

Supplementary material

Supplementary material A: Protocol

Precarious employment and mental health: protocol for a systematic review

Authors & contributions:

Torkel Rönnblad, Lunds Universitet

muh1otr1@student.lu.se

Theo Bodin*, Karolinska Institutet

theo.bodin@ki.se

Anton Lager, Stockholms Läns Landsting

Emelie Andersson, Stockholms Läns Landsting

Occupational Medicine

Institute of Environmental Medicine (IMM), C6, Occupational medicine, Solnavägen 4, Plan 10 113 65

Stockholm, Sweden

**: corresponding author*

TB is the guarantor, TR drafted the manuscript. Both contributed to development of inclusion criteria and search strategies. All authors read and approved the final manuscript.

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INTRODUCTION

Rationale

Rapid changes in the labour market in recent decades has led to an expansion of various non-traditional employment forms, with long-term full time employment contracts becoming progressively less of a norm. These forms of labour are often coined together as “flexible” employment, but is a heterogenous group in that quite diverse types of arrangements usually are included under the term; such as both voluntary and involuntary part-time or self-employment, short-term contracts, flexitime arrangements and “staff for hire”-enterprise based employment to name a few. Concern has been raised that some of these arrangements may constitute a health hazard for workers, but several earlier reviews performed indicate that a crucial differential point regarding health outcomes is whether the arrangement is worker-based or

company-based (i.e. voluntary or involuntary from the employees point of view); with worker-based flexible arrangements having a neutral or positive effect, while company-based arrangements shows a negative impact on health parameters, particularly psychosocial & mental health.(1, 2)

To comprehensively address the more involuntary forms of “flexible” work, the term *precarious employment* has been proposed. This term addresses several key characteristics of the objective employment conditions such as contract length, schedule, wages, legal rights & occupational safety; but the term *precariousness* also recognizes the importance of more subjective and employer-employee relational aspects such as perceived job insecurity, knowledge of and ability to exercise legal rights, and psychosocial work conditions. A precarious employment is characterized by low control & predictability, low perceived job security, underpayment and limited social protection, and there are indications that it may be related to poor health outcomes.(3) Most performed studies rely on isolated aspects of precarious conditions, such as scheduling organization, however there is reason to believe that the comprehensive concept of a precarious employment as described above may constitute an independent risk factor for poor health. Regarding mental health, precarious employments may be related to several known risk factors such as low job control and sense of coherence, low income and economic security, high job strain and low social support at work.(4) Little is known about how these factors may act synergistically, and many of those at highest risk may not be reached by traditional register studies and workplace trials since more than one employer and/or informal employment is common in this group. Taken together, this indicates that a comprehensive understanding of precarious conditions may be necessary to evaluate the health effects of a changing labour market. No systematic review has to the authors knowledge been performed using this approach.

Objectives

The primary aim of this systematic review is to investigate the evidence of an association between precarious employment and mental health, both in terms of self-rated health and adverse outcomes (i.e. illness/disease and following secondary outcomes such as hospitalization and medication). Both isolated aspects of precarious work conditions and a comprehensive approach to precariousness as an exposure will be investigated.

A secondary aim is to critically evaluate the term '*precarious*', how it is used in included studies and what it contributes to occupational health research. The term is at present used in a variety of meanings, and it is the authors' aim to on the basis of this review visualize what aspects of precariousness are less researched than others, and from this make suggestions on which subjects should be prioritized in future research and which definition and role of the term "precarious" could be most useful for this purpose.

METHODS

Eligibility criteria

Studies will be selected according to the following criteria:

Study design

Only controlled trials and cohort studies will be included.

Setting

No restriction by type of setting will be used.

Time frame

A minimum follow-up time of 1 year is required.

Population

The target population is adults at working age. Studies with a minimum of 300 participants in this category will be included. For comparability only studies performed in Europe, North America, Australia and New Zealand will be included.

