BMJ Open Systematic review and meta-analysis of the prevalence of depressive symptoms, dysthymia and major depressive disorders among homeless people

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ABSTRACT

Objectives To assess the global prevalence estimates of depressive symptoms, dysthymia and major depressive disorders (MDDs) among homeless people.

Design Systematic review and meta-analysis.

Data sources Databases including PubMed, Scopus and Web of Science were systematically searched up to February 2020 to identify relevant studies that have reported data on the prevalence of depressive symptoms, dysthymia and MDDs among homeless people.

Eligibility criteria Original epidemiological studies written in English that addressed the prevalence of depressive problems among homeless people.

Data extraction and synthesis A random-effect meta-analysis was performed to pool the prevalence estimated from individual studies. Subgroup and sensitivity analyses were employed to compare the prevalence across the groups as well as to identify the source of heterogeneities. The Joanna Briggs Institute's quality assessment checklist was used to measure the study quality. Cochran's Q and the I^2 test were used to assess heterogeneity between the studies.

Results Forty publications, including 17 215 participants, were included in the final analysis. This meta-analysis demonstrated considerably higher prevalence rates of depressive symptoms 46.72% (95% CI 37.77% to 55.90%), dysthymia 8.25% (95% CI 4.79% to 11.86%), as well as MDDs 26.24% (95% CI 21.02% to 32.22%) among homeless people. Our subgroup analysis showed that the prevalence of depressive symptoms was high among younger homeless people (<25 years of age), whereas the prevalence of MDD was high among older homeless people (>50 years of age) when compared with adults (25–50 years).

Conclusion This review showed that nearly half, one-fourth and one-tenth of homeless people are suffering from depressive symptoms, dysthymia and MDDs, respectively, which are notably higher than the reported prevalence rates in the general population. The findings suggest the need for appropriate mental health prevention and treatment strategies for this population group.

BACKGROUND

Global epidemiological evidence shows that a substantial proportion of homeless people

Strengths and limitations of this study

- Estimating the prevalence of the different categories of depressive problems separately (depressive symptoms, dysthymia and major depressive disorders) and assessing the prevalence across the lifespan are the main strengths of the present systematic review and meta-analysis.
- The vast majority of the included studies were performed in high-income countries, and only three studies were conducted in low-income and middle-income countries, which significantly affects the global representativeness of the estimates.
- We included only peer-reviewed published articles.
- Only studies published in the English language were included in this meta-analysis, therefore, relevant studies published in another language might have been missed.

living in both high-income and low-income countries are suffering from mental, neurological and substance-use disorders.^{1–3} The reported prevalence estimates of mental, neurological and substance-use disorders among homeless people ranged from 25% to 92%.^{4–7} Research evidence indicates that the presence of mental and substance disorders among homeless people is frequently and consistently associated with a higher risk of negative outcomes including disability and mortality from alcohol and drug use, suicide and general medical conditions.^{8–12}

Regarding depressive problems, in particular, scientific evidence from numerous studies has shown that depressive problems are the most common mental health problems among homeless people.^{13–17} The reported prevalence estimates of depressive problems among the homeless people ranged from 9.5% to 76.9% across the studies.^{13–17} These prevalence rates are higher than the estimates in the general population

(5%–7.2%).^{18 19} Moreover, the vast majority of homeless people with depressive problems have comorbid physical disease, mental and substance-use disorders.^{1 3 20} Epidemiological evidence suggests that comorbid conditions in patients with depressive disorders are associated with more severe disability, suffering, suicide, as well as higher mortality rates from different causes when compared with non-comorbid depressive disorders.^{8–11 21–25}

However, to the best of our knowledge, there is no previous systematic review and meta-analysis that measured the global prevalence estimates of depressive symptoms, dysthymia and major depressive disorders (MDDs) among homeless people. This study fills this gap in the literature by analysing the global prevalence estimates of those depressive problems among homeless people. The finding from such analysis will provide robust data on depressive problems among homeless individuals, which in turn helps policy-makers and programme managers in developing policy solutions and designing appropriate and effective intervention strategies for those population groups.

METHODS

Data sources and search strategies

This systematic review and meta-analysis was performed in accordance with the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).²⁶ We used a predesigned protocol (unpublished) for searching, extracting data, inclusion or exclusion of studies, assessing quality and data analysis. A systematic search of relevant studies was carried out in three reputable databases—PubMed, Scopus and Web of Science using keywords and combinations tailored to each database. The details about the searching technique are in online supplemental material 1. In addition, the reference lists of included studies were hand-searched to identify additional articles.

Eligibility criteria and study selection

In this systematic review and meta-analysis, studies were included if they: (1) were conducted among homeless people; (2) assessed the prevalence of depressive symptoms, dysthymia or MDDs or reported data to estimate the prevalence and (3) were written in English language. Studies were excluded if they satisfy the following criteria: (1) they were commentaries, reviews, case reports and animal studies; (2) they were letters, editorials, conference papers, books and notes.

Selection of studies for the inclusion in the systematic review and meta-analysis

In this systematic review and meta-analysis, the corresponding author (GA) identified articles and consequently evaluated them by their titles and abstract based on the eligibility criteria. Full-text articles were selected for further assessment by the author. This author further appraised the full text of each study and subsequently retained those full-text articles to be included in the final analysis.

Definition of key terms and concepts

Depressive disorders and dysthymia

This systematic review and meta-analysis combined studies from a wide range of settings and countries across the globe that reported the lifetime prevalence estimate of MDDs as well as dysthymia according to standard diagnostic criteria's, which were assessed by using standard diagnostic instruments such as the Diagnostic Statistical Manual of Mental disorders (DSM), Schedule for Clinical Assessment of Neuropsychiatry (SCAN), International Classification of Disease (ICD) and Composite International Neuropsychiatric Interview (CIDI) and Mini-International Neuropsychiatric Interview (MINI).

Depressive symptoms

The prevalence of depressive symptoms in this review indicates the current prevalence as measured by the screening instruments such as the Centre for Epidemiologic Surveys for Depression (CES-D), Depression, Anxiety and Stress Scale (DASS), Patient Health Questionnaire (PHQ-9) and Zung Self-rating Depression Scale.

