 [27] | 2 | Case definition too broad |
| 18 | Clays, 2007 [69] | 4 | Case prevalence above 10% |
| 19 | de Lange, 2002 [2] | 1 | No case definition |
| 20 | DeSanto Iennaco, 2010 [57] | 5 | Outcome: administrative health claims |
| 21 | Dragano, 2008 [59] | 5 | Cross-sectional, exposure not shift work or work hours |

| | | | |
|----|-----------------------------|---|--|
| 22 | Dragano, 2011 [89] | 7 | Selective reporting |
| 23 | Driesen, 2011 [50] | 3 | Case definition not validated against an acceptable standard |
| 24 | Einarsen, 2015 [28] | 2 | Case definition too broad |
| 25 | Emdad, 2013 [29] | 2 | Case definition too broad |
| 26 | Ferrie, 2005 [3] | 1 | No case definition |
| 27 | Fujiwara, 2008 [53] | 5 | No relevant exposure |
| 28 | Geiger-Brown, 2007 [30] | 2 | Case definition too broad |
| 29 | Godin, 2005 [71] | 4 | Case prevalence above 10% |
| 30 | Godin, 2009 [56] | 5 | Outcome sickness absence |
| 31 | Greenglass, 2001 [4] | 1 | No case definition |
| 32 | Griffin, 2002 [70] | 4 | Case prevalence above 10% |
| 33 | Hanson, 2015 [48] | 3 | Case definition not validated against an acceptable standard |
| 34 | Ibrahim, 2009 [65] | 5 | Risk estimates without confidence limits |
| 35 | Idris, 2014 [5] | 1 | No case definition |
| 36 | Kato, 2014 [72] | 4 | Case prevalence above 10% |
| 37 | Kim, 2013 [51] | 3 | Case definition not validated against an acceptable standard |
| 38 | Kim, 2017 [73] | 4 | Case prevalence above 10% |
| 39 | Kim, 2018 [74] | 4 | Case prevalence above 10% |
| 40 | Kivimaki, 2007 [31] | 2 | Case definition too broad |
| 41 | Lamy, 2013 [6] | 1 | No case definition |
| 42 | Lee, 2015 [54] | 5 | No relevant exposure |
| 43 | Lee, 2016 [7] | 1 | No case definition |
| 44 | Lunau, 2013 [90] | 7 | Selective reporting |
| 45 | Lunau, 2018 [85] | 6 | Study specifically aimed to examine effect modification |
| 46 | Madsen, 2014 [84] | 6 | Study specifically aimed to examine effect modification |
| 47 | Magnusson Hanson, 2014 [8] | 1 | No case definition |
| 48 | Magnusson Hanson, 2016 [82] | 6 | Study specifically aimed to examine effect mediation |
| 49 | Magnusson Hanson, 2017 [83] | 6 | Study specifically aimed to examine effect mediation |
| 50 | Mausner-Dorsch, 2000 [60] | 5 | Cross-sectional, exposure not shift work or work hours |
| 51 | Melchior, 2007 [61] | 5 | Cross-sectional, exposure not shift work or work hours |
| 52 | Meneton, 2017 [75] | 4 | Case prevalence above 10% |
| 53 | Mezuk, 2011 [62] | 5 | Cross-sectional, exposure not shift work or work hours |
| 54 | Moore, 2004 [9] | 1 | No case definition |
| 55 | Muntaner, 2006 [10] | 1 | No case definition |
| 56 | Nakao, 2006 [63] | 5 | Cross-sectional, exposure not shift work or work hours |
| 57 | Nakata, 2011 [76] | 4 | Case prevalence above 10% |
| 58 | Netterstrom, 2010 [77] | 4 | Case prevalence above 10% |
| 59 | Niedhammer, 1998 [78] | 4 | Case prevalence above 10% |
| 60 | Nyberg, 2017 [11] | 1 | No case definition |
| 61 | Nyberg, 2018 [32] | 2 | Case definition too broad |
| 62 | Oksanen, 2010 [91] | 8 | Overlap with Kouvonen et al. 2008 [92] |
| 63 | Paterniti, 2002 [12] | 1 | No case definition |

| | | | |
|----|------------------------|---|--|
| 64 | Peter, 2016 [13] | 1 | No case definition |
| 65 | Sen, 2010 [55] | 5 | No relevant exposure |
| 66 | Shirangi, 2013 [14] | 1 | No case definition |
| 67 | Siegrist, 2012 [88] | 7 | Selective reporting |
| 68 | Sinokki, 2009 [93] | 8 | Overlap with Sinokki et al. 2009 [93] |
| 69 | Stansfeld, 2003 [33] | 2 | Case definition too broad |
| 70 | Stansfeld, 2008 [64] | 5 | Cross-sectional, exposure not shift work or work hours |
| 71 | Stoetzer, 2009 [99] | 8 | Overlap with FandinoLosada et al. 2013 [100] |
| 72 | Takahashi, 2012 [15] | 1 | No case definition |
| 73 | Taris, 1999 [16] | 1 | No case definition |
| 74 | Theorell, 2014 [17] | 1 | No case definition |
| 75 | Tomioka, 2011 [79] | 4 | Case prevalence above 10% |
| 76 | Tornroos, 2015 [18] | 1 | No case definition |
| 77 | Uchida, 2018 [19] | 1 | No case definition |
| 78 | Virtanen, 2008 [35] | 2 | Case definition too broad |
| 79 | Virtanen, 2011 [95] | 8 | Overlap with Virtanen et al. 2012 [96] |
| 80 | Virtanen, 2015 [80] | 4 | Case prevalence above 10% |
| 81 | Waldenstrom, 2008 [34] | 2 | Case definition too broad |
| 82 | Wang, 2011 [97] | 8 | Overlap with Shields et al. 2006 [98] |
| 83 | Weigl, 2012 [52] | 3 | Case definition not validated against an acceptable standard |
| 84 | Woodward, 1999 [20] | 1 | No case definition |
| 85 | Waage, 2014 [21] | 1 | No case definition |
| 86 | Özdemir, 2013 [22] | 1 | No case definition |

Appendix 3. Description of studies – tables and forest plots

| | |
|---|---------|
| Table A3.1 Summary characteristics of included studies | page 16 |
| Table A3.2 Characteristics of 54 individual studies (51 original papers) included in review | page 18 |
| Table A3.3 Control for potential confounders by study | page 26 |
| Forest plots, figures A3.1 to A3.11 and textbox with column and abbreviation explanations | page 30 |

| Table A3.1 Summary characteristics of included studies | |
|---|----|
| Source population | N |
| Employed general population | 30 |
| Public employees | 10 |
| Hospital employees | 5 |
| Union members | 4 |
| Private company employees | 3 |
| Elder care workers | 1 |
| Mixed population | 1 |
| Study population, Country | N |
| Denmark | 20 |
| Finland | 9 |
| Canada | 8 |
| USA | 3 |
| Germany, Norway, Sweden, United Kingdom, each two studies | 8 |
| France, Italy, Japan, Korea, Netherlands, each one study | 5 |
| Several countries | 1 |
| Publication year | N |
| 1999-2009 | 19 |
| 2010-2014 | 21 |
| 2015-2018 | 14 |
| Follow-up years (cohort studies) | N |
| 1 - <2 years | 5 |
| 2 years | 13 |
| >2 - 4 years | 16 |
| >4 years | 10 |
| Varying, 11 and 15 years | 3 |

| Table A3.1 (continued) | |
|--|----|
| Follow-up times (cohort studies) | N |
| 1 time | 30 |
| 2-3 times | 5 |
| 4-6 times | 2 |
| Registers, continuous (e.g. antidepressants, hospital admissions) | 10 |
| Participants, cohort studies | N |
| 1365 - <5000 | 30 |
| 5000 - < 10000 | 11 |
| 10000 – 27461 | 6 |
| Participants, cross-sectional studies | |
| 1385 - <5000 | 1 |
| 5000 - < 10000 | 2 |
| 10000 – 11450 | 2 |
| Participants, nested case-referent studies | |
| Cases: 14166 / referents: 58060 in each of the two studies (same material) | 2 |
| Participation (%) | N |
| ≥80% | 19 |
| ≥60-80% | 27 |
| ≥40-60% | 2 |
| <40 | 1 |
| No information | 5 |
| Sex (percent male) | N |
| 0-39 | 19 |
| 40-59 | 28 |
| 60-78 | 6 |
| No information | 1 |
| Age distribution | N |
| Too heterogeneously reported to be summarized (employed adults, 18-75 years old) | |

| Table A3.1 (continued) Baseline prevalence of outcome (%) | | | | |
|--|----------|---------------|----------------|----------------|
| Prevalence period | N | Median | Minimum | Maximum |
| 0 to 9 months | 18 | 2.7 | 1.3 | 8.7 |
| 12 months | 8 | 3.9 | 2.5 | 9.1 |
| 1 to 6 years | 9 | 4.9 | 2.3 | 10.5 |
| Many years or lifetime | 11 | 8.0 | 2.6 | 18.0 |
| Varying by country (0 to lifetime) | 1 | 0.6 | - | - |
| Not reported (5) or not applicable (2) | 7 | - | - | - |