Exposures

Of interest are exposure to any work condition that can be regarded as precarious on its own, or combinations of several factors that together constitute a precarious employment state. This includes objective and subjective job insecurity, temporary and unpredictable employment, “staff for hire”-enterprises, unpredictable scheduling, 0-hour contracts (employment without income guarantee), involuntary part-time or self employment, low or insufficient wages, several different employers, objective and subjective powerlessness against employer in regards to negotiating work conditions, low ability to exercise legal rights, low job control and vulnerability to authoritarian treatment. The relevance and nature of exposures in included studies will be elaborately commented in the review article.

Any study that addresses one or more of the above mentioned exposures will be considered, as will any study reports that uses the term ‘*precarious*’ to describe studied work-related exposure; this in line with the secondary aim of the review as stated under “Objectives”.

The search strategy will be constructed using synonyms or words related to ‘precarious/insecure employment’ for exposure, as it is not our objective to use a preformed definition of which particular exposures can be classified as precarious for screening; rather to use an inclusive approach and on the basis of included material make suggestions for a useful definition.

Comparators

The main comparator will be either exposure to full-time jobs with high security or non-exposure to precarious work conditions; but given the complex and non-binary nature of precariousness, any comparison between lower and higher exposure to described components of precarious work conditions will be relevant.

Outcomes

Mental health in a broad sense is of interest. Possible relevant outcomes will be self-rated mental and psychosocial health, health care consults, diagnoses of mental illnesses resulting in medication use, disability leave, hospitalisation, early retirement and suicide. Outcomes will be graded with regards to specificity/validity (i.e. psychiatric diagnoses>self rated health), severity (i.e. completed suicide>depressive

disorder>insomnia), and plausibility of an etiologic association with exposure (i.e. insomnia>disorders with a larger known genetic component, such as bipolar disorder). Results and effect sizes will be sorted for similar outcomes, and all grading and prioritization will be commented and elaborated in the results section of the review article.

Language

Only literature written in English or Swedish will be included.

Publication status

Only articles accepted for publishing in peer-reviewed journals will be included. Ahead-of-print electronically published articles will be accepted.

Year of publication

Articles published from the year 2000 and forward will be included.

Information sources

Three electronic bibliographic databases will be included as sources of literature: PubMed/MEDLINE, Web of Science and PsycInfo.

Search strategy

Search strategies is developed using medical subject headings (MeSH) when applicable and free text words related to the three main headings “precarious” “employment” and “mental health” as shown in the model below:

“outsourced services”* “outsourced” ”outsourcing” “precarious” “temporary” “layoff” “layoffs” “downsizing” “atypical” “contingent” “atypical” “flexible” “casual” “non-standard” “nonstandard” “unprotected” “insecure” “insecurity”	AND	“employment”* “work”* “job”	AND	“mental health”* “mental disorder” “depressive disorder”* “depression” “anxiety”* “dyssomnias”* "sleep initiation and maintenance disorders" “insomnia”* “sleep”*
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*: MeSH term and free word term. No asterix = only free word term

Draft search strategies for all three databases is included in appendix 1.

Data management

Search results will be downloaded to EndNote reference manager software individually by both reviewers. The software will be used to remove duplicates.

Selection process:

Two independent reviewers will screen the search results by

1. Title
2. Abstract
3. Full text

The references will be marked through each step as “y” (meets the inclusion criteria), “n” (does not meet the inclusion criteria) or “u” (uncertain). References marked as uncertain will proceed to the next level of screening. Any conflicts or remaining uncertain articles will be solved through discussion, conflict resolving and consensus decision between reviewers.

Data items, outcomes and prioritization

All data items and outcomes described under *inclusion criteria* will be extracted and prioritized according to description. For outcomes, effect sizes with confidence intervals/standard errors, any stratifications, and information on adjustments will be extracted. Strategies and schemes for prioritization will be developed in collaboration between both reviewers and thoroughly explained in the review article.

Risk of bias in individual studies

Risk of bias in included studies will be evaluated with specific emphasis on the control of outcome baseline variables, representative study groups and the methods of exposure & outcome measurement.

Overall risk of bias will be summarized for individual studies as evidence quality grademarks, which will be reported in the results section and used as guidance for the critical interpretation of effects & effect sizes.

Data synthesis

A systematic narrative synthesis will be written using text, tables and figures (forest plots) to explain the characteristics and findings of the studies. Where possible, results from studies on sufficiently similar exposure & outcome, composite effect sizes will be calculated. The relationship between findings both within and between included studies will be explored and elaborated. Implications of the findings for further research will be discussed.