Homelessness

There is no internationally consistent definition of homelessness. Some scholars (countries) define homelessness narrowly as the absence of access to safe shelter while others define broadly comprising those people living in marginal housing (marginal accommodations), people who are sleeping in public places or designed shelter and rooflessness.^{27 28} In this study, we have included studies that defined homelessness in various ways. Thus, homelessness represents the comprehensive definition mentioned above (which is beyond rooflessness).

Methods for data extraction and quality assessment

Two independent authors (AB and GA) performed data extraction from the included studies. We extracted the following data from each study: first author(s) name, country of the study, sample size, year of publication, tools used and a number of positive cases, and the reported prevalence of depressive symptoms, dysthymia and MDDs. The Joanna Briggs institute quality assessment tool was used to assess the quality of studies included in this meta-analysis.²⁹ According to this scale, the scoring of each study was conducted based on the frequency scales that are answered as yes, no, not clear (when some information is missing in the study) and not applicable (the question does not apply to that study depending on the design). The total quality score for each study was calculated based on the total number of positive scores.

Data synthesis and analysis

All statistical analysis was conducted by using comprehensive meta-analysis software version 3. The prevalence and 95% CI were calculated using a random-effect model.³⁰ The I^2 statistics was used to measure between-study heterogeneity.³⁰ The values of I^2 statistics such as 25, 50 and 75% represented low, medium and high heterogeneity, respectively.³¹ The ages of the participants and the

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flowchart of review search. This figure illustrates the process of searching for relevant studies from the three reputable databases including identification, selection, eligibility and inclusion of the studies depending on the predefined criteria.

quality of the studies were used to determine the possible source of heterogeneity between the studies. Publication bias was assessed by using the funnel plot and Egger's regression tests. For all analyses, the p value for statistical significance was set at 0.05.

Patient and public involvement

Patient and the public were not involved in this study.

RESULTS

Identification of relevant studies

After database searches performed strictly according to a predesigned protocol, 3388 studies were identified through an electronic database search. Further 13 studies have been added using manual searches making the total studies 3401. Of these, we excluded 2703 articles during the assessment of duplicate and titles, as they did not satisfy the selection criteria. Subsequently, 328 articles were excluded after the assessment of the abstract as they did not meet the inclusion criteria. Hence, a full text of 73 articles were retained for further evaluation and 40 of these were found to be eligible for meta-analysis (figure 1).

Characteristics of included studies

Overviews of the key characteristics of the studies included in this systematic review and meta-analysis are shown in table 1. A total of 40 studies, with 17215 participants, were included in the analysis. Majority of these studies (n=21) were conducted in the USA, and six were conducted in Canada, two in Australia, two in Germany, two in the UK, two in France, one in Spain, one in Japan, one in Iran, one in Serbia, one in Netherlands and one in Ethiopia.¹ The eligible articles were published between 1989 and 2017. The sample size for the included studies ranged from 36 participants in Germany to 2838 participants in the USA.

Regarding the specific outcomes, 21 studies assessed depressive symptoms, 20 assessed MDDs and 5 assessed dysthymia (chronic minor depressive disorders).

Depressive symptoms among homeless people were predominantly measured using the Centre for Epidemiological Studies Depression Scale-Revised (CES-D). The CES-D was used in 11 studies, Beck's Depression Inventory (BDI) in 2 studies, PHQ in 2 studies, DASS, Rost-Burnam Screener for Depression (RBSD) in 1 study and 1 study used a self-reported history of depressive symptoms.

Regarding MDDs, the majority (n=11) of the studies used the DSM to measure MDD. While five studies used Composite International Neuropsychiatric Interview (CIDI), five studies used MINI and ICD applied in one study. All studies used DSM to measure dysthymia.

Quality of included studies

Table 2 demonstrates the risk of bias and the quality of the included articles. Twenty-eight studies used an adequate sample size (71.79%) to measure the prevalence of depressive problems. About one-third of the studies scored positive on the item regarding response rate (35.89%), and the remaining studies scored negative (64.11%). To measure depressive problems, the vast majority of the studies used a standard instrument or valid diagnostic criteria (97.43%), and almost all studies used a study-specific questionnaire or instrument specifically designed to assess depressive problems (97.43%). All studies (100%) used appropriate statistical analysis to assess the prevalence of depressive problems. According to the Joanna Briggs institute quality assessment checklist, the included articles had a mean quality score of 7.71 ranging from 5 to 9. Twenty-five studies (64.10%) were high-quality studies (scored 7.71 and above) and the remaining were fair-quality studies (scored between 5 and 7.71) (table 2).

The prevalence of depressive symptoms in homeless people (meta-analysis)

The pooled prevalence estimates of depressive symptoms in the homeless people was found to be 46.72% (95% CI 37.77% to 55.90%). The heterogeneity across the studies was significant for this analysis ($I^2=97.57\%$; $p<0.001$) (figure 2).

Table 1 Distribution of studies on depression in homeless people included in the qualitative and quantitative analysis based on year, study design, sample size, instrument, country, response rate, study population and prevalence

