TITLE

Motivational Interviewing-based interventions for reducing substance misuse and increasing treatment engagement, retention, and completion in the homeless populations of high-income countries: an equity-focused systematic review and narrative synthesis

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KEY WORDS

homeless, drugs, alcohol, addiction, motivational interviewing

RUNNING HEAD

Motivational Interviewing with the homeless

POTENTIAL CONFLICTS OF INTEREST

None of the authors have any potential conflicts of interest in terms of the work presented in this paper.

WORD COUNT

5081 excluding abstract, tables and references

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ABSTRACT

Aim: Rising mortality and disease prevalence in the homeless have been largely attributed to addiction disorders. This review aimed to assess whether Motivational Interviewing (MI) is effective in changing substance misuse behaviours in the homeless, specifically: 1. reducing substance misuse; 2. increasing addiction treatment linkage; and 3. whether MI effectiveness varied according to the different levels of social disadvantage within homeless populations.

Method: Electronic databases and other sources were searched (to July 2021) for relevant randomized trials and comparative studies. Risk of bias in included studies was evaluated using the Cochrane Risk of Bias tool. A Narrative Synthesis framework was applied to included studies. Moderator variables subgroup analyses were planned *a priori*. PROSPERO study protocol registration: CRD42019134312

Results: The searches found 1885 records; after application of inclusion criteria n=11 studies from 30 articles were included in the review, all from the United States. There was a paucity of research regarding MI effectiveness for substance misuse outcomes in homeless populations, with a focus on short-term rather than long-term impacts. Risk of bias was generally low but was high for detection bias in most studies. MI appeared to be more effective overall amongst adult homeless persons, yielding consistently small effects, and alcohol use behaviours seemed to be more amenable to change as a result of MI/MET (Motivational Enhancement Therapy) interventions than drug use ones. Limited evidence with high risk of bias indicated that social gradient may at-

tenuate MI effectiveness within the young homeless population, with no impact in the most disadvantaged.

Conclusions: The review's mixed findings discourage the use of MI as a stand-alone substance use intervention in homeless populations. Although the review findings did not identify MI effectiveness for substance use according to the external level of social disadvantage faced by homeless persons, this should be a focus for further research.

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INTRODUCTION

Homelessness is a substantial issue in high-income countries. For example, the total number of people sleeping rough in England in 2018 was 165% higher than in 2010 **(Fitzpatrick et al., 2019)**. Moreover, in 2017 there were 597 homeless deaths, with many attributable to drug poisoning (32%) or were alcohol related (10%)**(Office for National Statistics, 2019)**. Higher prevalence of Hepatitis C infections and cardiovascular and respiratory conditions have been found in the homeless **(Aldridge et al., 2018; Fazel et al., 2014)** and these have been attributed, in part, to higher alcohol, smoking and illicit drugs exposure when compared with the non-homeless **(Fazel et al., 2014)**. The link between social inequity and homeless health inequalities seems persistent as estimates have shown that over a third of homeless deaths were attributable to substance misuse problems, with the average age of death of 47 years in males and 43 in females **(Thomas, 2012)**.

Whilst substance misuse, including tobacco smoking, is a significant behavioural determinant of poor health outcomes for homeless people in high-income countries, causal mechanisms involve "an interaction between individual and structural factors" (4)(p.1529). Homeless persons face differing levels of social adversity and should therefore be considered as heterogeneous groups within high-income countries **(Zerger, 2002)**. When implemented in the context of social heterogeneity and adversity, standard interventions with homeless groups, such as case management, supported housing offers or trauma-informed care, involve cross-discipline components of psychology, health, and social welfare.

In comparison, Motivational Interviewing (MI) is a low intensity intervention that emphasises respect for a person's autonomy **(British Psychological Society, 2010; Markland et al., 2005)**, thus it would likely be acceptable to homeless clients **(Orwin et al., 1999)**. MI has been defined as a collaborative dialogue that aims to facilitate a client's own motivation to change behaviour **(Rollnick et al., 2008)**. The concept of ambivalence has been central to these conversations, during which a person's ability to voice reasons for change ("change talk") co-occurs with verbalisations favouring the status quo ("sustain talk") **(R. Miller & Rollnick, 2013)**. MI clinical practice also emphasises its practitioners' acceptance of the client and empathy. These processes, together with collaboration, compassion, and evocation of motivations for change, constituted the so-called "MI spirit" construct **(R. Miller & Rollnick, 2013)**. Through consideration of these aspects of MI practice, Miller and Rose **(W. R. Miller & Rose, 2009)** proposed the emergent theory of MI. This theory elaborated on two hypothesised active ingredients of MI-based interventions – one being the relational component, comprising the practitioner's empathy and "MI spirit". The other one was the technical component pertaining to skills in evoking a client's "change talk". These technical and relational factors in the MI intervention were proposed to effect behavioural change **(W. R. Miller & Rose, 2009)**.

Historically, there has been uncertainty regarding MI effectiveness in distressed populations **(Moyer et al., 2002)**. Linked to this, reviews of a broader range of psychosocial interventions (PSI) for substance misuse and homelessness (12,13) found few MI studies in these groups, limiting conclusions. However, one systematic review has examined MI empirical studies across a 25-year period and suggested that MI could be particularly useful for socially-marginalised groups **(Lundahl et al., 2010)**. To date there has been no review specifically focusing on MI effectiveness in substance-using people who experience homelessness. Moreover, in any such review the "Inverse Equity Hypothesis", where an intervention has greater benefit for the less disadvantaged, thus increasing inequalities **(Tinner et al., 2018)**, should be considered **(V. A. Welch et al., 2013)**.

In our equity-focused systematic review we aimed to assess if MI-based interventions were effective for substance misuse behaviour change in persons experiencing homelessness in high income countries. Our objectives were to review:

1. MI effectiveness in reducing substance misuse in the homeless population.
2. MI effectiveness in substance abuse treatment linkage for homeless persons.
3. Whether MI had differential effects according to the levels of social disadvantage within homeless populations.

METHODS

We followed the design and reporting principles of the PRISMA-Equity 2012 guidelines and the objectives set out by the Campbell and Cochrane Equity Methods Group in their Homeless Health Guidelines project **(Pottie K, Kendall C, Bloch G, Welch V, Stergiopoulos V, Anderman A and Tugwell P, 2018; V. Welch et al., 2012)**. A protocol for the review was published on the PROSPERO database, registration number CRD42019134312 **(Orciari EA, Perman-Howe PR, Foxcroft DR, 2019)**.

PICOS framework

The PICOS model presented in Table 1 was used to define the review's research question. Main components of this framework corresponded to the following dimensions: "Population" of interest, "Intervention" to be evaluated in "Comparison" to its alternatives and, finally, measurable "Outcomes" **(Aveyard et al., 2016)**. "Study design" was explicitly added to the PICO framework as experimental studies are best suited to answer effectiveness questions **(A Aschengrau & GR Seage III, 2014)**.

Table 1 here

Inclusion and Exclusion criteria

Table 2 here

Inclusion/exclusion criteria are set out in Table 2. The review only included studies carried out in high-income economies, as classified by the World Bank on the basis of gross national income (GNI) per capita **(World Bank, 2018)**. It was expected that this approach would have the added benefit of focusing the enquiry on generating insights about within-country equity issues rather than confounding the findings with wider global inequalities. When defining the "target population", this review drew on the description of Multiple Exclusion Homelessness (MEH), considered as the state of homelessness along with at least one other, simultaneously occurring, "deep social exclusion" experience, such as substance misuse, experience of institutional care, as well as street activities, for instance, begging **(Fitzpatrick et al., 2012). The c**oncept of MEH has been chosen as it captures the complex interplay of individual and structural factors of the homelessness experience that generates multiple and complex needs.