Meta-bias(es)

The possibility of publication bias and outcome reporting bias will be evaluated and discussed. If possible, funnel plots will be constructed for specific exposure & outcome combinations and used as guidance for the critical interpretation of results. Implications for future research will be discussed.

References:

1. Joyce K, Pabayo R, Critchley Julia A, Bambra C. Flexible working conditions and their effects on employee health and wellbeing. Cochrane Database of Systematic Reviews [Internet]. 2010; (2). Available from: <http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008009.pub2/abstract>
<http://onlinelibrary.wiley.com/store/10.1002/14651858.CD008009.pub2/asset/CD008009.pdf?v=1&t=inhz7pa&s=996ba730f2cdc36660d4c738016ae5f7b71ff089>.
2. Costa G, Akerstedt T, Nachreiner F, Baltieri F, Carvalhais J, Folkard S, et al. Flexible working hours, health, and well-being in Europe: some considerations from a SALTSA project. *Chronobiology international*. 2004;21(6):831-44.
3. Benach J, Vives A, Amable M, Vanroelen C, Tarafa G, Muntaner C. Precarious employment: understanding an emerging social determinant of health. *Annual review of public health*. 2014;35:229-53.
4. Theorell T, Hammarstrom A, Aronsson G, Traskman Bendz L, Grape T, Hogstedt C, et al. A systematic review including meta-analysis of work environment and depressive symptoms. *BMC public health*. 2015;15:738.

Supplementary material B: Full search strings

((temporary[All Fields] OR layoff[All Fields] OR downsizing[All Fields] OR "outsourced services"[MeSH Terms] OR outsourcing[All Fields] OR atypical[All Fields] OR contingent[All Fields] OR flexible[All Fields] OR casual[All Fields] OR non-standard[All Fields] OR nonstandard[All Fields] OR unprotected[All Fields] OR insecurity[All Fields]) AND ("employment"[MeSH Terms] OR "work"[MeSH Terms] OR work[Text Word] OR employment[All Fields] OR job[All Fields]) AND ("mental health"[MeSH Terms] OR "depressive disorder"[MeSH Terms] OR "depression"[MeSH Terms] OR depression[All Fields] OR "anxiety"[MeSH Terms] OR anxiety[All Fields] OR "dyssomnias"[MeSH Terms] OR "sleep initiation and maintenance disorders"[MeSH Terms] OR insomnia[All Fields] OR "sleep"[MeSH Terms] OR sleep[All Fields])) AND ("humans"[MeSH Terms] AND (English[lang] OR Swedish[lang]))

WEB of Science

(TS=(temporary OR layoff OR downsizing OR "outsourced services" OR "outsourced" OR "outsourcing" OR atypical OR contingent OR flexible OR casual OR non-standard OR nonstandard OR unprotected OR insecurity) AND TS=("employment" OR "work" OR "job") AND TS=("mental health" OR "depressive disorder" OR "depression" OR "anxiety" OR "dyssomnias" OR "sleep initiation and maintenance disorders" OR "sleep" OR "insomnia")) AND LANGUAGE: (English OR Swedish) AND DOCUMENT TYPES: (Article) Timespan: 2000-2016. Indexes: SCI-EXPANDED, SSCI, A&HCI, CPCI-S, CPCI-SSH, ESCI.

PsycInfo:

(insecure OR temporary OR layoffs OR downsizing OR outsourcing OR atypical OR contingent OR flexible OR casual OR nonstandard OR precarious OR unprotected) AND (work OR employment OR "occupational status" OR job) AND ("mental health" OR depression OR anxiety OR insomnia OR "mental disorders")

Limiters - Published Date: 20000101-20160731; Peer Reviewed; Publication Status: fully published; Publication Type: Peer Reviewed Journal; Language: English; Population Group: Human; Exclude Dissertations