Author (year) (reference number)	Sample size	Tools used	Country	Study population	Outcome (magnitude of depressive problems)
Landefeld <i>et al</i> (2017) ²¹	348	Centre for Epidemiologic Surveys for Depression (CES-D)	USA	Old adults age ≥50	Depressive symptoms 53.5% (n=185)
Bacciardi <i>et al</i> (2018) ³²	489	Mini-International Neuropsychiatric Interview (MINI)	USA	Adult with TBI	Depressive symptoms 35.78% (n=175)
Rogers <i>et al</i> (2017) ³³	124	Rost-Burnam Screener for Depression (RBSD)	USA	Adults ≥50	Depressive symptoms 52 (n=64)
Lee <i>et al</i> (2017) ¹³	156	CES-D	USA	Adults	Depressive symptoms 120 (77.5%)
Palar <i>et al</i> (2015) ³⁴	346	Beck Depression Interview (BDI)	USA	Adults with HIV	Depressive symptoms 139 (35.8%)
Noël <i>et al</i> (2016) ³⁵	497	MINI	Canada	Adults with mental health problems	Depressive symptoms 40% (n=199)
Roze <i>et al</i> (2018) ³⁶	733	Composite International Neuropsychiatric Interview (CIDI)	France	Women (adults)	MDD 28.8%
Sarajlija <i>et al</i> (2014) ³⁷	104	BDI	Serbia	Adults	MDD 15.4% (n=16) Depressive symptoms 62.5% (n=65/104)
Berg <i>et al</i> (2005) ¹⁴	415	CES-D	USA	Adults (18–55) with latent TB	Depressive symptoms 50% (n=209)
Topolovec-Vranic <i>et al</i> (2017) ²⁰	990	MINI	Canada	Adults with mental health problems/TBI	MDD 42.1% (n=417/990)
Coohey <i>et al</i> (2015) ¹⁶	457	Diagnostic Statistical Manual of Mental disorders (DSM)	USA	Adults	26.25% (n=)
Pluck (2008) ³⁸	50	Zung Self-rating Depression Scale	UK	Adults	Depressive symptoms 62.14% (n=31)
Fletcher <i>et al</i> (2017) ³⁹	131	Structured Clinical Interview for DSM-IV Axis I Disorders (SCID)	USA	Adults who were have sex with men (MSM)	MDD 39% (n=51)
Gory <i>et al</i> (1990) ⁴⁰	150	CES-D	UK	Adult	Depressive symptoms 75% (n=150)
Susser <i>et al</i> (1989) ⁴¹	223	CES-D	USA	Adults (men)	Depressive symptoms 33% (n=74)
Munoz <i>et al</i> (1998) ⁴²	262 Madrid 1563 Los Angeles	CIDI Diagnostic Interview Schedule (DIS)	Spain	Adult	MDD Madrid 21% (n=55/262); MDD Los Angeles 21.2% (n=332/1563) Dysthymia Madrid 17.7% (n=47/262) Los Angeles 14.8% (n=231)
Nyamathi <i>et al</i> (2012) ⁴³	267	CES-D	USA	Adult (18–46) with G/B	Depressive symptoms 62.2% (n=166)
Ghose <i>et al</i> (2013) ⁴⁴	2838	International Classification of Disease (ICD)	USA	Adults (veterans)	MDD 9.5% (n=269)
Okamura <i>et al</i> (2014) ⁴⁵	423	Patient Health Questionnaire (PHQ2 (two question Instrument))	Japan	Adults	Depressive symptoms 28.9% (n=119/412)
Brown <i>et al</i> (2013) ¹⁵	472	PHQ-9	USA	Adults aged 50 years and older	Depressive symptoms 39.8% (n=99)
Logan <i>et al</i> (2013) ⁴⁶	208	Not mentioned	USA	Young adults aged 18–25 years	Depressive symptoms 64.4% (n=134)

Continued

Table 1 Continued

Author (year) (reference number)	Sample size	Tools used	Country	Study population	Outcome (magnitude of depressive problems)
Rhoades <i>et al</i> (2013) ⁴⁷	305	CES-D	USA	Adult men heterosexual (age >18)	Depressive symptoms 46.36% (n=141)
Strehlua <i>et al</i> (2012) ⁴⁸	196	MINI	Canada	Women with age 19–25	MDD 29% (n=56)
Prinsloo <i>et al</i> (2012) ⁴⁹	38	SCID	Iran	Adult with age ≥26	MDD 42.1% (n=16)
Whitbeck <i>et al</i> (2012) ⁵⁰	112	CIDI	Canada	Adult	MDD 29.7% (n=33)
Hadland <i>et al</i> (2011) ³	559	CES-D	Canada	Young with age 14–26	Depressive symptoms 43.4% (n=194)
Crawford <i>et al</i> (2011) ¹⁷	241	CIDI	USA	Young women with age b/n 16 and 19	MDD 32.50% (n=73)
Nyamathi <i>et al</i> (2012) ⁵¹	156	CES-D	USA	Young adults	Depressive symptoms 52.60% (n=82)
Larney <i>et al</i> (2009) ⁵²	105	Depression, Anxiety and Stress Scale (DASS)	Australia	Adult	Depressive symptoms 44.76% (n=47)
Greifenhagen <i>et al</i> (1997) ⁵³	36	DSM	Germany	Adult women	MDD 50% (n=16) Dysthymia 6 % (n=2)
Koegel <i>et al</i> (1998) ⁵⁴	445	DSM	USA	Adult	MDD 18.3% (n=60) Dysthymia 9.3% (n=41)
Fichter <i>et al</i> (2001) ⁵⁵	265	SCID	Germany	Adult men	MDD 21.1% (n=59)
Kovess <i>et al</i> (1999) ⁵⁶	838	CIDI	France	Adult	MDD 33.7% (n=241)
Rohde <i>et al</i> (2001) ⁵⁷	523	SCID	USA	Adolescent age less than 21	Depressive symptoms 17.6% (n=92), MDD 12.2% (n=61) and dysthymia 6.5% (n=34)
Spinelli <i>et al</i> (2017) ⁵⁸	350	CES-D	USA	Adult with age 50 and above	Depressive symptoms 38.3% (n=134)
Van Straaten <i>et al</i> (2014) ⁵⁹	385	DASS	Netherlands	All homeless	Depressive symptoms 41.55% (n=160)
Bassuk <i>et al</i> (1986) ⁶⁰	80	DSM	USA	Adult	MDD 12.5% (n=10)
Herman <i>et al</i> (1989) ⁶¹	382	DSM	Australia	Adult	MDD 20% (n=78)
Ayano <i>et al</i> (2017) ¹	456	DSM	Ethiopia	Adult	MDD 9.6% (n=44)
Krausz <i>et al</i> (2013) ⁶²	489	MINI	Canada	—	MDD 45.429% (n=222) Dysthymia 4.7 (n=23)

MDD, major depressive disorders; TBI, Traumatic Brain Injury.

The prevalence of MDDs in homeless people (meta-analysis)

The pooled prevalence of MDDs was 26.24% (95% CI 21.02% to 32.22%). Significant heterogeneity has been found for this analysis ($I^2=97.57$; $p<0.001$) (figure 3).

The prevalence of persistent depressive disorders (dysthymia) disorder in homeless people

Our random-effects meta-analysis resulted in pooled prevalence estimates of dysthymia in the homeless people 8.25% (95% CI 4.79% to 11.86%). This analysis

also resulted in a significant heterogeneity between the studies ($I^2=89.80$ %; $p<0.001$) (figure 4).