Table A3.2 Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|------------------------|---------------------|--------------------------|-------------------------------|--------|---|---|--|---|---------------------------------------|
| Bonde 2009 [113] County Denmark | Public employees | Cohort | 4/1 | 13335 | 21 | 16-71 | ≥60-80 | Demands Control Job-strain Support | Work-unit average | AD treatment |
| Bonde 2009 [113] Municipality Denmark | Public employees | Cohort | 4/1 | 4815 | 23 | 17-67 | ≥60-80 | Decision authority Skill-discretion Work-load | Work-unit average | AD treatment |
| Bonde 2016 [103] PRISME/WBH Denmark | Public employees | Cohort | 4/2 | 7502 | 26 | >45: 42% | ≥60-80 | Bullying | Self-report, perceived | SCAN and MDI |
| Dembe 2016 [114] NLSY79 USA | Employed population | Cross- sectional | - | 7492 | 51 | 46-51 | Nr | Work hours | Self-report | Doctor's diagnosis, self-report |
| Dement 2014 [115] DHSS USA | Hospital employees | Cohort | 6/1 | 9884 | 21 | <30-60+ | ≥80 | Violence, threats | Notified claims Registry records | AD treatment |
| d'Errico 2011 [116] CGIL Italy | Trade union members | Cohort | 6/1 | 2046 | 51 | 15-45+ | ≥40-60 | Demands Control Job-strain Work hours Shift work | Self-report, perceived | AD treatment |
| Fandino-Losada 2013 [100] PART Sweden | Employed population | Cohort | 3/1 | 4427 | 45 | 20-64 | ≥80 | Demands Control Job-strain | Self-report, perceived | MDI- algorithm |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|------------------------|---------------------|--------------------------|-------------------------------|--------|---|---|--|---------------------------|--------------------------|
| Grynderup 2012 [117] PRISME[109] Denmark | Public employees | Cohort | 2/1 | 3046 | 21 | <35-55+ | ≥60-80 | Demands Control Job-strain | Work-unit average | SCAN |
| Grynderup 2013 [118] PRISME Denmark | Public employees | Cohort | 2/1 | 3047 | 21 | <35-55+ | ≥60-80 | Procedural and relational justice | Work-unit average | SCAN |
| Gullander 2014 [101] PRISME/WBH Denmark | Public employees | Cohort | 4/2 | 5198 | 25 | <35-55+ | ≥60-80 | Bullying | Work-unit average | SCAN and MDI |
| Hall 2018 [119] NSWHN Canada | Nurses | Cross- sectional | - | 11450 | 5 | <35-55+ | ≥80 | Night work, Shift work | Self-report | CIDI-SFMD |
| Hannerz 2016 [120] (COPSOQ/DANES/ DWECS) Denmark | Employed population | Cohort | 2-5/1 | 19259 | 55 | 21-59 | ≥60-80 | Work hours | Self-report | AD treatment |
| Hanson 2013 [111] SHLOSH Sweden | Employed population | Cohort | 1/1 | 3661 | 49 | 20-59 | ≥60-80 | Demands Decision authority Skill discretion Emotional demands | Self-report, perceived | AD treatment |
| Hanson 2013 [111] DWECS Denmark | Employed population | Cohort | 1/1 | 6418 | 50 | 20-59 | ≥60-80 | Demands Decision authority Skill discretion Emotional demands | Self-report, perceived | AD treatment |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|--------------------------------|---------------------|--------------------------|-------------------------------|--------|---|---|--|---------------------------|--|
| Hogh 2016 [102] WBH Denmark | Company employees | Cohort | 2/2 | 1455 | 30 | 47 (9.4) | ≥40-60 | Bullying (negative behaviour, Direct harassment, isolation, intimidation) | Self-report, perceived | SCAN and MDI |
| Joensuu 2010 [38] Still Working Study Finland | Employed forest industry | Cohort | 15/cont. | 13868 | 77 | <35-65 | ≥60-80 | Decision authority Skill discretion Support, colleagues Support, supervisors | Self-report, perceived | Doctor's diagnosis, Hospital records ^a |
| Kim 2016 [121] KOWEPS Korea | Employed population | Cohort | 4/3 | 2733 | 64 | 20-59 | ? | Work hours | Self-report | CES-D 11 (≥16) |
| Kivimaki 2003 [122] Hospital personnel study Finland | Hospital employees | Cohort | 2/1 | 5432 | 11 | 18-63 | ≥60-80 | Bullying | Self-report, perceived | Doctor's diagnosis, self-report |
| Kivimaki 2007 [123] Ten town study Finland | Employed population | Cohort | 2-4/1 | 15995 | 11 | 19-62 | ≥60-80 | Effort-reward- imbalance Procedural and relational justice | Self-report, perceived | Doctor's diagnosis, self-report |
| Kivimaki 2007 [123] Hospital personnel study Finland | Hospital employees | Cohort | 2-4/1 | 4445 | 22 | 20-60 | ≥60-80 | Effort-reward- imbalance Procedural and relational justice | Self-report, perceived | Doctor's diagnosis, self-report |
| Kleppa 2008 [124]* HUSK Norway | Employed population | Cross- sectional | - | 10442 | 59 | 40-45 | ≥60-80 | Work hours Night work Shift work | Self-report | HADS-D (≥8) |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|----------------------------|--------|--------------------------|-------------------------------|--------|---|---|---|--|---|
| Laaksonen 2012 [125] (City of Helsinki study) Finland | Public employees | Cohort | 5/1 | 5786 | 78 | 40-60 | ≥60-80 | Demands Control, Support, Work hours Shift work | Self-report, perceived | AD treatment |
| Madsen 2010 [110] DWECS Denmark | Employed population | Cohort | 5/1 | 4958 | 52 | 40 (nr) | ≥60-80 | Violence, threats | Self-report, perceived | AD treatment |
| Madsen 2017 [126] IPD-Work Several countries | Mixed empl. Populations | Cohort | Varying/cont. | 27461 | 41 | 43 (9.6) | ≥80 | Job-strain | Self-report, perceived | Doctor's diagnosis, Hospital records |
| Niedhammer 2015 [127] SIP France | Employed population | Cohort | 4/1 | 4717 | 51 | 20-74 | ≥60-80 | Demands Control Support Reward Emotional demands Job-insecurity Work hours Night work Shift work | Self-report, perceived Self-report | MINI |
| Nielsen 2016 [128] DWECS-2000 Denmark | Employed population | Cohort | 5/cont. | 4541 | 52 | 40 (10) | ≥80 | Effort-reward- imbalance | Self-report, perceived | AD treatment |
| Nigatu 2018 [109] (Alberta cohort study) Canada | Employed population | Cohort | 4/3 | 4200 | 45 | 45 (10) | ≥60-80 | Job-strain Effort-reward- imbalance | Self-report, perceived | CIDI-WMH- Auto 2.1 |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|------------------------|-----------------|--------------------------|-------------------------------|--------|---|---|---|---------------------------|--------------------------|
| Oyane 2013 [129] SUSSH Norway | Nurses | Cross-sectional | - | 2035 | 9 | 21-63 | <60 | Night work Shift work | Self-report | HADS-D (≥8) |
| Plaisier 2007 [39] NEMESIS Netherlands | Employed population | Cohort | 2/1 | 3048 | 58 | 18-65 | ≥80 | Demands Control Job-insecurity | Self-report, perceived | CIDI ^b |
| Rugulies 2006 [130] DWECS Denmark | Employed population | Cohort | 5/1 | 4133 | 52 | <35-55+ | ≥80 | Demands Decision authority Skill discretion Support Job-insecurity | Self-report, perceived | MHI-5 (≤52) |
| Rugulies 2010 [131] (Danish Longitudinal Study on Work, Unemployment and Health) Denmark | Employed population | Cohort | 3.5/cont. | 5142 | 47 | 37-56 | ≥80 | Job-insecurity | Self-report, perceived | AD treatment |
| Rugulies 2012 [132] (Eldercare sector study) Denmark | Eldercare workers | Cohort | 1.7/1 | 4435 | 0 | 46 (9) | ≥60-80 | Bullying | Self-report, perceived | MDI- algorithm |
| Rugulies 2013 [87] DWECS Denmark | Employed population | Cohort | 5/1 | 2701 | 49 | 40 (9) | ≥60-80 | Effort-reward- imbalance | Self-report, perceived | MHI-5 (≤52) |
| Shields 1999 [104] CNPHS Canada | Employed population | Cohort | 2/1 | 3830 | 57 | 25-54 | ≥80 | Work hours Shift work | Self-report | CIDI-SFMD |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|--|------------------------|--------|--------------------------|-------------------------------|--------|---|---|--|--|--------------------------|
| Shields 2006 [98] CNPHS Canada | Employed population | Cohort | 2/1 | 12011 | 51 | 18-75 | ≥80 | Job-strain Support, colleagues Support, supervisors | Self-report, perceived | CIDI-SFMD |
| Sinokki 2009 [94] Health 2000 study Finland | Employed population | Cohort | 3/cont. | 3429 | 49 | 30-64 | ≥80 | Support, colleagues Support, supervisors | Self-report, perceived | AD treatment |
| Smith 12 [107] CNPHS Canada | Employed population | Cohort | 2/1 | 3735 | 54 | 26-60 | Nr | Demands Control Job-strain Support | Self-report, perceived | CIDI-SFMD |
| Stansfeld 2012 [112] Whitehall II United Kingdom | Public employees | Cohort | 2/1 | 3942 | 74 | 35-55 | ≥60-80 | Job-strain Support | Self-report, perceived | UM-CIDI |
| Thielen 2011 [133] (Danish Longitudinal Study on Work, Unemployment and Health) Denmark | Employed population | Cohort | 3.5/cont. | 4661 | 52 | 40, 50 | ≥80 | Demands Skill discretion (low work variance) Support, colleagues Support, supervisors Emotional demands | Self-report, perceived | AD treatment |
| Tokuyam 2003 [134] (Insurance company study) Japan | Insurance company | Cohort | 4/4 | 1365 | 47 | 20-73 | ≥60-80 | Work hours Work-load | Self-report Self-report, perceived | Zung SDS (>40) |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|---|----------------------------------|--------|--------------------------|-------------------------------|--------|---|---|--|--|--------------------------|
| Vammen 2016 [135] PRISME Denmark | Public employees | Cohort | 2/1 | 3125 | 22 | <35->55 | ≥60-80 | Emotional demands | Self-report, perceived Self-report, content Work-unit average | SCAN |
| Varma 2012 [136] (Senior Consultant Study) Denmark | Senior Medical Consultants | Cohort | 1.6/cont. | 2790 | 71 | 55 (6.6) | ≥80 | Work hours | Self-report | AD treatment |
| Virtanen 2007 [137] Health 2000 study Finland | Employed population | Cohort | 3/cont | 3366 | 49 | M:44.2 (8.4), F:45.0 (8.2) | ≥80 | Demands Control Job-strain | Self-report, perceived | AD treatment |
| Virtanen 2008 [138] Hospital personnel study Finland | Hospital employees | Cohort | 5/cont | 7340 | 8 | 39 (10) | ≥80 | Work-load (hospital bed occupancy higher than the norm) | Objective measuremen ts, register information | AD treatment |
| Virtanen 2012 [96] Whitehall II United Kingdom | Public employees | Cohort | 3.8-7.2/1 | 2123 | 77 | 41-61 | ≥60-80 | Job-strain Social support Work hours | Self-report, perceived | UM-CIDI |
| Wang 2004 [105] CNPHS Canada | Employed population | Cohort | 6/4 | 7371 | nr | 18+ | Nr | Demands Decision authority Skill discretion Job-insecurity | Self-report, perceived | CIDI-SFMD |
| Wang 2009 [106] CNPHS Canada | Employed population | Cohort | 11/6 | 4866 | 54 | 36 (nr) | ≥80 | Job-strain | Self-report, perceived | CIDI-SFMD |