Search Strategy

The search strategy did not contain keywords related to substance misuse reduction and treatment engagement outcomes as measurement in the studies was unlikely to be standardised **(Adams-Guppy & Guppy, 2016)**. An example of the PubMed database search strategy is presented in the Supplementary Material, with the truncated (*) keywords describing "Population" and

"Intervention" components of the review's research question, along with relevant MeSH headings.

The following electronic databases were searched (latest search July 2021): Academic Search Complete, , British Nursing Database, the Campbell Collaboration Online Library, CINAHL, Cochrane Library, the CRD Database, PsycINFO, PubMed, Web Of Science, ZETOC. In addition, as this review was equity-focused, an extension to the search strategy in the form of a manual search of the UK Centre for Homelessness Impact **(Centre for Homelessness Impact, 2018)** website and their evidence maps was undertaken. Due to the fact that this review evaluated a complex public health intervention, which was likely to involve few interrelating components **(Booth et al., 2016)**, these databases were chosen as they offered a cross-discipline body of research in psychology, health and social welfare.

Reference lists of the articles identified as eligible for review inclusion were also checked for additional studies, using a citation search snowballing method **(Booth et al., 2016)**. Manual website-based search and Web of Science were the tools used to conduct such citation tracking, minimising the likelihood that this review omitted the most recent study reports **(Aveyard et al., 2016)**.

Study selection and records management

After duplicates were removed via Mendeley reference manager software, the study selection process was conducted by the review team in two phases. The first screen of the studies involved scanning of the studies' titles and abstracts by one reviewer to initially evaluate the relevance to the inclusion and exclusion criteria. A second reviewer checked a 20% sample of title and abstracts to ensure consistency of selection. Records were organised into "Include", "Exclude" and "Uncertain" Mendeley library folders. If at this stage it was unclear if the study met the eligibility criteria for inclusion, its full-text report was reviewed, and on this basis, the study was either included or excluded. Uncertainties were resolved in discussion with a second member of the re-

view team. The second phase focused on obtaining and reviewing the eligibility of full-text reports for all studies deemed eligible for inclusion in the initial title/abstract screening stage. A record of studies excluded in both phases of the screening process was kept, with documented reasons for the exclusion of studies rejected in the full-text eligibility assessment stage. If, after the second screen, it was still uncertain whether a particular study was eligible for inclusion, the final decision was arrived at through discussion within the review team.

Data extraction and study quality assessment

Data extraction was guided by our *a priori* logic model and PROGRESS-Plus characteristics relevant for the equity dimension of the review were scrutinized **(Campbell and Cochrane Equity Methods Group, 2018)**. This enabled evaluation of the MI intervention aimed at disadvantaged homeless populations. Data extraction was completed by one reviewer using a data extraction template. The template was piloted on a small number of included studies (n=3) to ensure that the collected data items were appropriate for answering the research question **(Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, Britten N, Roen K and Duffy S, 2006)**.

We assessed internal validity of included studies using the Cochrane risk of bias tool (version 5) **(Cochrane Collaboration, 2011)**. The risk of bias assessments were used to assist in the evaluation of the overall robustness of the body of knowledge upon which the review's evidence synthesis and resulting conclusions were based. We also extracted data on external validity using the generalizability, applicability and predictability (GAP) domains suggested by Fernandez-Hermida et al **(Fernandez-Hermida et al., 2012)**.

Data Synthesis and Analysis

A Narrative Synthesis approach **(Popay J, Roberts H, Sowden A, Petticrew M, Arai L, Rodgers M, Britten N, Roen K and Duffy S, 2006)** was used for data synthesis and included four phases: theoretical framework development in the form of an intervention logic model; descriptive preliminary

synthesis; interpretive analysis; and synthesis robustness evaluation. We also placed more importance in data synthesis on a longer-term follow-up period that would allow examination of MI effect sustainability and of the so-called "sleeper effect" – a claim that MI effect size is larger at longer follow-up times **(R. Miller & Rollnick, 2013)**(p.400).

A preliminary MI intervention logic model (Table 3) was developed based on the latest elaboration of the MI approach **(R. Miller & Rollnick, 2013)** as well as another review of MI effectiveness **(Foxcroft et al., 2016)**. This logic model included relapse prevention, conceptualising change as an iterative but progressive process. Table 3 shows the MI hypothesised causal mechanism of action and includes *a priori* identified moderators.

Table 3 here

This preliminary logic model made explicit the review's assumption that the MI intervention could affect health equity **(Ueffing E, Tugwell P, Welch V, Petticrew M and Kristjansson E, 2012)**, because we anticipated that any intervention effects may have been moderated by different external disadvantage levels experienced by homeless population groups. MI effect moderator variables were identified from MI clinical texts **(R. Miller & Rollnick, 2013; W. Miller & Rollnick, 2002)** and included: social capital, personal feedback, MI intervention intensity and fidelity, manual guidance, severity of substance dependence and client's age. We also added substance type as a potential moderator of MI effect **(Burke et al., 2003)**.

Levels of disadvantage in the homeless persons' social environment were operationalised as different homelessness categories (Table 3) and were utilised as proxies of social capital accessible to a homeless individual; a category of social stratification in the PROGRESS-Plus checklist related to social connections **(Campbell and Cochrane Equity Methods Group, 2018)**. We assumed that

rough sleeping was characterised by low social capital and living in hostel/supported accommodation by the best. The hypothesised relationship between MI and social disadvantage was that there would be poorer MI effectiveness in homeless persons with the least social capital **(Barry et al., 2017)**.

RESULTS

Study selection

Study selection has been reported according to PRISMA-Equity 2012 extension guidelines **(V. Welch et al., 2012)**. Figure 1 shows the PRISMA flowchart for this review. The search for studies in electronic databases and in web-based evidence maps resulted in 2686 records (last search July 2020). After the removal of duplicates, 1885 titles/abstracts were screened using eligibility criteria and 1839 records excluded. Forty-six full text articles were further assessed for inclusion and 18 records excluded (Supplementary Material) 2). Subsequently, a further two studies were identified through reference list searching of included records. This resulted in the final inclusion of 11 studies, reported in 30 separate articles. All included studies had two full independent data extractions and any discrepancies were resolved with a third reviewer.

Figure 1 here

Included studies

One study was a cluster, cross-over randomized controlled trial (RCT) **(Tucker et al., 2017)** and the remaining studies were individual parallel arm RCTs **(Baer et al., 2007; Collins et al., 2019; Kennedy et al., 2018; Okuyemi et al., 2013; Peterson et al., 2006; Rosenblum et al., 2005; Slesnick et al., 2013, 2015; Thompson et al., 2017; Wain et al., 2011)**. All the included studies were

conducted in the United States in urban settings. Nine studies evaluated the effectiveness of stand-alone MI/MET **(Baer et al., 2007; Collins et al., 2019; Okuyemi et al., 2013; Petticrew et al., 2012; Slesnick et al., 2013, 2015; Thompson et al., 2017; Tucker et al., 2017; Wain et al., 2011)**. Two studies evaluated MI/MET in combination with other PSI: a social network intervention **(Kennedy et al., 2018)** and cognitive behavioural therapy (CBT) with information provision and referral as well as peer advocacy **(Rosenblum et al., 2005)**. Two studies utilised group format for the mode of MI delivery **(Rosenblum et al., 2005; Tucker et al., 2017)**. Nine studies stated that self-reported alcohol and other drug consumption were the main outcomes of interest **(Baer et al., 2007; Collins et al., 2019; Kennedy et al., 2018; Peterson et al., 2006; Rosenblum et al., 2005; Slesnick et al., 2013, 2015; Thompson et al., 2017; Tucker et al., 2017)**. Two studies examined substance misuse treatment entry and/or completion – either self-reported **(Rosenblum et al., 2005)** or verified by service records **(Wain et al., 2011)**. Only one study focused solely on tobacco smoking cessation **(Okuyemi et al., 2013)**. Five studies supplemented their interview approach with a biomarker measure **(Baer et al., 2007; Peterson et al., 2006; Rosenblum et al., 2005; Slesnick et al., 2013, 2015)**, four performing urine drug screening **(Baer et al., 2007; Peterson et al., 2006; Slesnick et al., 2013, 2015)** and one using hair drug screening **(Rosenblum et al., 2005)**. Only one study utilised urine screening for alcohol use measurement **(Collins et al., 2019)**.