Sensitivity analysis

Table 3 illustrates the results of the subgroup and sensitivity analysis. We conducted a sensitivity analysis by the age of the participants, the sample size, the instrument used to measure depressive problems and the quality of the included studies in order to explore the possible source of heterogeneity in the analysis of the prevalence

Table 2 The quality of studies included in the systematic review and meta-analysis

Study name	Response									Total
	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	
Landefeld <i>et al</i> ²¹	Y	N	Y	Y	Y	Y	Y	Y	U	7
Bacciardi <i>et al</i> ³²	Y	N	Y	Y	Y	Y	Y	Y	U	7
Rogers <i>et al</i> ³³	Y	N	N	Y	Y	N	Y	Y	U	6
Lee <i>et al</i> ¹³	Y	N	N	Y	Y	N	Y	Y	U	6
Palar <i>et al</i> ³⁴	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Noel <i>et al</i> ³⁵	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Roze <i>et al</i> ³⁶	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Sarajlija <i>et al</i> ³⁷	Y	N	Y	Y	Y	Y	Y	Y	Y	8
Berg <i>et al</i> ¹⁴	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Topolovec-Vranic <i>et al</i> ²⁰	N	Y	Y	Y	Y	Y	Y	Y	U	7
Coohey <i>et al</i> ¹⁶	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Pluck <i>et al</i> ³⁸	N	N	N	Y	Y	Y	Y	Y	U	5
Fletcher <i>et al</i> ³⁹	N	N	N	Y	Y	Y	Y	Y	U	5
La Gory <i>et al</i> ⁴⁰	Y	Y	N	Y	Y	Y	Y	Y	U	7
Susser <i>et al</i> ⁴¹	Y	Y	N	Y	Y	Y	Y	Y	U	7
Munoz <i>et al</i> ⁴²	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Nyamathi <i>et al</i> ⁴³	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Ghose <i>et al</i> ⁴⁴	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Okamura <i>et al</i> ⁴⁵	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Brown <i>et al</i> ¹⁵	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Logan <i>et al</i> ⁴⁶	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Rhoades <i>et al</i> ⁴⁷	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Strehlua <i>et al</i> ⁴⁸	N	Y	Y	Y	Y	Y	Y	Y	U	8
Prinsloo <i>et al</i> ⁴⁹	N	Y	N	Y	Y	Y	Y	Y	Y	7
Whitbeck <i>et al</i> ⁵⁰	N	Y	N	Y	Y	Y	Y	Y	U	6
Hadland <i>et al</i> ³	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Crawford <i>et al</i> ¹⁷	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Nyamathi <i>et al</i> ⁵¹	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Larney <i>et al</i> ⁵²	N	Y	N	Y	Y	Y	Y	Y	Y	7
Greifenhagen <i>et al</i> ⁵³	N	Y	N	Y	Y	Y	Y	Y	Y	7
Koegel <i>et al</i> ⁵⁴	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Fichter <i>et al</i> ⁵⁵	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Kovess <i>et al</i> ⁵⁶	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Rohde <i>et al</i> ⁵⁷	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Spinelli <i>et al</i> ⁵⁸	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Van Straaten <i>et al</i> ⁵⁹	Y	Y	Y	Y	Y	Y	Y	Y	Y	9
Bassuk <i>et al</i> ⁶⁰	N	Y	N	Y	Y	Y	Y	Y	U	6
Herman <i>et al</i> ⁶¹	Y	Y	Y	Y	Y	Y	Y	Y	U	8
Ayano <i>et al</i> ¹	Y	Y	Y	Y	Y	Y	Y	Y	Y	9

A. Q1–Q9 represents questions used to assess the quality of included studies, which are listed below.

Q1. Was the sample frame appropriate to address the target populations?

Q2. Were the study participants sampled in appropriate way?

Q3. Was the sample size adequate?

Q4. Were the study subjects and setting described in details?

Q5. Was the data analysis conducted with sufficient coverage of the identified sample?

Q6. Was a valid method used in the identification of conditions?

Q7. Was the condition measured in a standard, reliable way for all participants?

Q8. Was there an appropriate statistical analysis?

Q9. Was the response rate adequate, and if not, was the low response rate managed appropriately?

N, no; NA, not applicable; U, unclear; Y, yes.

Figure 2 The prevalence of depressive symptoms among homeless people: a meta-analysis. The figure shows the results of the meta-analysis of the studies on depressive symptoms among homeless people using random-effect model.

of depressive problems in the homeless people. All the sensitivity analyses were conducted by using a random-effect model.

Our analysis based on the age of the participants demonstrated that the prevalence of depressive symptom was high among younger homeless people (<25 years of age), whereas the prevalence of MDD was high among older homeless people (>50 years of age) when compared with adults (25–50 years). The prevalence of depressive symptoms was 58.21% for younger participants and it was 44.76% and 47.44% for adult and older participants, respectively. In these sensitivity analyses, the observed difference in the magnitude of depressive symptoms by the age of the participants was not statistically significant ($p=0.261$).

Similarly to depressive symptoms, we found no significant difference in the prevalence of depressive disorders

Figure 3 The prevalence of major depressive disorders (MDDs) among homeless people: a meta-analysis. The figure shows the results of the meta-analysis of the studies on MDDs among homeless people using random-effect model.

Figure 4 The prevalence of dysthymia among homeless people: a meta-analysis. The figure shows the results of the meta-analysis of the studies on dysthymia among homeless people using random-effect model.

by the age of the participants ($p=0.839$). The prevalence of depressive disorder was 22.98% for younger participants and it was 25.38% and 29.89% for adult and older participants, respectively.

In our sensitivity analysis based on the quality of included studies, the pooled estimated prevalence of depressive symptoms was 40.45% for high-quality studies and it was 57.03% for fair-quality studies, although the difference observed was not statistically significant ($p=0.059$). Likewise, the prevalence of depressive disorder was 21.75% as measured for high-quality studies and it was 32.45% for fair-quality studies, although the difference observed was statistically significant ($p=0.002$) (table 2).

We also found that the prevalence of depressive disorders was highest when measured by MINI (33.64%) followed by CIDI (27.42%), Structured Clinical Interview for DSM-IV Axis I Disorders (21.66%) and DSM (20.18%). However, the observed differences across the tools were not statistically significant ($p>0.05$).