Table A3.2 (continued) Characteristics of 54 individual studies (51 original papers) included in review (nr: not reported)

| First author, Year Substudy, study (label) or acronym, Country | Population | Design | Follow-up years/times | Baseline Participants N | % Male | Age range, mean (SD) or other | Follow-up participants: percentage of baseline participants | Exposures | Exposure source | Measure of depression |
|--|---------------------|----------------------|-----------------------|---------------------------------|--------|-------------------------------|---|---|------------------------|---|
| Wang 2012 [108] (Alberta cohort study) Canada | Employed population | Cohort | 1/1 | 2752 | 56 | 25-65 | ≥60-80 | Support, colleagues Support, supervisors Job-insecurity | Self-report, perceived | CIDI-WMH-Auto 2.1 |
| Wege 2017 [139] GSOEP Germany | Employed population | Cohort | 2/1 | 7073 | 53 | 44 (11) | ≥60-80 | Job-insecurity | Self-report, perceived | Doctor's diagnosis, self-report |
| Wege 2018 [86] GSOEP Germany | Employed population | Cohort | 271 | 6693 | 51 | 44 (11) | ≥60-80 | Effort-reward-imbalance | Self-report, perceived | Doctor's diagnosis, self-report |
| Wieclaw 2006 [41] (Danish Empl. Study) Denmark | Employed population | Nested case-referent | - | 14166 cases/ 58060 referents | 38 | 18-65 | ≥80 | Violence, threats of violence | Job-exposure-matrix | Doctor's diagnosis, Hospital records ^c |
| Wieclaw 2008 [40] (Danish Empl. Study) Denmark | Employed population | Nested case-referent | - | 14166 cases/ 58060 referents | 38 | 18-65 | ≥80 | Demands Control Job-strain Emotional demands | Job-exposure-matrix | Doctor's diagnosis, Hospital records ^c |
| Wirth 2017 [140] NHANES USA | Employed population | Cross-sectional | - | 7434 | 49 | 47 (nr) | Na | Shift work | Self-report | PHQ-9 (≥10) |
| Ylipaavalniemi 2005 [141] Hospital personnel study Finland | Hospital employees | Cohort | 2/1 | 4815 | 11 | 44 (nr) | ≥80 | Demands Control Job-strain Procedural and relational justice | Self-report, perceived | Doctor's diagnosis, self-report |

^a Includes all affective disorders with unipolar depression; ^b Includes dysthymia; ^c Includes all affective disorders

Table A3.3 Control for potential confounders by study. (0=no, 1=yes; na: not applicable for non-cohort studies)

| First author, publication year (substudy) | Previous depression ^d | Depression at baseline ^{d,f} | Depressive symptoms at baseline ^{e,f} | Family history of depression | Neuroticism/ Personality | Living alone/ Marital status | Recent life-events | Childhood adversity | Socioeconomic status ^g | Somatic illness/ self-rated health | Number of confounders controlled for |
|---|----------------------------------|---------------------------------------|--|------------------------------|--------------------------|------------------------------|--------------------|---------------------|-----------------------------------|------------------------------------|--------------------------------------|
| Bonde 2009 (County) [113] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Bonde 2009 (Municipality) [113] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Bonde 2016[103] | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Dembe 2016 [114] ^a | 0 | na | na | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dement 2014 [115] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| d'Errico 2011 [116] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Fandino-Losada 2013 [100] | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 5 |
| Grynderup 2012 [117] | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 6 |
| Grynderup 2013 [118] | 0 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 7 |
| Gullander 2014 [101] | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 5 |
| Hall 2018 [119] ^a | 0 | na | na | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 |
| Hannerz 2016 [120] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| Hanson 2013 (DWECS) [111] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Hanson 2013 (SLOSH) [111] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Hoegh 2016 [102] | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 5 |
| Joensuu 2010 [38] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Kim 2016 [121] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 4 |
| Kivimaki 2003 [122] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| Kivimaki 2007 (10 town) [123] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

Table A3.3 (continued) Control for potential confounders by study. (0=no, 1=yes; na: not applicable for non-cohort studies)

| First author, publication year (substudy) | Previous depression ^d | Depression at baseline ^{d,f} | Depressive symptoms at baseline ^{e,f} | Family history of depression | Neuroticism/Personality | Living alone/Marital status | Recent life-events | Childhood adversity | Socioeconomic status ^g | Somatic illness/self-rated health | Number of confounders controlled for |
|---|----------------------------------|---------------------------------------|--|------------------------------|-------------------------|-----------------------------|--------------------|---------------------|-----------------------------------|-----------------------------------|--------------------------------------|
| Kivimaki 2007 (Hospital personnel) [123] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Kleppa 2008 [124] ^a | 0 | na | na | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Laaksonen 2012 [125] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Madsen 2010 [110] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3 |
| Madsen 2017 [126] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 |
| Niedhammer 2015 [127] | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 5 |
| Nielsen 2016 [128] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Nigatu 2018 [109] | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 |
| Oyane 2013 [129] ^a | 0 | na | na | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| Plaisier 2007 [39] | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 |
| Rugulies 2006 [130] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 |
| Rugulies 2010 [131] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 3 |
| Rugulies 2012 [132] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 |
| Rugulies 2013 [87] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Shields 1999 [104] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3 |
| Shields 2006 [98] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 4 |
| Sinokki 2009 [94] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3 |
| Smith 2012 [107] | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 5 |
| Stansfeld 2012 [112] | 0 | 0 | 1 ^h | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 4 |

| First author, publication year (substudy) | Previous depression ^d | Depression at baseline ^{d,f} | Depressive symptoms at baseline ^{e,f} | Family history of depression | Neuroticism/ Personality | Living alone/ Marital status | Recent life-events | Childhood adversity | Socioeconomic status ^g | Somatic illness/ self-rated health | Number of confounders controlled for |
|---|----------------------------------|---------------------------------------|--|------------------------------|--------------------------|------------------------------|--------------------|---------------------|-----------------------------------|------------------------------------|--------------------------------------|
| Thielen 2011 [133] | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 4 |
| Tokuyama 2003 [134] ^b | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 6 |
| Vammen 2016 [135] ^b | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 7 |
| Varma 2012 [136] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| Virtanen 2007 [137] | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 3 |
| Virtanen 2008 [138] ^c | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) | 0 (na) |
| Virtanen 2012 [96] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| Wang 2004 [105] | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 5 |
| Wang 2009 [106] | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 7 |
| Wang 2012 [108] | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 4 |
| Wege 2017 [139] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| Wege 2018 [86] | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| Wieclaw 2006 [41] ^a | 0 | na | na | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| Wieclaw 2008 [40] ^a | 0 | na | na | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 |
| Wirth 2017 [140] ^a | 0 | na | na | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 |
| Ylipaavalniemi 2005 [141] | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total | 4 | 29 | 11 | 5 | 6 | 39 | 10 | 4 | 32 | 19 | na |

^a Cross-sectional or nested case-control studies;

^b Some potential confounders excluded from most adjusted model after confounder selection procedure;

^c Not relevant for this study because the potential confounders mentioned in the table are unlikely to be associated with the exposure in this study (objectively registered hospital bed occupancy higher than the norm);

^d Sufficient control by interview or questionnaire instrument cases at baseline

^e Sufficient control by continuous score

^f Only relevant for cohort studies

^g Sufficient if based on more than 3 categories

^h GHQ-30 in some analyses

Forest Plots (Fig A3.1 to Fig A3.11)

(Textbox with column and abbreviation explanations at the end of this Appendix)