Expanders - Also search within the full text of the articles

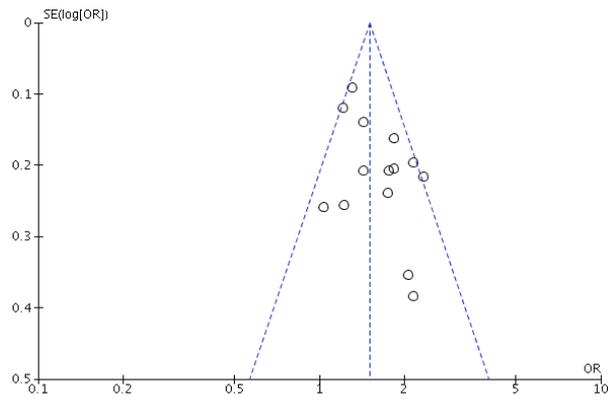
Narrow by Language: - english

Search modes - Find all my search terms

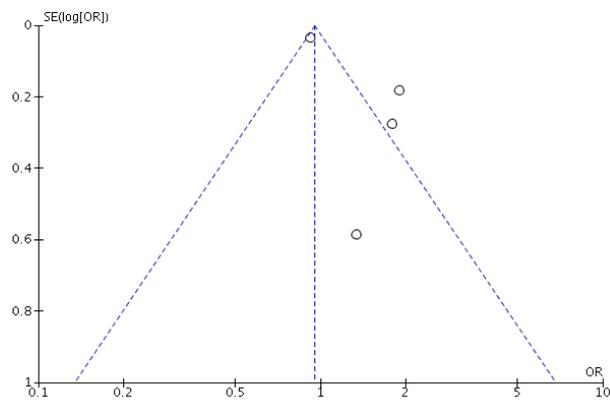
Supplementary material C: Form used for full text assessment

[Separate PDF file](#)

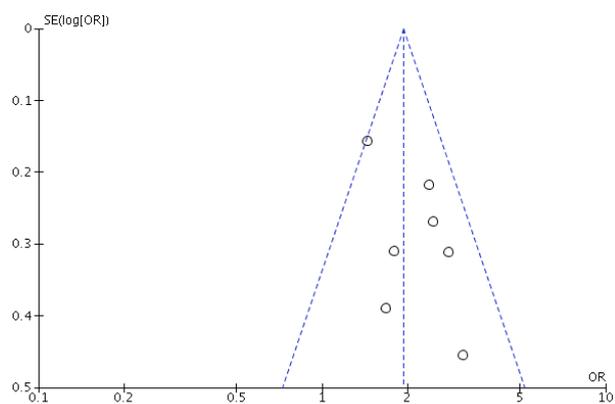
Supplementary material D: Funnel plots



Job insecurity vs. no/low job insecurity; all mental health outcomes



Temporary employment vs. permanent employment; all mental health outcomes



Multidimensional exposures; all mental health outcomes

Section 1: Basic information

1. Reviewer:

2. Reference:

3. Population (Country, setting, age restrictions etc):

4. Comment:

5. Total number of participants (including drop-outs):

6. Comment:

7. Exposure:

8. Comment:

9. Comparator/control/reference:

10. Comment:

11. Outcome:

12. Comment:

13. Study Design:

14. Comment:

15. Follow-up time:

16. Comment:

17. Does the study meet the inclusion criteria? (PICOS)

Mark only one oval.

- Yes
- Maybe
- No (go to exclusion)

18. Is there a major quality flaw that clearly disqualifies the study?

Mark only one oval.

- No
- Maybe
- Yes (go to exclusion)

19. Reason for exclusion:

Section 2: Excluded reference (skip this section if included)

20. Could the article be useful as reference for background, discussion etc?

Mark only one oval.

- No (end review here)
- Maybe
- Yes

21. (If "yes" or "maybe") because it covers the following:

22. Useful quotes (paste one or many):

Section 3: Study details & quality assessment

23. Effective study sample (n=):

24. **Comment:**

25. **Number of male participants:**

26. **Comment:**

27. **Number of female participants:**

28. **Comment:**

29. **Exposure definition & measurement method:**

30. **Comment:**

31. **Outcome definition & measurement method:**

32. **Comment:**

33. **Results/Effect sizes**

(n) + Total + gender breakdown for each exposure-outcome combination, description of adjustments

34. **Comment:**

35. **A1 Potential selection bias**

Mark only one oval per row.