Moreover, our sensitivity analysis based on the sample size revealed that the prevalence estimates of both depressive symptoms as well as depressive disorders were found to be considerably higher in studies that involved a lower small sample size when compared with studies that involved a higher sample size.

Finally, one of the studies included in the final analysis was conducted among female participants only. When we remove this study from the final analysis, the prevalence estimates remained virtually the same 26.13% (95% CI 20.76% to 32.33%).

Publication bias

In this review, the funnel plot was symmetrical and regression tests associated with the funnel plot (Egger's test) provided no evidence of potential publication bias for the prevalence of depressive symptoms ($B=5.11$, $SE=35.78$, $p=0.390$) as well as depressive disorders ($B=0.289$, $SE=3.26$, $p=0.930$) (figures 5 and 6).

DISCUSSION

To our knowledge, this is the first comprehensive systematic review and meta-analysis on the prevalence of depressive symptoms, dysthymia and MDDs among homeless people. We found 39 studies measuring the three types of depressive problems among homeless people: depressive

Table 3 Subgroup and sensitivity analysis of prevalence of depressive problems among homeless participants by age and quality of the studies

Subgroup	Number of studies	Estimates		Heterogeneity across the studies		Heterogeneity between groups (p value)
		Prevalence (%)	95% CI	I ² (%)	P value	
Age (depressive symptom)						
Adult	13	44.76	32.95 to 57.20	98.04	<0001	0.261
Older	3	47.44	37.22 to 57.88	88.14	<0001	
Younger	2	58.21	46.13 to 69.38	88.6	<0001	
Age (depressive disorders)						
Adult	16	25.38	19.44 to 32.40	97.72	<0001	0.839
Older	2	29.89	14.84 to 51.05	95.28	<0001	
Younger	3	22.98	11.96 to 39.58	95.79	<0001	
Quality of the study (depressive symptoms)						
High	11	40.45	29.68 to 52.23	93.3	<0.0001	0.059
Fair	7	57.03	44.39 to 68.81	98.17	<0.0001	
Quality of the study (depressive disorders)						
High	14	21.75	16.67 to 27.86	81.24	<0.0001	0.002
Fair	7	35.45	29.31 to 42.11	97.43	<0.0001	
Sample size (depressive symptoms)						
300 and above	14	37.3	27.05 to 48.82	98.09	<0.0001	0.008
300 and above	14	59.18	47.74 to 69.69	93.41	<0.0001	
Sample size (depressive disorders)						
300 and above	14	23.91	17.99 to 31.04	98.23	<0.0001	0.397
Below 300	8	27.81	22.12 to 34.32	79.69	<0.0001	

symptoms, MDDs and dysthymia. Our analysis resulted in a considerably higher prevalence of depressive symptoms, (46.72%), MDDs (26.24%), as well as dysthymia (8.25%) among homeless people. These prevalence rates are notably higher compared with that of the general population, suggesting depressive symptoms, MDDs and dysthymia are important and global public health issues

among homeless people requiring urgent attention in terms of prevention and treatments.

The review showed that the existing literature on the prevalence of depressive symptoms, MDDs and dysthymia, among homeless people demonstrated a significant variation depending on the age of the participants and the reported quality of the studies. The vast majority of the included studies were performed in high-income countries (92.5%; n=37) and only a few studies were performed in low-income and middle-income countries (7.5%; n=3). Almost all studies used standard instruments to measure

Figure 5 The risk of publication bias for the prevalence of depressive symptoms among homeless people. **Figure 6** The risk of publication bias for the prevalence of major depressive disorders among homeless people.

the prevalence of depressive symptoms, MDDs and dysthymia among the homeless people.

The results of our systematic review and meta-analysis suggest that nearly half of homeless people have experienced depressive symptoms. Thus, the prevalence of depressive symptoms among homeless people is 6.5 times higher than the estimates in the general population (7.2%).¹⁸ One of the possible explanations for this difference could be the higher prevalence rates of acute and chronic medical conditions, including HIV/AIDS, tuberculosis and other medical problems among the homeless people that possibly increase the risks of psychiatric disorders including depressive symptoms as reported in many previous studies.^{24 63–67} Another possible explanation is that homeless people are more likely to experience sexual assault and physical abuse that is frequently and consistently associated with a higher risk of depressive problems among the exposed individuals.^{68–71} Finally, when compared with the general population the magnitude of substance-use disorders, as well as other psychiatric problems, are considerably high among homeless people, which are associated with greater risks of depressive symptoms among the homeless.^{1 2 7 54 72}

Our study showed that more than one-fourth of the homeless people had MDDs, which was 2.30 times higher than the estimates from a previous systematic review conducted in Western countries among the homeless (11.4%).² The reason for variation in the prevalence could be due to: (1) the previous study was conducted only in Western countries, and this study included studies from developed as well as developing countries. Thus, the potential reason for the higher prevalence of depressive disorders in this study may be due to the inclusion of new studies including studies from low-income and middle-income countries. (2) The variation in characteristics of the participants across the countries in terms of experiencing the potential contributing factors that increase the risk of MDDs.

Surprisingly, the prevalence of MDDs in this study was 5.25 times higher than the global prevalence of MDD in the general population reported by a recent meta-analysis (5%).¹⁹ Similarly, pooled prevalence estimates in this study was 1.5–3 times higher than the pooled prevalence estimates of dysthymia in the general population (3%–6%).⁷³ As discussed earlier, the possible factors for the higher prevalence in homeless people could be due to the presence of stressful life events, as well as comorbid medical, mental and substance-use disorders among the homeless people.^{1 2 24 54 63–72}

This review also showed that the prevalence of depressive symptoms was high among younger homeless people (<25 years of age), whereas the prevalence of MDD was high among older homeless people (>50 years of age) when compared with adults (25–50 years). The findings support the views that depressive disorders are common in older people than younger adults and they are more likely to be severe in presentation, display cognitive changes and more complex presentations with high

somatic symptoms.⁷⁴ The possible risk factors for these include age-related neurobiological changes, cognitive diathesis and increased rates of stressful life events.^{75–77}

Strengths and limitations

Estimating the prevalence of the different categories of depressive problems separately (depressive symptoms, dysthymia and MDDs) and assessing the prevalence across the lifespan are the main strengths of the present systematic review and meta-analysis.