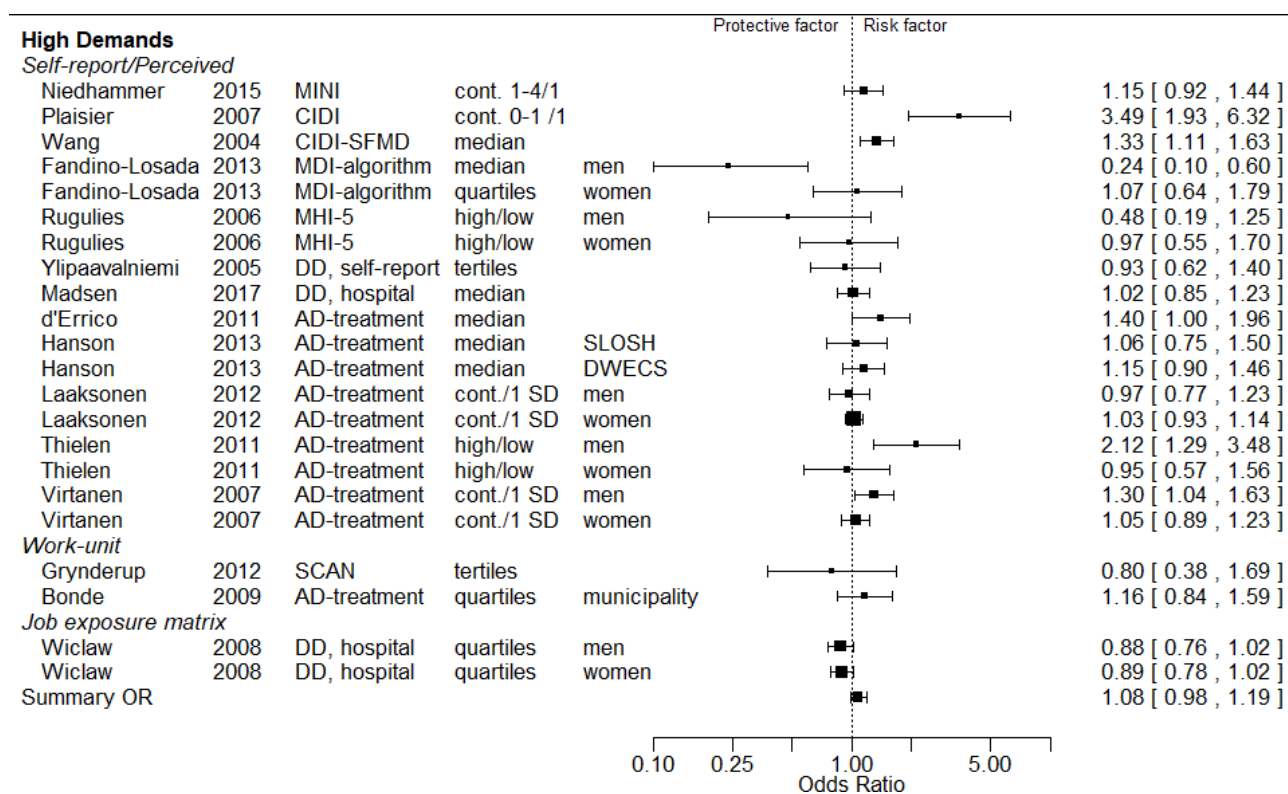


Fig A3.1 Forest plot for demands (abbreviations, see textbox after last forest plot).

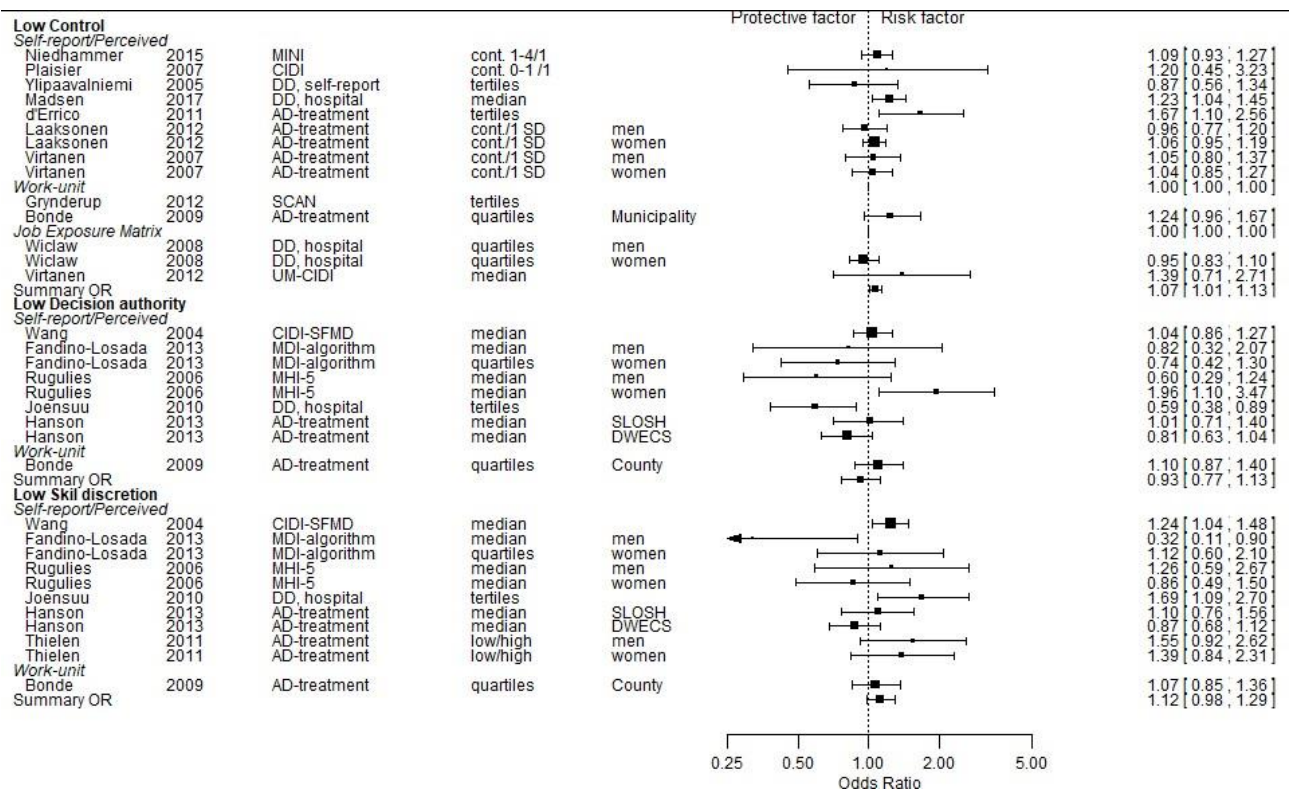


Fig A3.2 Forest plot for control, decision authority and skill discretion (abbreviations, see textbox after last forest plot).

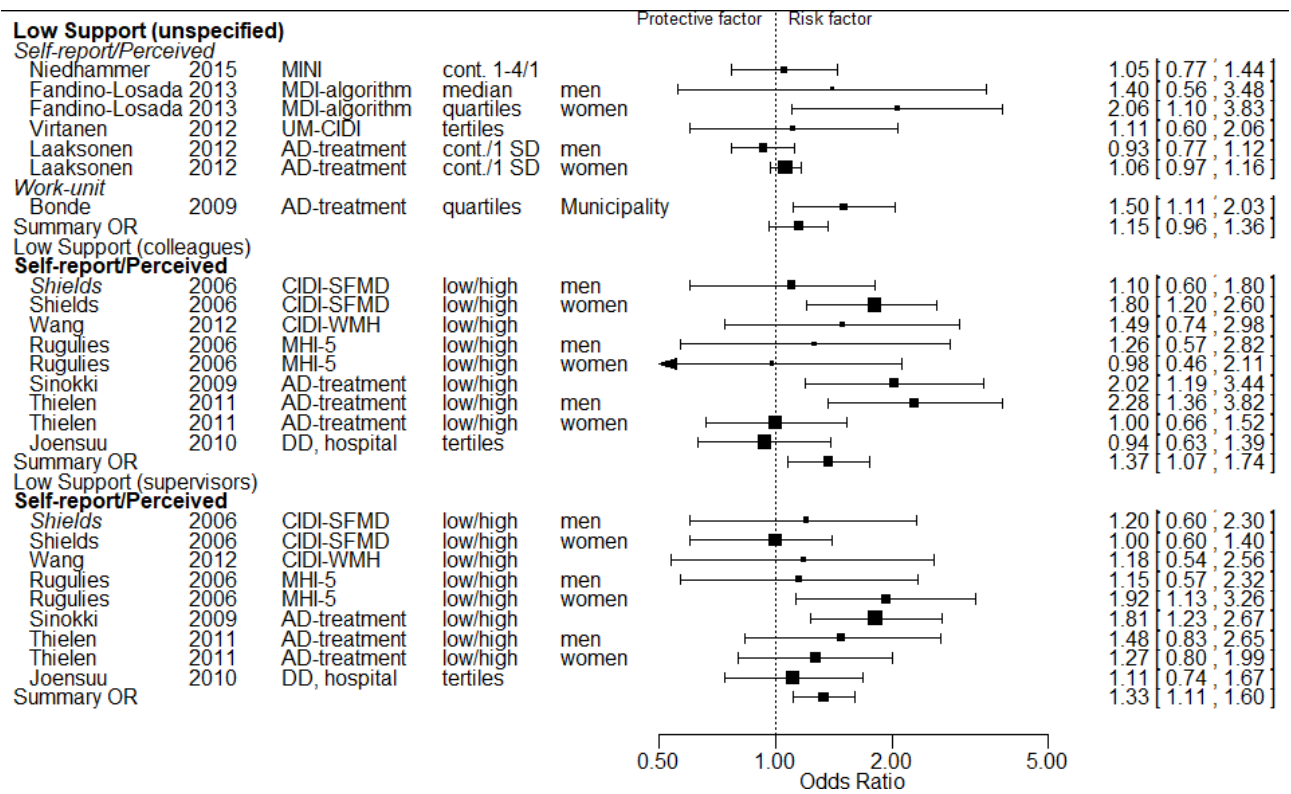


Fig A3.3 Forest plot for support (abbreviations, see textbox after last forest plot).