Risk of bias assessment

Figure 2 provides a summary of the risk of bias judgement across included studies.

Figure 2 here

Overall, the risk of selection bias across the studies was low, but there was insufficient reporting on allocation concealment in all but one of the studies **(Collins et al., 2019)**. Blinding was the weakest point across all studies: there was a high risk of performance bias in five studies with four other studies lacking clear reporting. Eight studies were at high risk of detection bias. The risk of attrition bias was low as loss to follow-up was mainly non-differential. There were no concerns regarding selective outcome reporting.

Preliminary synthesis

We grouped the studies based by length of follow up and the *a priori* moderator participants' age.

Table 4 here

Short- and medium-term, versus longer-term, MI/MET outcomes in homeless adolescents/young adults under 25

Six out of 11 included studies tested the MI/MET intervention in young people experiencing homelessness (Table 4). Although the samples were largely homogenous, as most participants were street-connected and recruited from US urban settings, small variations from this were observed. For example, Tucker et al **(Tucker et al., 2017)** included a population from a beachside resort area and Slesnick et al **(Slesnick et al., 2015)** recruited young people from an urban runaway shelter offering a maximum average stay of three days. It's worth noting that in this latter study there was an option of returning to the family home, perhaps meaning the participants were less entrenched in the experience of homelessness; indeed the MI brief interventions were carried out back in the adolescents' home settings. In the sub-category of studies reporting only on short- and medium-term outcomes, no significant effects on drug use behaviours were detected. Also, apart from one study, the picture was similar regarding alcohol intake. The trial by Tucker et al

(Tucker et al., 2017) was an outlier reporting a small overall MET effect on reduced frequency of alcohol use (*d*=0.31). This outlying effect should be considered though in the context of the study's broad inclusion criteria, with a proportion of the study sample less dependent on alcohol (28% reporting not drinking in the last 30 days at baseline versus 31% in control).

In contrast to the short-term follow up studies, one of the two studies looking at longer-term outcomes reported a medium positive MET effect on drugs use reduction (*d*=-0.52) as well as medium (*d*=-0.45) to large (*d*=-0.71) positive effects on reduction in drinking behaviours **(Slesnick et al., 2015)**. When compared with the short-term studies, these findings might have appeared to support the "sleeper effect" – the assertion that an MI effect was detectable at longer follow up **(R. Miller & Rollnick, 2013)**. However, despite the RCT design, these effects were calculated using only baseline and six-month follow-up data for each treatment arm separately, and thus represented within-group effect sizes and not between-group treatment differences. Due to these limitations in Slesnick et al's **(Slesnick et al., 2015)** analysis, we cannot assert whether it was the intervention that caused these longer-term positive outcome changes or some other phenomenon, for example regression to the mean. The other longer-term study used a composite measure of alcohol and drug use to examine the trajectory of change and found that MI improved reductions at 12 months but increased, slightly, relapse at 18 months **(Slesnick et al., 2013)**. These two were also the only trials in the young people category which tested MI/MET effectiveness against active PSI comparators, finding no good evidence for its superiority. Nevertheless, the tested intensity of MI/MET was much lower than other PSI comparators (two or four sessions for MI/MET versus 14 or 12 sessions for PSI) and their effects were comparable **(Slesnick et al., 2013, 2015)**.

Short- and medium-term MI/MET outcomes in homeless adults

The five MI/MET studies on older adults (25+) experiencing homelessness aimed to test intervention effectiveness on substance use and two studies also aimed to gauge MI/MET impact on treat-

ment entry and/or completion. The samples from these studies was heterogeneous in terms of homelessness categories and recruitment settings. Three studies identified a small positive effect on alcohol consumption **(Collins et al., 2019; Kennedy et al., 2018; Rosenblum et al., 2005)**. This effect was maintained across two-week to three-month post-intervention follow-up measurements. Two of these studies also evaluated MI/MET impact on drug use reduction and neither of them found sufficient evidence to support it **(Kennedy et al., 2018; Rosenblum et al., 2005)**. One other study **(Okuyemi et al., 2013)** reported no effect for MI on tobacco smoking cessation rates in the homeless population.

In contrast, there were large positive impacts on substance misuse treatment entry, with either 95% entering residential treatment in the MI group vs 71% in control **(Wain et al., 2011)** or 71% engaging in community treatment vs 50% in the comparison condition **(Rosenblum et al., 2005)**. These two studies were quite different, making meaningful comparison difficult. One tested a single, MI-pure individual session **(Wain et al., 2011)** whereas the other evaluated multiple MET group sessions with subsequent CBT group modules before follow-up effect measurements were taken **(Rosenblum et al., 2005)**. It is worth noting that Wain et al **(Wain et al., 2011)** found no MI effect on treatment retention or completion, as compared with the standard treatment intake approach. None of the studies in the older adult category reported on longer-term outcomes.

Interpretive analysis

Theoretical framework and evidence mapping

The available evidence was mapped onto the preliminary logic model (Table 2). The connections drawn between this review's findings and the MI logic model for the homeless populations are presented in Table 5.

Table 5 here

Mapping the evidence from the included studies onto the causal logic chain indicated that more short-term surrogate indicators than longer-term effectiveness outcomes were available, limiting any interpretation about longer-term effects of MI on meaningful health and social outcomes in homeless populations.

Sub-group analyses

To interrogate further the preliminary synthesis, an exploration of the studies' heterogeneity was conducted through a series of *a priori* moderator sub-group analyses.

"The lower the social capital, the less effective the intervention may be in the homeless populations." (see Table 3, column 1: Moderator Variables Related to Population)

Notwithstanding some uncertainty concerning the analysis and results, Slesnick et al **(Slesnick et al., 2013, 2015)** studied young people at the very initial stages of their homelessness experience with a still relatively high level of social connectedness, such as family contact and home access. On the other hand, other studies recruited either solely rough-sleeping youth or over half of the sample was already street-connected and, as such, the participants were experiencing higher levels of disenfranchisement **(Baer et al., 2007; Peterson et al., 2006; Thompson et al., 2017)**. If we were to speculate that the between-study intervention effectiveness differences might have been, to some extent, due to MI/MET effects interaction with levels of external disadvantage, then this poses an interesting area for further study: whether individual behavioural interventions could adversely affect health equity if applied irrespective of the Social Determinants of Health. In the adult category, the social gradient impact on MI effects was difficult to examine due to samples' heterogeneity, not only across but also within the individual studies. This included in-

stances where the analytic sample was not representative of the study's intended sample due to post-hoc decisions on recruitment and low enrolment rates **(Kennedy et al., 2018)**, or when such broad inclusion criteria were employed that might have resulted in a sample that may not have been relevant to the phenomenon under study **(Rosenblum et al., 2005)**.

"The lower the fidelity and intensity of MI, the less effective the intervention may be in the homeless populations." (see Table 3, column 2: Moderator Variables Related to Intervention)

There were no issues with MI content or fidelity in either age group category, with all studies incorporating core MI elements in their respective intervention designs and evidencing MI adherence during the sessions' delivery. In contrast, the number of MI sessions varied greatly in programmatic content between studies, from one to 12 in the adult category and one to four in the young persons-category, but this did not appear to moderate the effect size observed across studies. This also seemed to be the case when actual session attendance, frequency and exposure duration were examined in relation to resulting MI/MET effect sizes. However, as session attendance, when reported, averaged between 48% **(Tucker et al., 2017)** and 73% **(Collins et al., 2019)** but was reported as low as 38% in one study **(Slesnick et al., 2013)**, it is still uncertain what is the exact minimum MI treatment dose required to induce observable behavioural change.