Nevertheless, our study has some limitations: first, the vast majority of the included studies were performed in high-income countries and only three studies were conducted in low-income and middle-income countries, which significantly affects the global representativeness of the estimates. Second, we included only peer-reviewed published articles so book reviews, grey literature, editorials and letters were excluded from the study during the selection process. Third, studies published in the English language are only included, which suggests that relevant studies published in another language might be missed. In fact, our evaluation of possible publication bias (small study effects due to possible missingness) revealed that the funnel plot was symmetrical and Egger's regression tests provided no evidence of substantial publication bias for the prevalence of depressive symptoms, dysthymia, as well as MDDs among the homeless people. Fourth, the observed heterogeneity across the studies used to measure depressive problems was the other limitation of the current meta-analysis. To further detect the potential source of heterogeneity, we conducted a sensitivity analysis by the age of the participants, the sample size, the instrument used to measure the outcome and the quality of the included studies. Our analysis revealed that the quality of the studies and the sample size explained some of the observed heterogeneity ($p < 0.05$). Nevertheless, the results should be interpreted with caution. Fifth, we were unable to conduct sensitivity analysis stratified by the type of comorbid mental or substance-use disorders, trauma experiences, as well as comorbid medical conditions including HIV/AIDS due to a limited number of studies in each subgroup.

The other limitation of the study is that only one reviewer (GA) conducted the selection of the studies. However, this is not a major concern in our systematic review and meta-analysis since our assessment of publication bias showed no evidence of significant publication bias or small study effects for the prevalence of depressive symptoms ($B = 5.11$, $SE = 35.78$, $p = 0.390$) as well as depressive disorders ($B = 0.289$, $SE = 3.26$, $p = 0.930$), suggesting the effects of missed studies (if any) were not statistically significant. In addition, we have involved two independent investigators for data extraction and quality assessment. The existing guidelines in systematic review and meta-analysis including Cochrane library and PRISMA suggest quality assessment and data extraction must be performed by two independent investigators.^{26 78} However, involving the

second author in entire processes including selection and screening is not mandatory (optional).^{26 78} In fact, a recent systematic review indicated that the involvement of more than one reviewer in the entire process could increase the probability of including more studies in the final review.⁷⁹ Another systematic review on the subject revealed no significant differences in the rates of effectiveness (avoiding the number of studies with inappropriate exclusions) in studies that involved a second author in the entire process and studies that did not.⁸⁰

The implication of the findings

Our findings suggest the urgent need for robust studies to explore the possible reasons for the higher prevalence of depressive symptoms, depressive disorders and dysthymia among homeless people as compared with the reported magnitude in the general population. In addition, further studies to estimate the prevalence of depressive problems in low-income and middle-income countries are warranted. Finally, given the high prevalence rates of depressive problems and their potential negative consequences, early screening and interventions should be considered among those population groups. The intervention strategies might include the integration of homelessness, mental health, physical health, as well as alcohol and drug use and other human services, working in a coordinated and joined-up way to deliver tailored and holistic interventions for those population groups.

CONCLUSION

This systematic review and meta-analysis revealed that the prevalence of depressive symptoms, dysthymia and depressive disorders are notably high among homeless people, underlying the importance of early screening and prevention for depressive problems among homeless people. Further strong studies are needed to examine the possible reasons for the higher prevalence of depressive problems among homeless people. Also, future robust and informative studies need to investigate better mechanisms of prevention, screening and detection management of those problems among homeless people.

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REFERENCES

- 1 Ayano G, Assefa D, Haile K, *et al*. Mental, neurologic, and substance use (MNS) disorders among street homeless people in Ethiopia. *Ann Gen Psychiatry* 2017;16:40.
- 2 Fazel S, Khosla V, Doll H, *et al*. The prevalence of mental disorders among the homeless in Western countries: systematic review and meta-regression analysis. *PLoS Med* 2008;5:e225.
- 3 Hadland SE, Marshall BDL, Kerr T, *et al*. Depressive symptoms and patterns of drug use among street youth. *J Adolesc Health* 2011;48:585–90.
- 4 Scott J. Homelessness and mental illness. *Br J Psychiatry* 1993;162:314–24.
- 5 Breakey WR, Fischer PJ, Kramer M. Health and mental health problems of homeless men and women in Baltimore. *JAMA* 1989;262:1352–7.
- 6 Gelberg L, Linn LS. Demographic differences in health status of homeless adults. *J Gen Intern Med* 1992;7:601–8.
- 7 Ayano G, Tesfaw G, Shumet S. The prevalence of schizophrenia and other psychotic disorders among homeless people: a systematic review and meta-analysis. *BMC Psychiatry* 2019;19:370.
- 8 Babidge NC, Buhrich N, Butler T. Mortality among homeless people with schizophrenia in Sydney, Australia: a 10-year follow-up. *Acta Psychiatr Scand* 2001;103:105–10.
- 9 Hwang SW. Mortality among men using homeless shelters in Toronto, Ontario. *JAMA* 2000;283:2152–7.
- 10 Prigerson HG, Desai RA, Liu-Mares W, *et al*. Suicidal ideation and suicide attempts in homeless mentally ill persons: age-specific risks of substance abuse. *Soc Psychiatry Psychiatr Epidemiol* 2003;38:213–9.
- 11 Barrow SM, Herman DB, Córdova P, *et al*. Mortality among homeless shelter residents in New York City. *Am J Public Health* 1999;89:529–34.
- 12 Ayano G, Tsegay L, Abraha M, *et al*. Suicidal ideation and attempt among homeless people: a systematic review and meta-analysis. *Psychiatr Q* 2019;90:829–42.
- 13 Lee KH, Jun JS, Kim YJ, *et al*. Mental health, substance abuse, and suicide among homeless adults. *J Evid Inf Soc Work* 2017;14:229–42.
- 14 Berg J, Nyamathi A, Christiani A, *et al*. Predictors of screening results for depressive symptoms among homeless adults in Los Angeles with latent tuberculosis. *Res Nurs Health* 2005;28:220–9.