	Yes	No	Lack of info	Not applicable	Partially
Where the participants recruited in a similar way?	<input type="radio"/>				
Where the groups studied assembled in a sufficiently similar way, a part from the occupational exposure?	<input type="radio"/>				

36. **Comment:**

37. A2 Potential bias in exposure

Mark only one oval per row.

	Yes	No	Partially	Lack of info	Not applicable
Where the circumstances (except for occupational exposure) similar for the participants?	<input type="radio"/>				
Where potential confounders adequately handled in the study?	<input type="radio"/>				

38. Comment:

39. A3 Potential bias in outcome measures

Mark only one oval per row.

	Yes	No	Partially	Lack of info	Not applicable
a) Was the outcome measure objective?	<input type="radio"/>				
b) Where those who evaluated the outcome unaware of the participants' occupational exposure?	<input type="radio"/>				
c) Was the outcome appropriately defined?	<input type="radio"/>				
d) Was the outcome appropriately measured?	<input type="radio"/>				
e) Was the outcome measured with defined methods and technologies?	<input type="radio"/>				
f) Where the methods and technologies used in the study validated?	<input type="radio"/>				
h) Was the outcome measured at appropriate points in time? (repeated measurements-more than two points)	<input type="radio"/>				
i) Has the statistical analysis taken correction of imbalances in baseline variables between groups with different exposures in to account in an adequate manner?	<input type="radio"/>				
j) If several observers took part - was the intraobserver reliability acceptable?	<input type="radio"/>				
k) Has the study applied appropriate statistical methodology?	<input type="radio"/>				

40. Comment:

41. A4 Potential bias in loss to follow-up

Mark only one oval per row.

	Yes	No	Lack of info	Not applicable	Partially
a) Was the drop-out of participants during the time to follow-up described?	<input type="radio"/>				
b) Was the number of drop-outs balanced between the groups?	<input type="radio"/>				
c) Where relevant variables at baseline comparable for drop-outs among participants with vs without occupational exposure?	<input type="radio"/>				
d) Was the statistical handling of drop-outs adequate?	<input type="radio"/>				

42. **Comment:**

43. **A5 Potential bias in reporting results**

Mark only one oval per row.

	Yes	No	Lack of info	Not applicable	Partially
a) Was the outcome measured in some other way than by self-assessment?	<input type="radio"/>				
b) Was the outcome reported in an adequate way (by the authors)?	<input type="radio"/>				

44. **Comment:**

45. **Overall risk for bias**

Mark only one oval per row.

	Unclear	Low	Moderate	High
A1) Selection bias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A2) Bias in exposure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A3) Bias in outcome measures	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A4) Bias in loss to follow-up	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
A5) Bias in reporting results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

46. **Comment:**

47. **B. Conflict of interests**

Mark only one oval per row.

	Yes	No	Lack of info	Not applicable
a) Is it a low risk that the study's results were affected by conflicts of interest, based on the bindings stated by the authors?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Is it a low risk that the results were affected by a sponsor with financial interest in the outcome?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

48. **Comment:**

49. **C. Transferability**

Mark only one oval per row.

	Yes	No	Partially	Not applicable
a) Is the study's context consistent with the focus of the present review?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

50. **Comment:**

51. **D. Study design and statistical methodology**

Mark only one oval per row.

	Yes	No	Partially	Not applicable
a) Is the study design adequate for the investigated research question?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b) Is the study design and number of participants adequate to obtain statistical power?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c) Where the associations high (e.g. odds ratio <0.5 or odds ratio >2.0) between occupational exposure and mental health outcome?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d) Where the associations very high (e.g. odds ratio <0.2 or odds ratio >5.0) between occupational exposure and mental health outcome?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e) Is there a correlation between dose and response for occupational exposure and mental health outcome?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

52. **Comment**

53. **Overall assessment**

Mark only one oval.

- Low quality
- Low/moderate (unclear; request opinion from additional reviewer)
- Moderate quality
- High quality

54. **Is assessment by a third/senior reviewer required?**

Mark only one oval.

- Yes
- No
- Maybe

55. **Reason/questions for additional reviewer:**

56. **Useful quotes (paste one or many):**