"The higher substance dependency and age of the client, the less effective the intervention may be in the homeless populations." (Table 3, column 1: Moderator Variables Related to Population)

The only study that appeared to support the above assumption of lack of MI effectiveness in highly dependent and older participants, was focused on tobacco as a substance of use, and could not be directly compared with any other study **(Okuyemi et al., 2013)**. Contrary to expectations, the remainder of the evidence showed that when young and older categories were compared on the available short-term outcomes, it was the adult category that demonstrated more frequent positive MI treatment responses, albeit only at small effect sizes **(Collins et al., 2019; Kennedy et**

al., 2018; Rosenblum et al., 2005). Long-term effects could not be compared due to lack of available data.

"MET may be a more effective derivative of MI approach in highly-dependent clients, but this may vary according to the type of substance used." (Table 3, columns 1 & 2: Moderator Variables)

There was a lack of evidence on the level and type of substance dependency interaction with MI/MET.

"The fact of MI intervention being manual guided or not may influence its effects". (Table 3, column 2: Moderator Variables Related to Intervention)

There was no comparative data on this dimension as all programmes featured manualized guidance.

Interpretive case description

The testing of the hypothesised moderators' influence on MI effect informed the final case description of the mechanism which underpinned the reported results, presented below in a concept map (Figure 3).

Figure 3 here

The use of a concept map for case description, based on the preliminary synthesis, interpretive and subgroup analyses, resulted in a new insight regarding the use of incentives. All programmes apart from one **(Wain et al., 2011)** offered incentives, and at times incentive use was very high **(Okuyemi et al., 2013)** or conflated the MI intervention with a contingency management ap-

proach **(Rosenblum et al., 2005)**. Such heavy incentive use to encourage treatment attendance may have implications for intervention applicability in other settings where resources may be limited. The visual representation of concepts in Figure 3 also made clear that some studies were richer in information on factors that facilitated implementation and intervention effectiveness and, as a result, weighed more on the synthesis output (34–36). Additional potential moderators identified after cross-examination of data included ethnicity, sex and adverse childhood experiences (ACEs) **(Slesnick et al., 2015)**. These could indicate appropriate future MI research directions in vulnerable homeless populations.

Assessing the robustness of the synthesis

The preliminary logic model is a step in the Narrative Synthesis method, and it was developed as a result of mapping literature searches. It clarified MI theory of change early on to guide the review process. Moreover, as per equity-focused review guidelines, this initial logic model made explicit the assumption that MI intervention could affect health equity. One limitation of the preliminary logic model was that it necessarily presented causal mechanism in an orderly, linear fashion whereas the listed MI processes and their causal mechanisms, although sequential, are also overlapping and iterative in their nature **(R. Miller & Rollnick, 2013)**. Nevertheless, the use of the logic model as an analytical tool helped to reduce researcher bias. This was because it allowed elaboration of intervention components and hypothetical causal pathways *a priori* – before becoming familiar with the review results. Therefore, the logic model provided, in the early stages of the Narrative Synthesis, an explicit framework regarding the chain of logic that the evidence ought to support **(Anderson et al., 2011)**.

The limitation of the synthesis was that it was supported by a small number of 11 studies with varying levels of methodological quality, despite all being RCTs. The final, interpretive exploration of relationships between and within studies included studies with robust internal validity **(Collins**

et al., 2019; Okuyemi et al., 2013), but also those which may have been prone to selection bias **(Rosenblum et al., 2005; Tucker et al., 2017)**. Therefore, the outputs of this synthesis should be interpreted with caution.

DISCUSSION

The review's search strategy and inclusion criteria yielded only 11 studies, so there is a paucity of evidence pertaining to MI effectiveness for substance misuse outcomes in the homeless, especially when compared with the abundance of MI research in mainstream populations. The outcomes examined by the studies included self-reports of alcohol and drug consumption. Only two studies included treatment engagement and completion as their end-point measures. Furthermore, MI use for smoking cessation in the homeless was neglected, with only one study.

In general, the studies displayed high internal validity with robust reporting of procedures regarding random sequence generation and good implementation of the RCT design overall. In contrast, little information was provided on allocation concealment across most studies and safeguarding against detection and performance biases was poor due to insufficient blinding. Current evidence on how MI effects could relate to meaningful societal and public health impacts in the homeless population has been preliminary and hypotheses-generating.

Concerning MI effectiveness, the evidence was most informative on short-term outcomes and generally failed to provide insights on longer-term MI effects. Those studies examining short- and medium-term impacts amongst the younger homeless group did not detect any MI effect on drug use behaviour change or on alcohol misuse. The two studies which examined longer-term outcomes reported medium to large MI effects in both behavioural domains but there are concerns about the analysis approach in one study. In studies with homeless adults aged 25+ there were consistent but small MI effects on alcohol use behaviours and large effects on treatment engage-

ment. One sub-group analysis indicated that social gradient might have the potential to attenuate MI effectiveness within the young homeless populations, but this needs further research.

Overall, there is currently no good, strong evidence for MI as a stand-alone approach to reducing inequalities in substance misuse related health outcomes in homeless population groups. A wider, non-MI specific body of knowledge points to the fact that housing increases homeless persons' retention in treatment, but not if paired with high intensity services **(Orwin et al., 1999)**. This could signal the potential value of MI, as a low-intensity adjunct intervention, in increasing retention, but first the issue of minimum effective dose in the homeless ought to be examined.

MI practitioner skills is also an area for further scrutiny. Possibly linked to ACEs is the observation that high levels of social adversity impact how a person relates to others in service settings **(Burley, A, 2017)**. Recent work on MI emergent theory has demonstrated that the relational component of empathic understanding and "MI Spirit" partially explained effect size variability of MI practitioner's technical skills, for instance complex reflections, in evoking change talk and sustain talk frequency **(Magill et al., 2018; W. R. Miller & Rose, 2009)**. The review highlighted an evidence gap regarding MI effectiveness in the substance-using homeless people, including a lack of empirical evidence supporting a coherent MI theoretical framework in the context of social marginalization. None of the MI homeless studies referred to the emergent theory as the basis for their intervention design. This is of concern given the MI popularity in low access threshold substance misuse treatments, for which people experiencing homelessness are the target population. The emergent theory has recently undergone meta-analytic scrutiny, and results have demonstrated that the assumed technical and relational model could only receive partial support for its proposed mechanism of action **(Magill et al., 2018)(51)(52)**. Thus, there is a need for further research to confirm this latest hypothesised MI causal mechanism in marginalised populations.

Due to limitations in the primary studies' analyses this review was not able to confirm whether a qualitative interaction, understood as a different direction of effect in different subgroups, existed between MI effectiveness and level of disadvantage **(Petticrew et al., 2012)**. This was also because no meta-analytic tests of interaction were possible due to lack of data and between-studies heterogeneity **(Sun et al., 2010)**. Our search results showed that the question of MI effectiveness in homeless populations is understudied with only US studies found in the search. This may be because MI, as low intensity, low-cost PSI, has been popular in the homeless supportive housing, for instance in the US Housing First models **(den Berk-Clark et al., 2015)**. Therefore, this review could be considered as providing preliminary evidence, and the results ought to be viewed as hypotheses-generating as far as MI effectiveness and health equity are concerned **(Petticrew et al., 2012)**.

Nevertheless, efforts were made to increase the credibility of subgroup analyses by pre-specifying effect moderators using MI clinical texts, other researchers' review findings and the PROGRESS-Plus framework **(Petticrew et al., 2012)**. The hypothesised direction of the moderated effect was established *a priori* **(Petticrew et al., 2012; Sun et al., 2010)**. Moreover, the review's search yielded a range of studies with both statistically significant and non-significant results, possibly indicating robustness to any publication bias.