- 15 Brown RT, Kiely DK, Bharel M, *et al.* Factors associated with geriatric syndromes in older homeless adults. *J Health Care Poor Underserved* 2013;24:456–68.
- 16 Coohy C, Easton SD, Kong J, *et al.* Sources of psychological pain and suicidal thoughts among homeless adults. *Suicide Life Threat Behav* 2015;45:271–80.
- 17 Crawford DM, Trotter EC, Hartshorn KJS, *et al.* Pregnancy and mental health of young homeless women. *Am J Orthopsychiatry* 2011;81:173–83.
- 18 Lim GY, Tam WW, Lu Y, *et al.* Prevalence of depression in the community from 30 countries between 1994 and 2014. *Sci Rep* 2018;8:2861.
- 19 Steel Z, Marnane C, Iranpour C, *et al.* The global prevalence of common mental disorders: a systematic review and meta-analysis 1980–2013. *Int J Epidemiol* 2014;43:476–93.
- 20 Topolovec-Vranic J, Schuler A, Gozdzik A, *et al.* The high burden of traumatic brain injury and comorbidities amongst homeless adults with mental illness. *J Psychiatr Res* 2017;87:53–60.
- 21 Landefeld JC, Miaskowski C, Tieu L, *et al.* Characteristics and factors associated with pain in older homeless individuals: results from the health outcomes in people experiencing homelessness in older middle age (hope home) study. *J Pain* 2017;18:1036–45.
- 22 Bender K, Brown SM, Thompson SJ, *et al.* Multiple victimizations before and after leaving home associated with PTSD, depression, and substance use disorder among homeless youth. *Child Maltreat* 2015;20:115–24.
- 23 Smith EM, North CS, Spitznagel EL. Alcohol, drugs, and psychiatric comorbidity among homeless women: an epidemiologic study. *J Clin Psychiatry* 1993.
- 24 Martens WH. A review of physical and mental health in homeless persons. *Public Health Rev* 2001;29:13–33.
- 25 North CS, Smith EM, Spitznagel EL. Violence and the homeless: an epidemiologic study of victimization and aggression. *J Trauma Stress* 1994;7:95–110.
- 26 Moher D, Shamseer L, Clarke M, *et al.* Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015;4:1.
- 27 Homelessness in Australia. *An introduction/edited by Chris Chamberlain, Guy Johnson & Catherine Robinson*. Sydney: NewSouth Publishing, 2014.
- 28 Clifford B, Wilson A, Harris P. Homelessness, health and the policy process: a literature review. *Health Policy* 2019;123:1125–32.
- 29 Dévieux JG, Malow RM, Attonito JM, *et al.* Post-traumatic stress disorder symptomatology and alcohol use among HIV-seropositive adults in Haiti. *AIDS Care* 2013;25:1210–8.
- 30 Borenstein M, Hedges LV, Higgins JPT, *et al.* A basic introduction to fixed-effect and random-effects models for meta-analysis. *Res Synth Methods* 2010;1:97–111.
- 31 Higgins JPT, Thompson SG, Deeks JJ. Measuring inconsistency in meta-analyses. *BMJ* 2003;327:557–60.
- 32 Bacciardi S, Marenmani AGI, Nikoo N, *et al.* Is bipolar disorder associated with traumatic brain injury in the homeless? *Riv Psichiatr* 2017;52:40–6.
- 33 Rogers CR, Robinson CD, Arroyo C, *et al.* Colorectal cancer screening uptake's association with psychosocial and sociodemographic factors among homeless blacks and whites. *Health Educ Behav* 2017;44:928–36.
- 34 Palar K, Kushel M, Frongillo EA, *et al.* Food insecurity is longitudinally associated with depressive symptoms among homeless and Marginally-Housed individuals living with HIV. *AIDS Behav* 2015;19:1527–34.
- 35 Noël F, Moniruzzaman A, Somers J, *et al.* A longitudinal study of suicidal ideation among homeless, mentally ill individuals. *Soc Psychiatry Psychiatr Epidemiol* 2016;51:107–14.
- 36 Roze M, Vandendorren S, van der waerden J, *et al.* Factors associated with depression among homeless mothers. Results of the ENFAMS survey. *J Affect Disord* 2018;229:314–21.
- 37 Sarajlija M, Jugović D, Zivaljević D, *et al.* Assessment of health status and quality of life of homeless persons in Belgrade, Serbia. *Vojnosanit Pregl* 2014;71:167–74.
- 38 Pluck G, Lee K-H, Lauder HE, *et al.* Time perspective, depression, and substance misuse among the homeless. *J Psychol* 2008;142:159–68.
- 39 Fletcher JB, Reback CJ. Mental health disorders among homeless, substance-dependent men who have sex with men. *Drug Alcohol Rev* 2017;36:555–9.
- 40 Gory ML, Ritchey FJ, Mullis J. Depression among the homeless. *J Health Soc Behav* 1990;31:87–102.
- 41 Susser E, Struening EL, Conover S. Psychiatric problems in homeless men. lifetime psychosis, substance use, and current distress in new arrivals at New York City shelters. *Arch Gen Psychiatry* 1989;46:845–50.
- 42 Muñoz M, Vázquez C, Koegel P. Differential patterns of mental disorders among the homeless in Madrid (Spain) and Los Angeles (USA). *Soc Psychiatr Psych Epidemiol* 1998;33:514–20.
- 43 Nyamathi A, Branson C, Idemudia F, *et al.* Correlates of depressed mood among young stimulant-using homeless gay and bisexual men. *Issues Ment Health Nurs* 2012;33:641–9.
- 44 Ghose T, Fiellin DA, Gordon AJ, *et al.* Hazardous drinking and its association with homelessness among veterans in care. *Drug Alcohol Depend* 2013;132:202–6.
- 45 Okamura T, Ito K, Morikawa S, *et al.* Suicidal behavior among homeless people in Japan. *Soc Psychiatry Psychiatr Epidemiol* 2014;49:573–82.
- 46 Logan JL, Frye A, Pursell HO, *et al.* Correlates of HIV risk behaviors among homeless and unstably housed young adults. *Public Health Rep* 2013;128:153–60.
- 47 Rhoades H, Wenzel SL. Correlates of prescription drug misuse among heterosexually active homeless men. *Subst Abuse* 2013;34:143–9.
- 48 Strehlau V, Torchalla I, Kathy LI, *et al.* Mental health, concurrent disorders, and health care utilization in homeless women. *J Psychiatr Pract* 2012;18:349–60.
- 49 Prinsloo B, Parr C, Fenton J. Mental illness among the homeless: prevalence study in a Dublin homeless hostel. *Ir J Psychol Med* 2012;29:22–6.
- 50 Whitbeck LB, Crawford DM, Sittner Hartshorn KJ. Correlates of homeless episodes among Indigenous people. *Am J Community Psychol* 2012;49:156–67.
- 51 Nyamathi A, Marfisee M, Slagle A, *et al.* Correlates of depressive symptoms among homeless young adults. *West J Nurs Res* 2012;34:97–117.
- 52 Larney S, Conroy E, Mills KL, *et al.* Factors associated with violent victimisation among homeless adults in Sydney, Australia. *Aust N Z J Public Health* 2009;33:347–51.
- 53 Greifenhagen A, Fichter M. Mental illness in homeless women: an epidemiological study in Munich, Germany. *Eur Arch Psychiatry Clin Neurosci* 1997;247:162–72.
- 54 Koegel P, Burnam MA. The prevalence of specific psychiatric disorders among homeless individuals in the inner city of Los Angeles. *Arch Gen Psychiatry* 1988;45:1085–92.
- 55 Fichter MM, Quadflieg N. Prevalence of mental illness in homeless men in Munich, Germany: results from a representative sample. *Acta Psychiatr Scand* 2001;103:94–104.
- 56 Kovess V, Mangin Lazarus C. The prevalence of psychiatric disorders and use of care by homeless people in Paris. *Soc Psychiatry Psychiatr Epidemiol* 1999;34:580–7.
- 57 Rohde P, Noell J, Ochs L, *et al.* Depression, suicidal ideation and STD-related risk in homeless older adolescents. *J Adolesc* 2001;24:447–60.
- 58 Spinelli MA, Ponath C, Tieu L, *et al.* Factors associated with substance use in older homeless adults: results from the hope home study. *Subst Abuse* 2017;38:88–94.
- 59 Van Straaten B, Schrijvers CTM, Van der Laan J, *et al.* Intellectual disability among Dutch homeless people: prevalence and related psychosocial problems. *PLoS One* 2014;9:e86112.
- 60 Bassuk EL, Rubin L, Lauriat AS. Characteristics of sheltered homeless families. *Am J Public Health* 1986;76:1097–101.
- 61 Herrman H, McGorry P, Bennett P, *et al.* Prevalence of severe mental disorders in disaffiliated and homeless people in inner Melbourne. *Am J Psychiatry* 1989;146:1179–84.
- 62 Krausz RM, Clarkson AF, Strehlau V, *et al.* Mental disorder, service use, and barriers to care among 500 homeless people in 3 different urban settings. *Soc Psychiatry Psychiatr Epidemiol* 2013;48:1235–43.
- 63 Dias M, Gaio R, Sousa P, *et al.* Tuberculosis among the homeless: should we change the strategy? *Int J Tuberc Lung Dis* 2017;21:327–32.
- 64 Fournier AM, Tyler R, Iwasko N, *et al.* Human immunodeficiency virus among the homeless in Miami: a new direction for the HIV epidemic. *Am J Med* 1996;100:582–4.
- 65 Sewell DD, Jeste DV, Atkinson JH, *et al.* HIV-associated psychosis: a study of 20 cases. San Diego HIV neurobehavioral research center group. *Am J Psychiatry* 1994;151:237–42.
- 66 Harris MJ, Jeste DV, Gleghorn A, *et al.* New-onset psychosis in HIV-infected patients. *J Clin Psychiatry* 1991;52:369–76.
- 67 Duko B, Ayano G. Suicidal ideation and attempts among people with severe mental disorder, Addis Ababa, Ethiopia, comparative cross-sectional study. *Ann Gen Psychiatry* 2018;17:23.
- 68 Mayo D, Corey S, Kelly LH, *et al.* The role of trauma and stressful life events among individuals at clinical high risk for psychosis: a review. *Front Psychiatry* 2017;8:55.