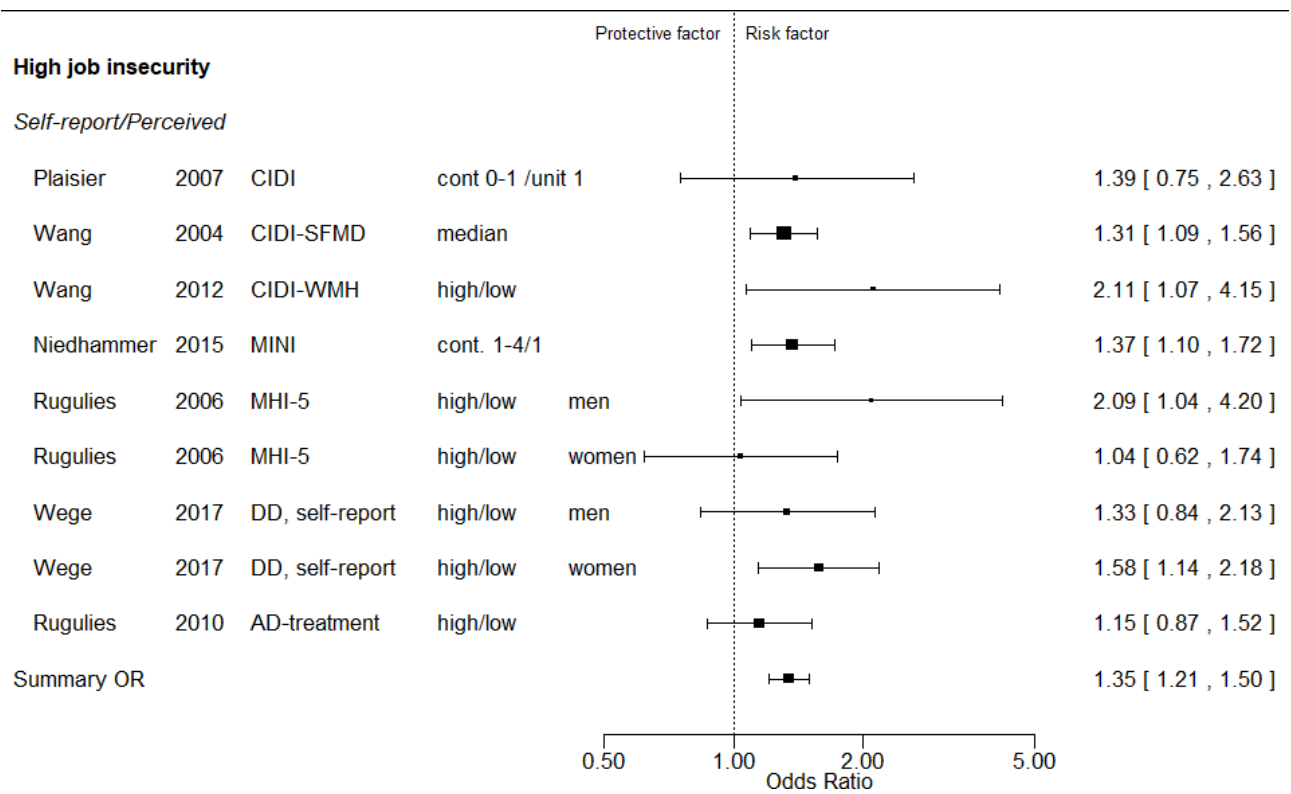


Fig A3.4 Forest plot for job-insecurity (abbreviations, see textbox after last forest plot).

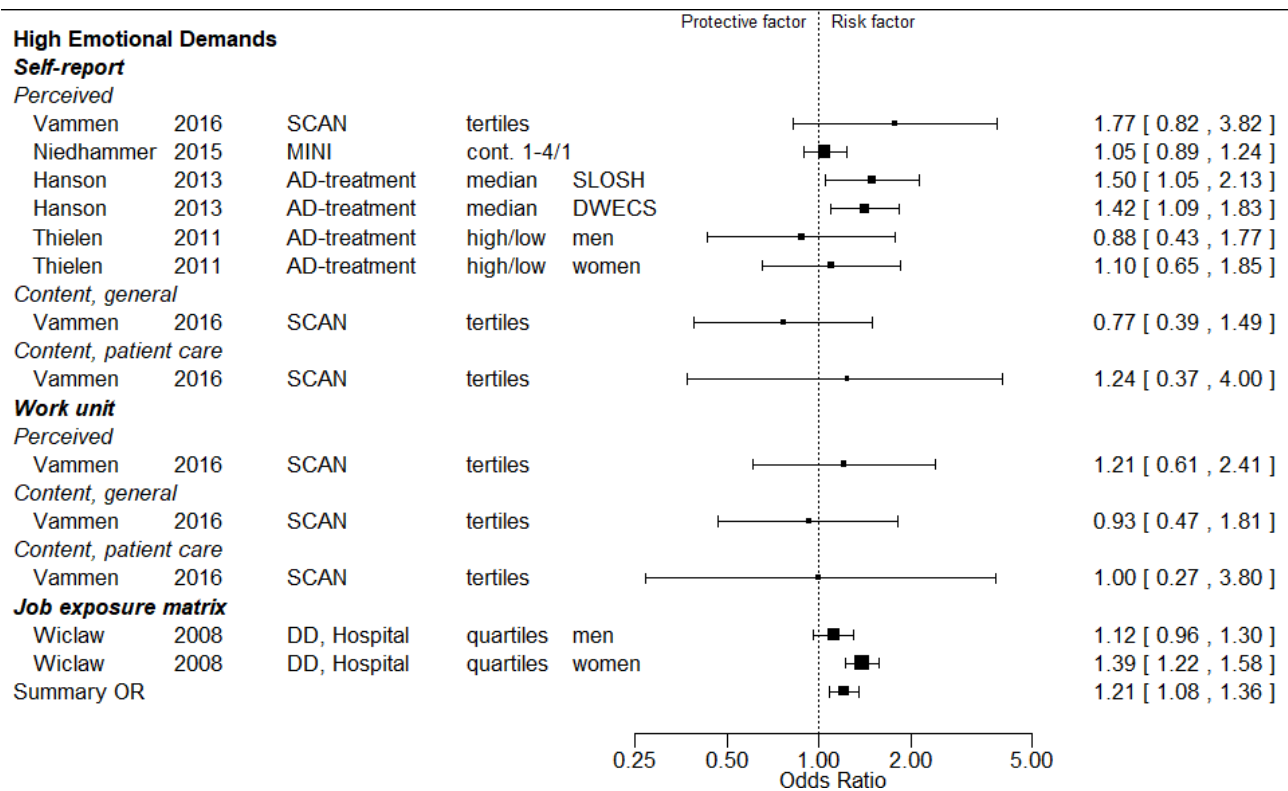


Fig A3.5 Forest plot for emotional demands (abbreviations, see textbox after last forest plot).

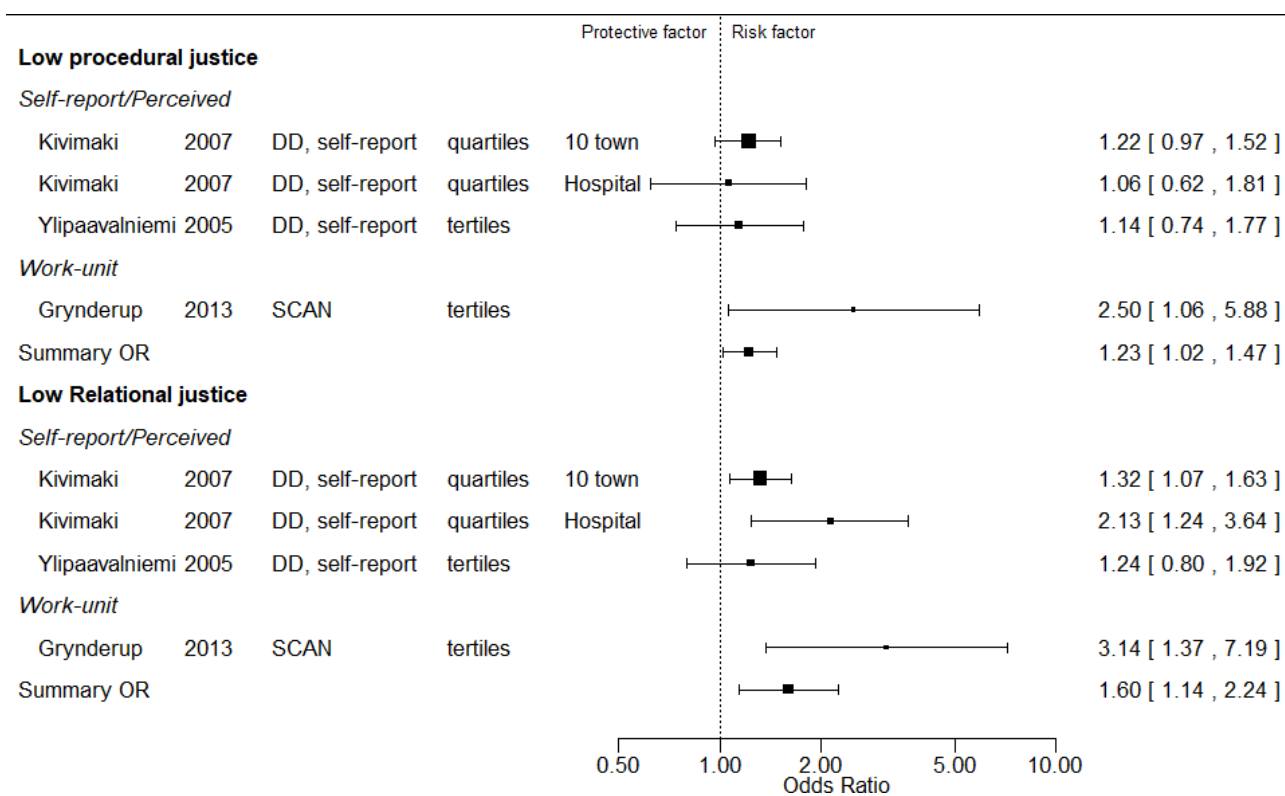


Fig A3.6 Forest plot for procedural and relational justice (abbreviations, see textbox after last forest plot).