In summary, this study contributed the only evidence synthesis to date on MI's differential effects according to disadvantage levels and its findings gave limited partial support to MI effectiveness in substance-using homeless people. This has been an important area to explore, given that poor health outcomes in the homeless can, in part, be attributed to illicit drugs, higher alcohol, and tobacco exposure (4) and MI has been a popular intervention to facilitate addictions treatment.

Further equity-focused primary research should test for the existence of the social gradient interaction with MI/MET effectiveness in people experiencing homelessness. Any such future trials

should guard against the presence of artefactual bias, such as regression to the mean, in their data analyses. Future primary studies could operationalise homelessness using continuous rather than categorical measures, for example length of time street homeless.

The review's mixed findings discourage the implementation of MI as a stand-alone substance use intervention in the homeless populations. This recommendation is supported by the fact that causal mechanisms of homelessness are complex and upstream determinants facilitating social injustices cannot be ignored when planning MI interventions. An over-reliance on personal behavioural change interventions may yield small-scale individual changes at best, with little impact on homeless population morbidity and mortality. On the other hand, it has to be acknowledged that MI displayed positive effects in some of the homeless studies. Given MI's preliminary evidence of effectiveness in homeless adults, its low-cost and low intensity, MI could be used as an add-on to established social and psychological support services.

FUNDING AND ACKNOWLEDGEMENTS

No external funding. We are grateful to Oxford Health NHS Foundation Trust for supporting EO for this work, and to the health care librarians at Oxford Brookes University who helped with the search strategy.

CONTRIBUTIONS

EO conceived the work and led the searches, analysis and initial drafting. PPH and DF advised on design and contributed to checking searches, screening papers, data extraction and drafting of the paper.

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FIGURES AND TABLES

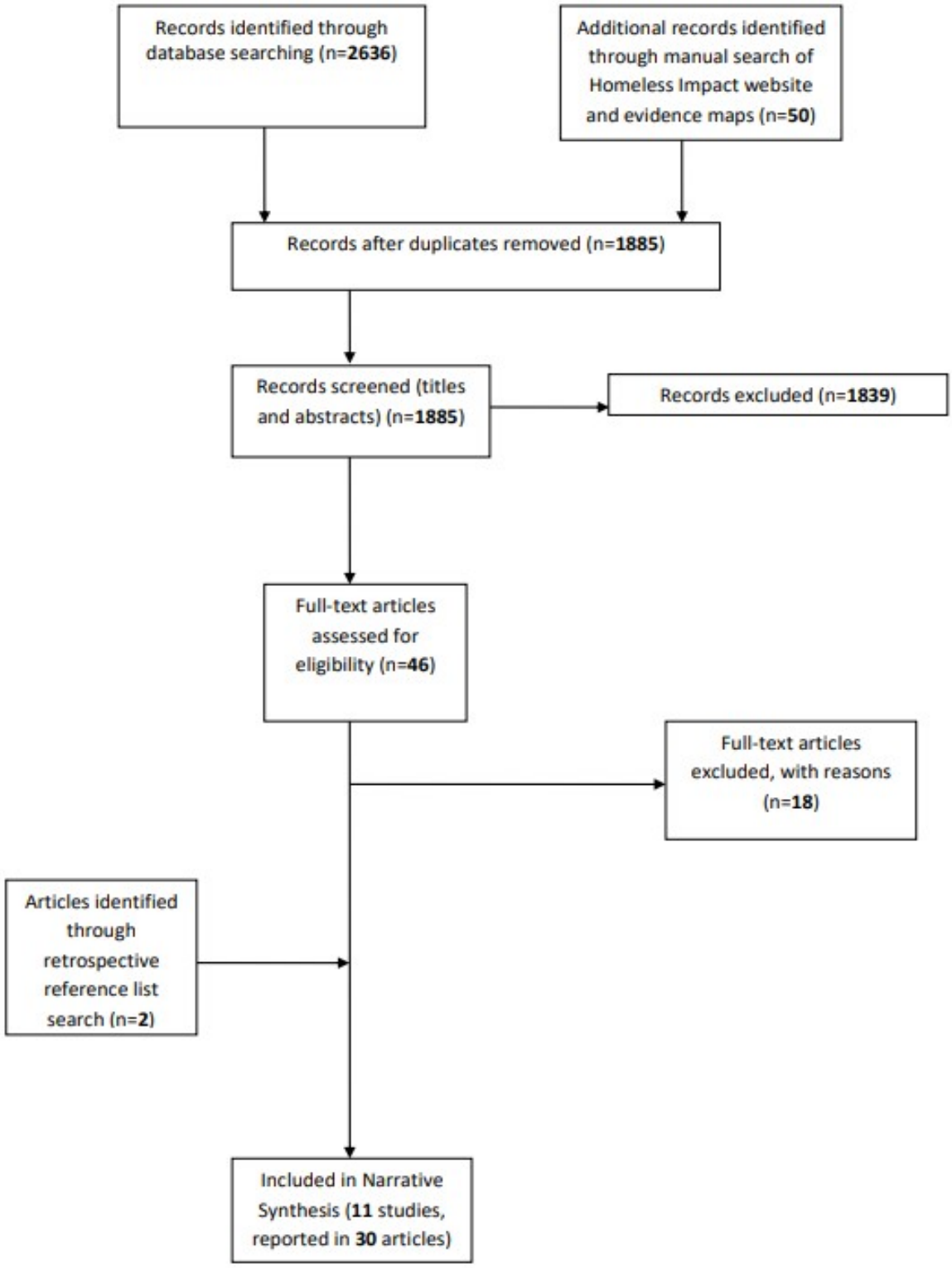

Figure 1. Study PRISMA flow diagram

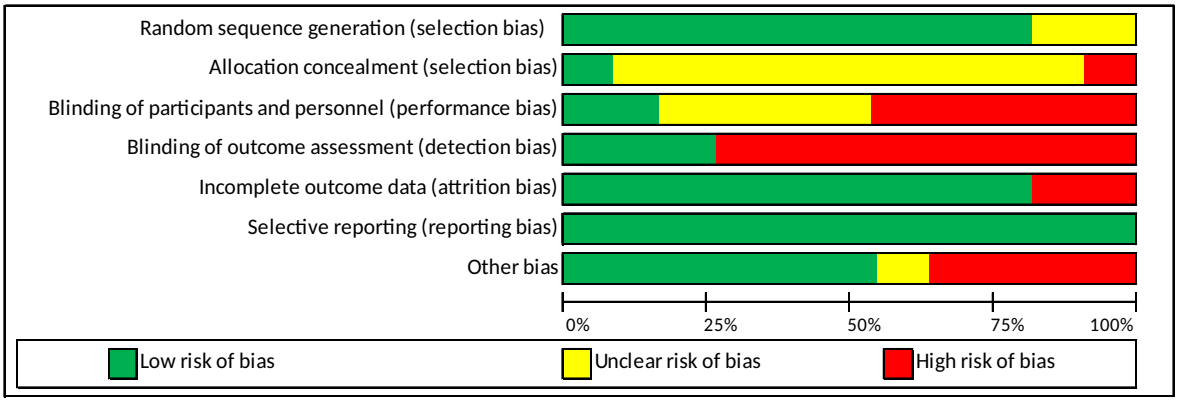

Figure 2. Risk of bias assessment gradings. Percentages (%) of low, unclear and high risk of bias – presented across all included studies (n=11).