- 69 Morelli N, Fogler J, Tembulkar S, *et al.* Potentially traumatic events in youth with and at clinical high risk for psychosis. *Early Interv Psychiatry* 2019;13:805–9.
- 70 McGrath JJ, Saha S, Lim CCW, *et al.* Trauma and psychotic experiences: transnational data from the world mental health survey. *Br J Psychiatry* 2017;211:373–80.
- 71 Bechdolf A, Thompson A, Nelson B, *et al.* Experience of trauma and conversion to psychosis in an ultra-high-risk (prodromal) group. *Acta Psychiatr Scand* 2010;121:377–84.
- 72 Fischer PJ, Breakey WR. The epidemiology of alcohol, drug, and mental disorders among homeless persons. *Am Psychol* 1991;46:1115–28.
- 73 Saha S, Chant D, Welham J, *et al.* A systematic review of the prevalence of schizophrenia. *PLoS Med* 2005;2:e141.
- 74 Fiske A, Wetherell JL, Gatz M. Depression in older adults. *Annu Rev Clin Psychol* 2009;5:363–89.
- 75 Zuckerman M. Vulnerability to psychopathology: a biosocial model. in: vulnerability to psychopathology: a biosocial model. *Am Psychol Assoc* 1999.
- 76 Lister JP, Barnes CA. Neurobiological changes in the hippocampus during normative aging. *Arch Neurol* 2009;66:829–33.
- 77 Hardy SE, Concato J, Gill TM. Stressful life events among community-living older persons. *J Gen Intern Med* 2002;17:841–7.
- 78 Ryan R. *Cochrane Consumers and Communication Review Group*. 'Cochrane Consumers and Communication Group: meta-analysis', 2016.
- 79 Stoll CRT, Izadi S, Fowler S, *et al.* The value of a second reviewer for study selection in systematic reviews. *Res Synth Methods* 2019;10:539–45.
- 80 Shemilt I, Khan N, Park S, *et al.* Use of cost-effectiveness analysis to compare the efficiency of study identification methods in systematic reviews. *Syst Rev* 2016;5:140.