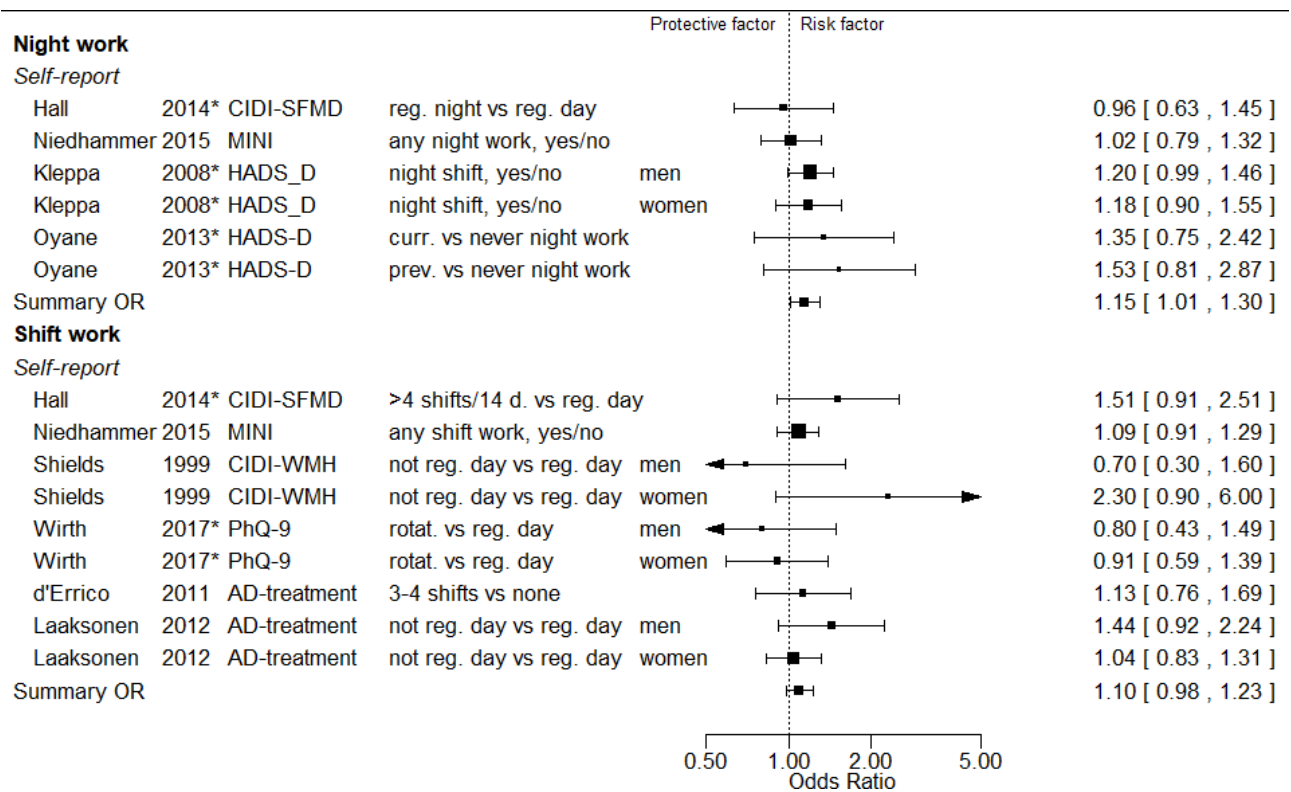


Fig A3.7 Forest plot for night work and shift work (abbreviations, see textbox after last forest plot)

'reg.' means regular, 'curr.' means current, 'd.' means day, 'rotat.' means rotating.

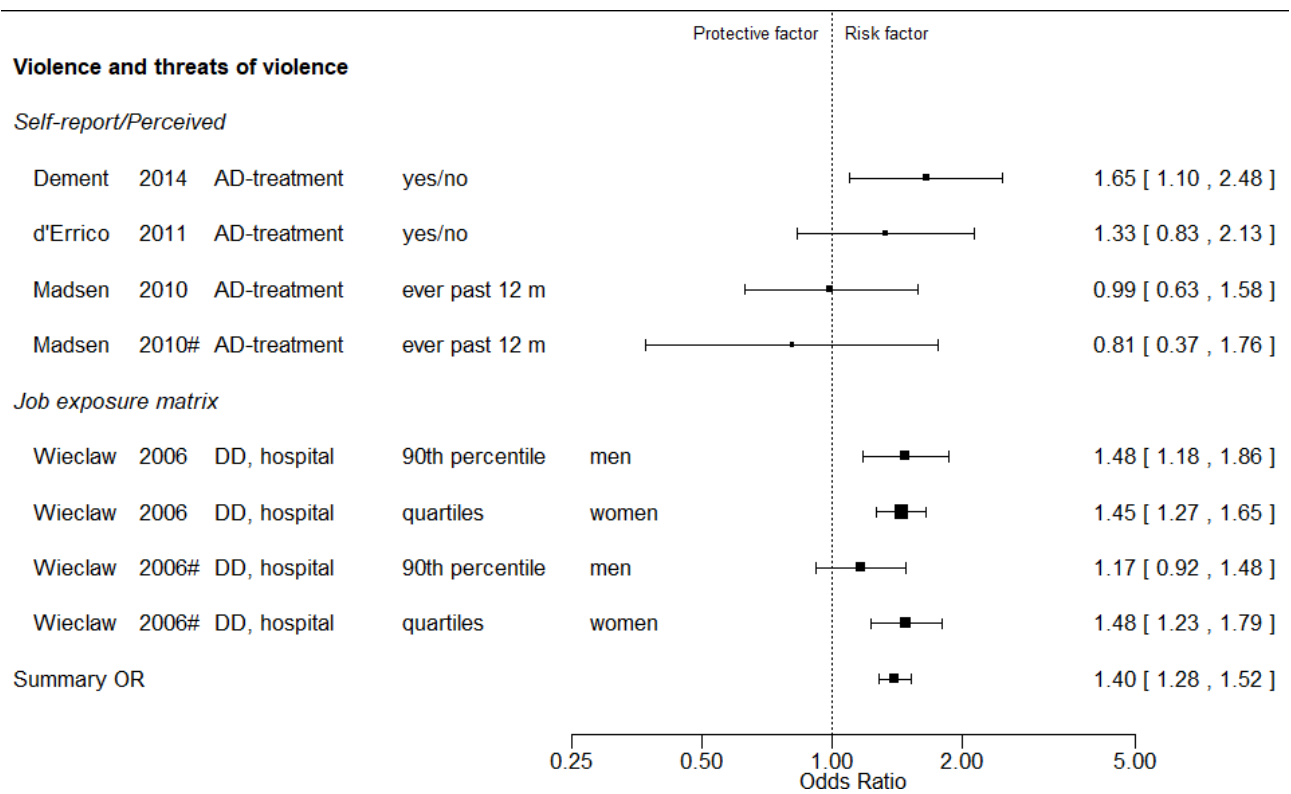


Fig A3.8 Forest plot for violence and threats of violence (abbreviations, see textbox after last forest plot)

means 'threats of violence'

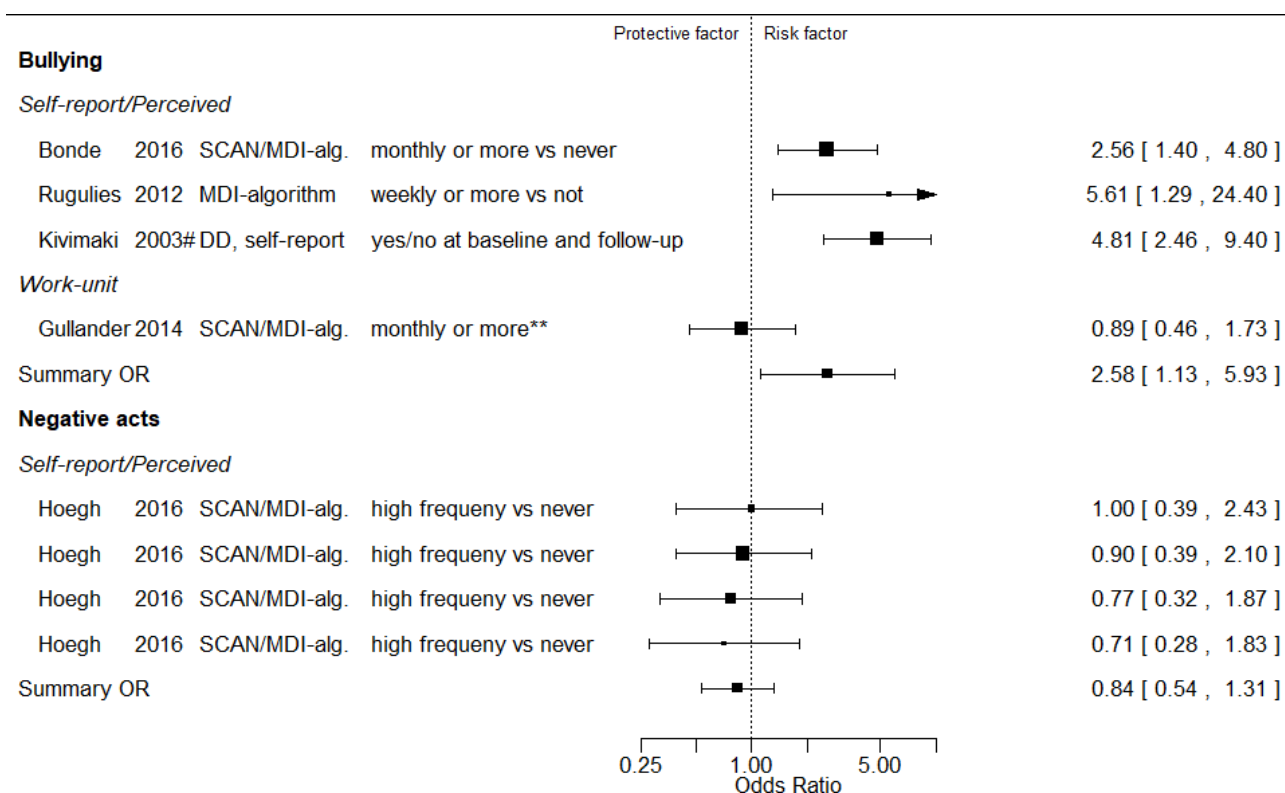


Fig A3.9 Forest plot for bullying and negative acts (abbreviations, see textbox after last forest plot)

risk estimate not truly prospective because it includes cross-sectional associations at follow-up,