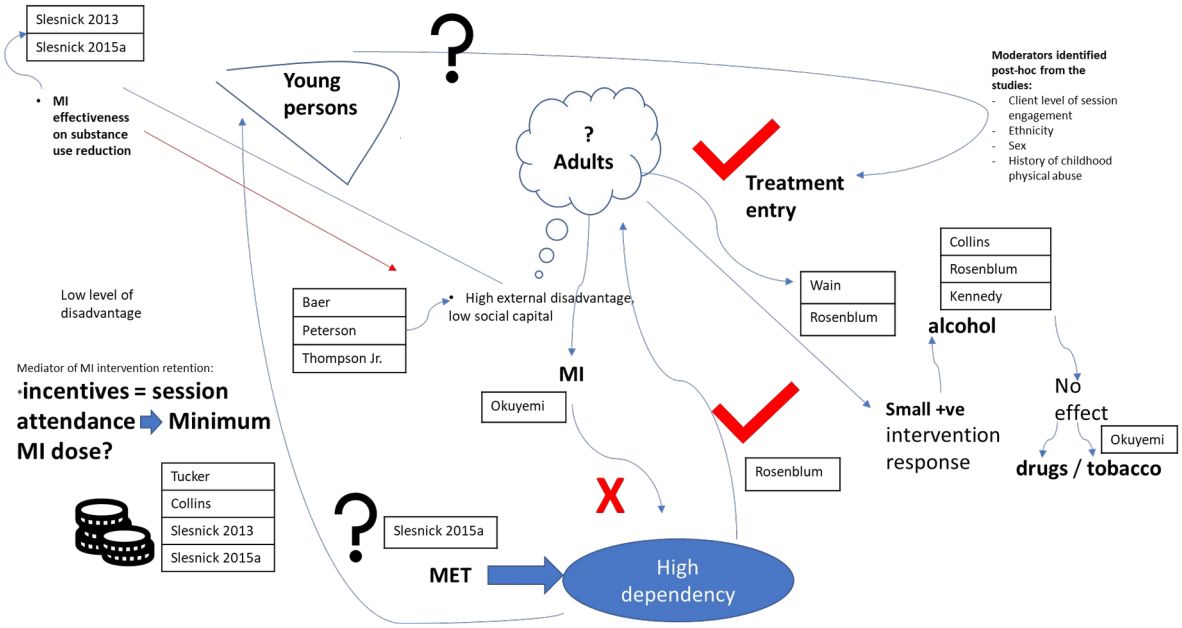

Figure 3. Conceptual mapping of MI /MET intervention in the homeless populations.

Table 1. PICOS analysis of the quasi-systematic literature review research question: What is the effectiveness of Motivational Interviewing-based interventions for reducing substance misuse and increasing treatment engagement, retention and completion in people who experience homelessness?

Population	People who experience homelessness and misuse substances (drugs and/or alcohol and/or tobacco and/or solvents)
Intervention	Motivational Interviewing session(s) which include(s) three core elements of engaging, change focus and evoking as a minimum and/or Motivational Enhancement Therapy
Comparators	• Substance misuse assessment only (no alternative intervention) • Alternative psychosocial interventions without the MI elements
Outcomes	• Frequency and/or quantity of consumed or inhaled substance • Cessation rates (tobacco) • Substance misuse treatment enrolment rates, retention and/or completion rates
Study design	• Intervention, comparative study design: • Randomised Controlled Trials (RCTs) • Non-randomised, comparative intervention studies

Table 2. Study eligibility criteria for inclusion.

PICOS:	Inclusion criteria	Exclusion criteria	Rationale
Population	Homelessness is defined as rooflessness or insecure housing, e.g. homeless hostels, sofa surfing; people who experience homelessness comprise at least 80% of a study sample *and* misuse the following categories of substances: drugs and/or alcohol and/ or tobacco and/or solvents		• Homelessness is a complex phenomenon beyond its most visible form of rough sleeping • To investigate intervention potential for reducing inequalities • To enable insight into the intervention differential impact according to the disadvantage context • To capture the multiple exclusion and polysubstance use reality lived by the homeless
	Any "high-income" country and service setting	Studies set in countries classified by the World Bank as "upper middle income" or below	Due to paucity of research in this subject area, studies from international contexts will have to be included, but applicability to UK's context will be ensured by including homeless populations from high-income countries
Intervention	One or more Motivational Interviewing (MI) session(s) which include(s) three core elements of engaging, change focus and evoking as a minimum and/or Motivational Enhancement Therapy (MET)		To ensure clear distinction between MI-based interventions and other psychosocial alternatives
Comparators	Control conditions of substance misuse assessment only (no alternative intervention) and/or alternative psychosocial interventions (PSI) without any of the MI elements	Comparator interventions lacking any PSI components, e.g. medication-based only	To ensure that equivalent interventions are being compared
Outcome	Studies that include the following measures: self-reported and/or validated frequency and/or quantity		These outcomes were chosen as appropriate for assessment of the intervention effectiveness in a disadvantaged group and as

	of consumed (for drugs/alcohol) or inhaled (for drugs/solvents) substance; self-reported and validated cessation (abstinence) rates (for tobacco) as well as substance misuse treatment enrolment rates (including nicotine replacement therapy for tobacco use), retention (including length of stay in placements) and completion rates; and have follow up periods of under and/or 6 months or over		meaningful surrogate end points for morbidity, mortality and quality of life
Study Design	Randomised controlled trials (RCTs) and non-randomised comparative intervention studies	Observational studies Before-and-after studies (with no control group)	• The research question is not aetiological in nature but aims to evaluate intervention effectiveness • It is anticipated that RCTs and quasi-experimental studies are available in the subject field
Additional considerations:			
Years considered	Studies conducted after 1980		MI approach introduced in the 1980s
Publication status	Published studies only		short timescale of the project does not allow for tracking of unpublished manuscripts
Language	English		Lack of resources for translation

Table 3. Preliminary logic model of MI intervention in the homeless populations

Target Population	MI Intervention Inputs	MI Intervention Processes	Immediate Impacts	Short- and Medium-term Impacts *Under 6 months*	Long-term Health and Social Outcomes *6 months or over*
People who experience homelessness	Ensuring MI intervention fidelity: Training in the MI-style and methods provided to staff delivering the MI intervention under investigation, +/- manual guide One or more MI sessions which, as a minimum, include(s) the three essential components and are based on five principles constituting MI practice (Foxcroft et al., 2016; R. Miller & Rollnick, 2013): - "engaged understanding" of client's perspective ("empathic and non-judgemental stance") - "clear change focus" (developing discrepancy; supporting efficacy to change) - "evoking of the client's own motivations for change" ("listening reflectively", "rolling with resistance") *...additionally, ...* +/- assessment results feedback, i.e. Motivational Enhancement Therapy (MET) which utilises Elicit-Provide-Elicit (EPE) framework *...ensuring...*	Goal-directed, person-centred conversation(s) that utilise(s) MI processes (R. Miller & Rollnick, 2013): • Engaging • Focussing • Evoking and • +/- planning ...delivered within the... "Spirit of MI" (R. Miller & Rollnick, 2013) which includes: - "Collaborative partnership" - "Respectful evoking" - "Acceptance of client's autonomy" - "Compassion" as an integral, ethical dimension of MI *...leading to...* Resolution of a client's ambivalence and securing their commitment to personal behaviour change ...as well as... Initiation of substance misuse behaviour change with subsequent maintenance of such change *...resulting in...*	Increased self-efficacy (specific to changing particular substance misuse behaviour) +/- Positive attitudinal change in favour of engagement with a range of available support Ability to contemplate feasible route to recovery (i.e. making changes independently and/or engagement in treatment – community and/or placement) Reduction in substance(s) use +/- Working towards treatment enrolment +/- Better engagement with support services *...which lead to...*	Sustained substance use reduction short- and medium-term – either through independent efforts, community services support or inpatient treatment enrolment, retention and completion Re-establishing positive personal relationships Accruing social capital Able to plan for housing stability Relapse prevention *...cumulating in...*	Able to sustain reductions in substance use (or abstinence) independently or through drawing on social and/or professional support Reduction in risky behaviours related to substance use (physical aggression, criminal justice problems, accidental injuries, unprotected sexual contacts) Fewer acute health problems, better management of any existing physical and/or mental health long-term conditions Reduced morbidity and mortality related to substance misuse Accommodation maintenance and life skills acquisition Reconnecting with wider, mainstream society / local community Engaging in meaningful occupation / paid employment Increased quality of life

Moderator Variables Related to Population **1. Level of *disadvantage* according to *homelessness category* and corresponding available *social capital*:** **- rough sleeping** **- sofa surfing/insecure dwelling** **- hostel/ supported homeless accommodation** **2. Age group:** **- adolescents and young adults (up to 25 years old)** **- adults (25 years old or over)** **3. Level of dependence on the substances used:** **- occasional use** **- higher risk** **- highly dependent** **4. Type of substance**	**Moderator Variables Related to Intervention** **5. Frequency and duration of MI sessions (= intensity of MI intervention)** **6. +/- Manual guided** **7. +/- Personal feedback component (=MET)** **8. Lacking some of the core components of MI (degree of intervention fidelity)**	**Planned *a priori* sub-group analyses, based on identified moderators** **To explore studies' heterogeneity through investigation of the hypothesised moderators' influence on MI effectiveness:** **The lower the social capital, fidelity and intensity of MI and higher substance dependency and age of the client – the less effective the intervention may be in the homeless populations** **MET may be a more effective derivative of MI approach in clients with higher substance dependency** **MI effectiveness may vary according to the type of substance used** **The fact of MI intervention being manual-guided or not may influence its effectiveness**			

Table 4. Study categories according to sample age and length of follow-up

Participants' age group	**Study**	**Intervention main features:** **• delivery format (individual vs group)** **• MI-pure vs MI-combined with other PSI** **• total number of sessions**	**Comparator**	**Short- and medium-term outcomes**	**Longer-term out-comes**
Adults ≥ 25 years old	Kennedy et al **(Kennedy et al., 2018)**	• individual MI • MI-combined (with social network intervention) • 4	• case man-agement	• small effect on drinking [a] • no effect on drugs	
	Wain et al **(Wain et al., 2011)**	• individual MI • MI-pure (no feed-back) • 1	• standard treatment intake inter-view	• large effect on treatment entry [b] • no effect on retention or completion	
	Okuyemi et al **(Okuyemi et al., 2013)**	• individual MI • MI-pure (NRT provided) • 6	• education and direct advice to quit	• no effect on tobacco smoking	
	Rosen-blum et al **(Rosenblum et al., 2005)**	• group MET • MET-combined (CBT/Information & Referral/Peer ad-vocacy • 12	• informa-tion and re-ferral + peer advocacy	• small effect on drinking (esp. in heavy drinkers) [b] • no effect on drugs • large effect on treatment engagement [b]	
	Collins et al **(Collins et al., 2019)**	• individual MI • MI-combined (with harm reduc-tion approach) • 4	• case man-agement in-cluding healthcare (but not substance misuse treatment)	• small effect on alcohol consumption[b]	
Adolescents and young adults < 25	Thompso n Jr. et al **(Thomps**	• individual MET • MET-pure • 2	• education comparison	• no effect on drinking	

years old	**on et al., 2017)**				
	Tucker et al (29)	• group MET • MET-pure • 4	• case management	• small effect on drinking [c] • no effect on drugs	
	Peterson et al **(Peterson et al., 2006)**	• individual MET • MET-pure • 1	• assessment only	• no effect on drinking • no effect on drugs (at three months' timepoint)	
	Baer et al **(Baer et al., 2007)**	• individual MET • MET-pure • 4	• case management	• no effect on drinking • no effect on drugs	
	Slesnick et al **(Slesnick et al., 2013)**	• individual MI • MI-pure • 4	• ecologically-based family therapy (14 sessions)		• reduction in total %days of alcohol and drug use, with faster relapse
	Slesnick et al **(Slesnick et al., 2015)**	• individual MET • MET-pure • 2	• community reinforcement approach (12 sessions) • case management (12 sessions)		• medium to large effect on drinking [c] • medium effect on drugs [c] • no clear evidence of superiority over community reinforcement approach or case management comparators

Criteria for evaluation of the intervention effect size (small, medium, large):
[a] – as evaluated by primary study authors
[b] – according to reviewer's judgement
[c] – as per standard Cohen's *d* cut off values: *d*=0.2 (small), *d*=0.5 (medium), *d*=0.8 (large)

Table 5. The review findings' connections to the *a priori* MI logic model (see also Table 2. for the logic model)

Evidence linkage *a priori* requirement for MI logic chain support				Judgement on effectiveness	
Target Population – "For whom?"	**MI Intervention Inputs – "How?"**	**MI Intervention Processes – "Why?"**	**Immediate Impacts *(attitudinal and psychological changes)***	**Short- and Medium-term Impacts *Under 6 months***	**Long-term Health and Social Outcomes *6 months or over***
(evidence from the United States only, urban settings) • Adults, age range 30-60 on average; high proportion of African Americans • Adolescents and young adults, average age range 14 to < 25 •either treatment seeking or non-treatment seeking homeless populace •Homelessness status – more dynamic in nature than simple static categories, with people in the state of transition, at times cyclical	*(no specific variation in MI inputs for different age groups)* MI either combined with other, theoretically distinct approaches, or delivered as stand-alone intervention Intervention often developed via co-creation of content with homeless persons involvement and feedback of "what works", use of peer advocates In-person sessions, mostly delivered through outreach mode, including street outreach and sleep site visits; use of tracking and locator forms; if attendance was required at specific location – help with transportation was provided MI delivery integrated with existing homeless services providers, utilising their already established relationship with this disfranchised population Interventionists with different professional backgrounds, amount of experience and educational levels Training provision to staff, including role play and regular supervision sessions Use of printed or visual materials (e.g. portable electronic devices, booklets, generic session cards or personalised, decisional balance sheets)	Low threshold for access, allowances made for flexible sessions' attendance and extended availability of MI / MET interventionists Sensitivity to lived social reality and context of disadvantage was essential in MI conversations Two distinct approaches to MI/MET session content, either: • clear focus on risk reduction through setting substance use reduction as a topic of collaborative conversation or, • explicit adaptation of MI/MET delivery to the harm reduction paradigm, where change goals in collaborative conversations were determined by the participant and, importantly, did not have to be related directly to abstinence or even substance use reduction goals Either MI/MET group format; utilising group dynamic or MI/MET individual conversations, but also focused on social influences' role in substance use behaviours All interventions utilised at least 3 out of 4 MI core processes - engaging, focusing, evoking +/- planning. The most important one was the process	Attitudinal and psychological changes were not the focus of this review's research question – however data was extracted on theoretical underpinnings of studied MI/MET interventions. This indicated that self-efficacy and readiness to change were the two most utilised attitudinal change psychological constructs of interest However, the multitude of other concepts extracted from the studies does not allow to conclude a sufficient direct empirical evidence support for assertion that any of these concepts is a necessary condition for subsequent, actual substance use behaviour change The diverse, theoretical underpinnings cited as a basis for MI interventions' design and guiding attitudinal measurements in the studies, included: • theory of self-determination and • self-efficacy theory • social network theories • social capital theories • social learning theory • decision-making theory • theory of reasoned action (TRA) • norm confrontation models • readiness to change concept only • Transtheoretical Model (TTM) (despite some of the included studies acknowledging the critique of the model and its concept of change) • Information-Motivation-Behavioural	Short-term: *Soon after final MI session - up to two-week follow up as a maximum, n=studies*: •null to small effect on alcohol drinking quantity and binge drinking days; more marked in heavy drinkers (n=3) •large effect regarding substance use treatment entry (n=2) •no effect on treatment retention/completion (n=1) •null effect for drug consumption (other than tobacco/alcohol) (n=2) Medium-term outcome *(2-4.5months; n=studies)*: •null effect on smoking cessation rates (n=1) •null effect in reduction of drug consumption, (with any small effects detected prior, not maintained at 3 months measurement); (n=3) •null to small effect in reducing alcohol consumption quantities (n=4)	Long-term (**surrogate trial outcomes only, n=1)*: • 82% of the MI group showed quicker reduction in overall substance use but faster relapse, where a decreasing pattern was observed at 12 months post-baseline (i.e. 6 months post-intervention) *but slight increase at 18 months timepoint (i.e. 12months post-intervention); does not report further detail on effect sizes (n=1) • medium to large effects regarding alcohol use reduction and medium effect size in drug use reduction at 6 months post-baseline (n=1) *No further consideration of relevance of the above end-points for reducing morbidity and/or mortality related to substance misuse or for improving quality of life