**whitnessed by >30% vs 0% of work-unit members

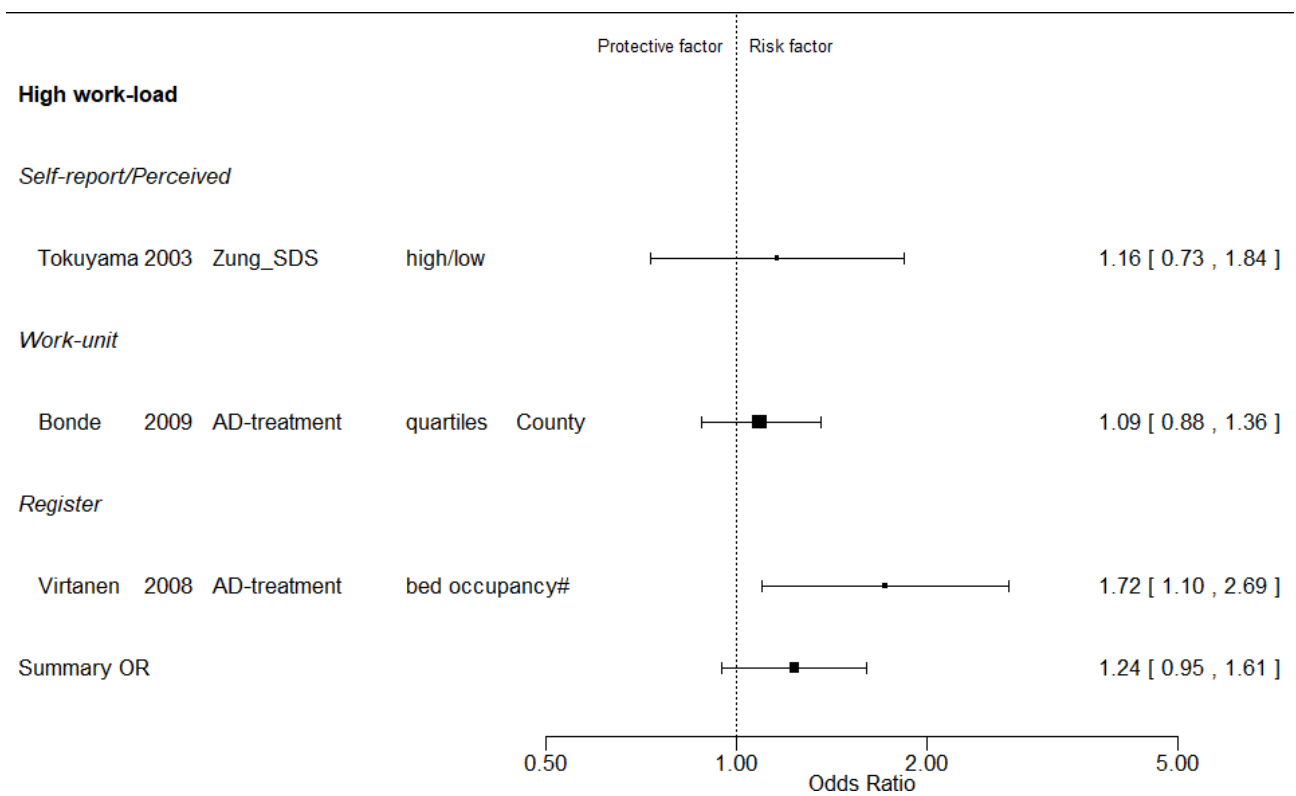


Fig A3.10 Forest plot for work-load (abbreviations, see textbox after last forest plot).

>10% excess hospital bed occupancy compared to the norm during past 6 months vs none

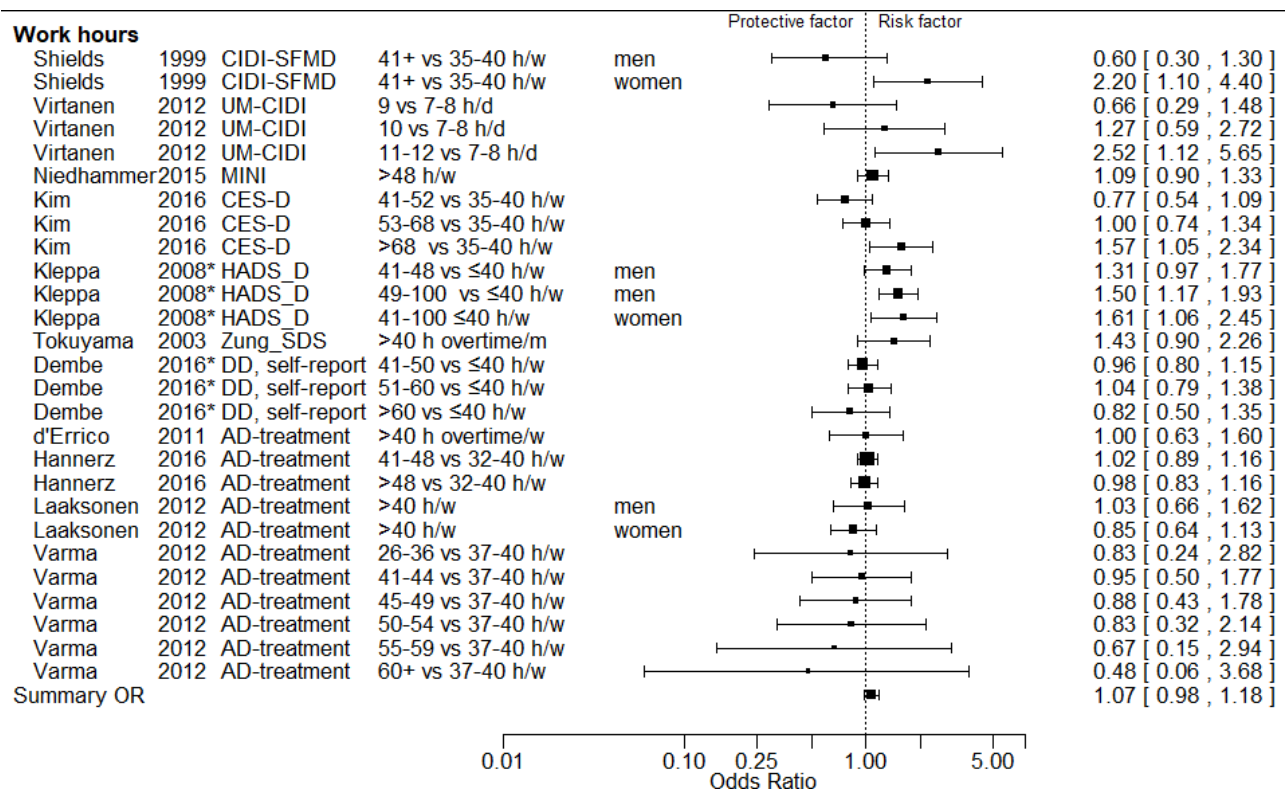


Fig A3.11 Forest plot for work hours (abbreviations, see textbox after last forest plot).

| Textbox: | | |
|--|--|--|
| Forest plot abbreviations by column | | |
| Column | Abbreviation | Explanation |
| 1 | First author | Method of exposure ascertainment and first author |
| 2 | Publication year | Asterisk (*) e.g. 2015* Unless otherwise specified, a * means that the study is a cross-sectional study |
| 3 | Diagnostic instrument | SCAN Schedules for Clinical Assessment in Neuropsychiatry [142] |
| | | CIDI Composite International Diagnostic Instrument [143] |
| | | UM-CIDI University of Michigan version of CIDI [144] |
| | | CIDI-SFMD Short Form version of CIDI [36, 145], Major Depression module |
| | | CIDI-WMH WHO Mental Health version of CIDI [146] |
| | | MINI Mini-International Neuropsychiatric Interview [147] |
| | | CES-D_11 Center for Epidemiologic Studies Depression Scale [148], modified from 20 to 11 items |
| | | HADS_D Hospital Anxiety and Depression Scale (HADS), [149], Depression subscale |
| | | MDI-algorithm Major Depression Inventory [150]. |
| | | MDI-score Major Depression Inventory [150]. |
| | | MHI-5 Mental Health Inventory [151] |
| | | PHQ-9 Patient Health Questionnaire-9 [152] |
| | | Zung SDS Zung Selfrating Depression Scale [153] |
| | | AD-treatment Antidepressant treatment |
| | | DD-self-report Doctors diagnosis, self-reported |
| | | DD-hospital Doctors diagnosis, hospital records |
| 4 | Exposure contrast | cont. 1-4/1 Continuous on a scale from 1 to 4, by 1 scale unit |
| | | cont./1 SD Continuous by 1 SD |
| | | median Above vs below the median |
| | | tertiles Upper tertile vs lowest tertile |
| | | tertile* Upper tertile vs other tertiles combined |
| | | quartiles Upper quartile vs lowest quartile |
| | | quartile* Upper quartile vs other quartiles combined |
| | | low/high or high/low Dichotomies defined in various ways |
| | | quadrant See legend to job-strain Forest plot |
| 5 | Substudy/sub material | |
| 6 | Plots of risk estimates and their 95% confidence intervals | Risk estimates are relative risks, odds ratios and hazard ratios for measures of depression related to the highest exposure contrast and from the most adjusted analytical model. Since the outcome prevalence was low (<10%) we do not distinguish between relative risks, odds ratios and hazard ratios. |
| 7 | Figures corresponding to column 6 | |

Appendix 4. Validity of measures of depression

There is no *objective* 'gold' standard for psychiatric diagnoses. Instead, the standard against which case definitions are assessed is best evidence consensus of experts, based on structured clinical interviews, the longitudinal course of the illness and all other relevant information, the so-called LEAD-standard (Longitudinal, Expert, All Data) [154]. This standard is feasible in a clinical context, but not in large epidemiological studies of the general or working population.

In such studies we considered that the occurrence of one or more depressive episodes, as determined from a semi-structured diagnostic interview (if available) should be the standard against which the accuracy of other measures of depression should be assessed.

Fully structured interviews, especially the WHO Composite International Diagnostic Interview (CIDI) [143], are sometimes treated as an alternative standard. However, the CIDI is essentially a questionnaire, which originally was administered by an interviewer because of complex skip and decision rules but has since been adapted for self-administration in computerized versions. The CIDI exists in many versions, sometimes only validated in relation to other CIDI versions. Prevalence estimates of depression generated by the CIDI depression module have been criticised for being inflated by false-positive [155]. For these reasons we did not consider diagnoses of depressive episodes, or recurrent or major depressive disorders based on fully structured interviews as a standard comparable to semi-structured interviews.

We looked for reports on the validity of depression measures that had been used in the studies that were reviewed, both in the reference list of each study and through a search in PubMed with search terms for title and abstracts covering the specific depression measure (e.g. CIDI or 'primary care' and related terms), terms for validation, sensitivity and specificity, and terms for semi-structured interview methods (e.g. SCAN, SCID). Hits were screened by title, if relevant also by abstract, and finally by full text reading, and the reference lists of usable studies were checked for further relevant reports. These searches and the selection of relevant studies were carried out by one of the authors (SM)

Fully structured diagnostic interviews and questionnaire instruments

We estimated the validity of measures of depression based on fully structured interviews or questionnaire instruments, taking depressive episodes diagnosed by semi-structured interview as the standard. If available, we used sensitivities and specificities from studies of general or working populations to calculate false positive and false negative rates in a population with a true depressive episode prevalence of 5%, considered to be close to the true prevalence in a general population. If we found no studies of general or working populations, we used data from unselected patients in primary care or unselected in- or out-patients from non-psychiatric hospital settings.

The results showed that false positive rates varied between 60% and 89%, and false negative rates between 0.2% and 3% (Table A4.1).

Primary care diagnoses

Studies among representative samples of adult primary care patients to assess the validity of diagnostic criteria for depression in comparison with diagnoses based on semi-structured clinical interviews (taken as

a standard) have reported sensitivities ranging from 20% to 100% and specificities ranging from 69% to 94% [156-160]. In a population with a true prevalence of 5%, these sensitivities and specificities would imply false positive rates in the order of 80%-90% and false negative rates of <5%.

Self-report of depression diagnosed by a doctor

None of the studies included in the review focused directly on primary care diagnoses of depression. However, the outcomes in seven studies were based on self-report of depression diagnosed by a doctor, and 15 investigations controlled for previous depression using such self-report. Since the large majority of depression diagnoses are made in primary care, these outcome measures will suffer from the same inaccuracies as primary care diagnoses of depression, and in addition from limitations of recall of doctor- diagnoses many years back in time.

Population false positive and negative rates for *self-reported doctor's diagnoses of any previous depression* compared to lifetime prevalence of depressive episodes diagnosed by a semi-structured diagnostic interview, have been estimated in one study to be 25% and 19%, respectively, with a true prevalence of 26% [161]. However, the use of semi-structured interviews to assess lifetime prevalence is problematic because of the potential for error in recall of depressive symptoms many years in the past [162].

Furthermore, population studies indicate that fewer than half of participants with a depressive episode access the formal health care system about their depressive symptoms [163, 164], which will reduce the sensitivity of recalled doctor's diagnosis.

Thus, while the validity of self-reported doctor's diagnosis of depression as a measure of previous depressive episodes is uncertain, available data suggest that it may suffer from substantial inaccuracy.

Primary care diagnoses of depression are important determinants of antidepressant treatment and of referral for hospital examination and treatment. Thus, limitations and inaccuracies of primary care diagnoses of depression will extend also to these measures of depression.

Antidepressant treatment

Antidepressant treatment is mainly prescribed in primary care by general practitioners. The indications for prescribing antidepressant treatment were systematically examined in a nationwide Dutch study [165]. The study showed that depression/feeling depressed was the indication in only 45% of prescriptions. Furthermore, a large European study has shown that only 30% of patients with a depressive episode, diagnosed by a semi-structured interview, were treated with antidepressants [166].

Routine hospital diagnoses

Studies on the validity of *routine hospital diagnoses* of depressive disorders and major depression, compared to diagnoses based on LEAD-criteria and best evidence consensus, including semi-

structured clinical interviews, have demonstrated false positive rates between 16% and 42%, and false negative rates between 5% and 31% [167-170]. In a systematic review of the accuracy of administratively collected diagnoses Davis et al., 2016 [171] found that the average false positive rate for affective disorders and unipolar depression (depressive episodes and dysthymia) was 25%. In a Danish study including routine discharge diagnoses of first-onset depressive episodes (ICD-10) from all psychiatric departments in eastern Denmark, the false positive rate was 24% compared to a subsequent semi-structured diagnostic interview [172].

Only a small proportion of persons with depressive episodes is treated in hospitals.

Diagnostic misclassification and bias

The null hypothesis of this review was that psychosocial exposures at work have no association with depressive episodes diagnosed by an acceptable standard (a semi-structured interview). However, studies used diagnostic methods that will have caused some misclassification with false positives and false negatives. If the true outcome is not associated with the exposure and if the misclassified cases are positively associated with exposure, then the risk estimate for a diagnosis of depression defined by the test will exceed unity. The size of this bias can be calculated for different circumstances involving specifications of the true prevalence of depressive episodes, the prevalence of a positive diagnostic test, the sensitivity of the test, the prevalence of exposure and the true relative risk of the association between misclassified cases and exposure.

As an example for circumstances similar to those of many studies included in this review: we set the true prevalence of depressive episodes to 3%, the prevalence of a positive diagnostic test to 5%, the sensitivity of the test to 75%, the prevalence of exposure to 25% and the true relative risk for the association between misclassified cases and exposure to 2.00. Under these circumstances, the relative risk of being diagnosed with depression by the test will be 1.49 even if the true relative risk is equal to unity. If the true relative risk of the association between misclassified cases and exposure is set to 1.50, then the relative risk of being diagnosed with depression by the test will be 1.26 even if the true relative risk is equal to unity. In both examples the false positive rate was 55%.

Meta-analytic estimates of relative risks of depressive *symptoms* by psychosocial factors at work have recently been examined in a systematic review, and many were found to be in the order of 1.5 to 2.0 for adverse high levels of exposure compared to low levels [173].

Against this background it seems quite plausible that relative risks up to between 1.25 and 1.50 could be explained by bias due to diagnostic false positives with depressive symptoms.

Table A4.1 Sensitivity and specificity of diagnostic methods used to assess current to 12-month occurrence of depressive episode or mood disorders/depressive disorders compared to a semi-structured diagnostic interview, and calculated false positive and negative rates for a true prevalence of 5%. (DE: depressive episode ICD-classification, MDE: major depressive episode DSM-classification; nr: not reported)

| Diagnostic method, First author, year | Material | Outcome | Test method | Re-ference method | Sensiti- vity | Specifi- city | False positive rate | False negative rate |
|---|---|----------------|--------------------|-------------------|---------------|---------------|---------------------|---------------------|
| CIDI | | | | | | | | |
| Brugha 2001 [174] | General population | DE | CIDI-Auto 1.1 | SCAN | 0.50 | 0.90 | 0.83 | 0.03 |
| Kessler 2003 [175] | General population | MDE | CIDI | SCID | 0.55 | 0.95 | 0.65 | 0.02 |
| Aalto-Setälä 2002 [176] | Working population | DE | CIDI-SF | SCAN | 0.73 | 0.82 | 0.83 | 0.02 |
| MINI | | | | | | | | |
| de Azevedo Marques 2008 [177] | Primary care patients | MDE | MINI | SCID | 0.90 | 0.93 | 0.60 | 0.01 |
| CES-D | | | | | | | | |
| Jahn 2018 [178] | General population | DE | CES-D \geq 10 | SCAN | 0.81 | 0.74 | 0.86 | 0.01 |
| Campo-Arias 2007, cited from Vilagut 2016 [179] | General population | MDE | CES-D (nr) | SCID | 0.98 | 0.58 | 0.89 | 0.002 |
| HADS-D | | | | | | | | |
| Abiodun 1994 [180] | General population | DE | HADS-D \geq 8 | PSE* | 0.90 | 0.91 | 0.66 | 0.01 |
| Kjærsgaard 2014 [181] | General population | MDE | HADS-D \geq 4 | SCID | 0,85 | 0.79 | 0.81 | 0.01 |
| MDI | | | | | | | | |
| Forsell 2005 [182] | General population | DE | MDI-algorithm | SCAN | 0.67 | 0.81 | 0.84 | 0.02 |
| MHI-5 | | | | | | | | |
| Rumpf et. al. 2001 [183] | General population | Mood disorders | MHI-5<52 | SCID | 0.72 | 0.86 | 0.79 | 0.02 |
| PHQ-9 | | | | | | | | |
| Kroenke 2001 [152] | Primary care patients | MDE | PHQ-9 \geq 10 | Adapted SCID | 0.88 | 0.88 | 0.72 | 0.01 |
| Patten 2015 [184] | Out-patients, multiple sclerosis clinic | MDE | PHQ-9 \geq 10 | SCID | 0.95 | 0.88 | 0.71 | 0.003 |
| Lowe 2004 [185] | Outpatients medical hospital and primary care | MDE | PHQ-9 \geq 12 | SCID | 0.95 | 0.84 | 0.76 | 0.003 |
| Zung SDS | | | | | | | | |
| Campo-Arias 2006 [186] | General population | MDE | Zung SDS \geq 40 | SCID | 88.6 | 74.8 | 0.84 | 0.01 |

*Present State Examination (a forerunner for SCAN)

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