	Number of sessions and duration of each session kept relatively low (ranging from 1 to max.12) and short (from 10mins to max. 70 mins) *heavy use of incentives, including for MI session attendance in most studies Arrangements usually in place to code for MI fidelity – MI delivered with good level of adherence to recognised techniques *...additionally, ...* Motivational Enhancement Therapy (MET) was the most commonly utilised derivative of MI approach (explicitly stated in 8 out of 11 studies) *...ensuring...*	of engagement ...delivered within the... "Spirit of MI" – this was a crucial ethical dimension; written in all of the variations of the MI/MET interventions being tested (collaboration, respect, client's autonomy, compassion) *...leading to...* Engagement at varying levels in sessions (*including some disengagement observed) ...as well as... Clients' high satisfaction/ good levels of MI intervention acceptability *...resulting in...*	(IMB) Skills Model • focus on intrinsic motivational components of "change talk" • cognitive dissonance *...which lead to...*	*...culminating in...*	

<u>Mediator and additional moderators identified post hoc from the studies</u>

Mediator:
- varying levels of client engagement during the session(s)

Other moderators of MI effect (influencing factors):
- ethnicity
- sex / gender
- adverse childhood experiences (physical abuse)

Supplementary Material

Appendix 1. Search strategy – PubMed database example.

Population			Boolean Operator:	Intervention
Boolean Operator: OR	**Boolean Operator:**	**Boolean Operator: OR**		**Boolean Operator: OR**
homeless*	**AND**	**substance* OR alcohol* OR drug* OR tobacco OR smok* OR solvent***	**AND**	**motivation* OR MI**

PubMed was searched to July 2021 using the NCBI (National Center for Biotechnology Information) interface with the following terms based on the above planned search:

1 homeless* OR "homeless persons"[MeSH Terms] OR "homeless youth"[MeSH Terms]
2 substance*
3 alcohol*
4 drug*
5 tobacco
6 smok*
7 solvent*
8 "substance related disorders"[MeSH Terms]
9 or/2-8
10 motivation*
11 MI
12 "motivational interviewing"[MeSH Terms]
13 or/10-12
14 1 and 9 and 13 **(555)**

Appendix 2. Studies excluded from the review.

No.	Authors/Publication year	Study title	Reasons for exclusion
1.	Santa Ana et al (2016)	"Impact of group motivational interviewing on enhancing treatment engagement for homeless Veterans with nicotine dependence and other substance use disorders: A pilot investigation."	Does not meet inclusion criteria as the study design does not include a comparator which is a psychosocial intervention that is an alternative to MI. The design only allowed for comparison of Group Motivational Interviewing (GMI) with Tobacco GMI (T-GMI, i.e. Group MI inclusive of specific components targeting tobacco use). Thus, the study tests for effectiveness of the tobacco specific components of GMI and does not provide information on Motivational Interviewing effectiveness in relation to control conditions without MI core elements.
2.	Santa Ana et al (2017)	"Impact of group motivational interviewing on enhancing treatment engagement for homeless veterans with nicotine dependence and other substance use disorders."	Conference proceedings abstract of the excluded study (1) LaRowe, Steven D. Armeson, Kent; Lamb, Kayla E. Hartwell, Karen (2016) "Impact of group motivational interviewing on enhancing treatment engagement for homeless Veterans with nicotine dependence and other substance use disorders: A pilot investigation."
3.	Samet et al (2005)	"A randomized controlled trial to enhance antiretroviral therapy adherence in patients with a history	People who experience homelessness comprised only 25% of the control group and 20% of the intervention arm. This does not

		of alcohol problems."	**meet review inclusion criteria.**
4.	**Bernstein et al (2005)**	**"Brief motivational intervention at a clinic visit reduces cocaine and heroin use."**	**Does not meet the review inclusion criteria as people who experience homelessness comprised 46% of the study sample.**
5.	**Shelley et al (2010)**	**"Smoking Cessation Among Sheltered Homeless: A Pilot."**	**The study does not have a comparison group.**
6.	**Smelson et al (2015)**	**"A cluster randomized Hybrid Type III trial testing an implementation support strategy to facilitate the use of an evidence-based practice in VA homeless programs."**	**Study protocol of a trial which aims to test implementation strategy only – and because of its design, does not contribute information on intervention (MISSION-Vet) effectiveness. Although this complex intervention utilises motivational interviewing elements, both trial arms receive the active components of the intervention, differing from each other on the implementation strategies only.**
7.	**Mayes and Handley (2005)**	**"Evolving a model for integrated treatment in a residential setting for people with psychiatric and substance use disorders."**	**This publication is a report, not a RCT, describing implementation of residential integrated treatment for homeless persons, based on motivational interviewing and harm reduction principles.**

8.	**Marín Puig et al (2017)**	**“Tobacco treatment of indigent patients alcoholics rehabilitation (sic!) in the Association Rauxa.”**	**Conference abstract of a programme evaluation with no control group.**
9.	**Merchant et al (2018)**	**“Lack of efficacy in a randomised trial of a brief intervention to reduce drug use and increase drug treatment services utilisation among adult emergency department patients over a 12-month period.”**	**Trial did not focus specifically on the homeless population. Over 75% participants in the study sample were never homeless or not homeless in past 12 months.**
10.	**Morse et al (2008)**	**“Integrated treatment for homeless clients with dual disorders: a quasi-experimental evaluation.”**	**Study design does not meet the review inclusion criteria because the 4th intervention group, “new integrated assertive community treatment” (NIACT), was recruited as a separate cohort of participants – one to two years later than the previous two treatment (ACTO – assertive community treatment only, IACT – integrated assertive community treatment) and one standard care (SC) arms.** **The main difference between IACT and NIACT was not in motivational intervention components but in implementation resources, with NIACT having increased staffing. Also, the study does not control for MI components and thus, does not**

			provide information on MI effectiveness.
11.	**Fletcher et al (2008)**	**"Evaluation of Treatment Programs for Dual Disorder Individuals: Modeling Longitudinal and Mediation Effects."**	**Publication presenting a different analysis of the data from original (2006) 3-arm trial (11)** **This paper focuses on methodological issues of longitudinal data analysis and identification of significant treatment effects mediators.**
12.	**Essock et al (2006)**	**"Comparison of ACT and Standard Case Management for Delivering Integrated Treatment for Co-occurring Disorders."**	**Both trial arms (Standard Case Management and ACT – Assertive Community Treatment) were implementing** **integrated treatment with individual motivational interviewing component. Study focused on identifying the more effective mode of integrated treatment delivery and not the integrated treatment effectiveness itself.**
13.	**Okuyemi et al (2006)**	**"Smoking cessation in homeless populations: a pilot clinical trial"**	**Feasibility trial where both compared study groups received individual Motivational Interviewing intervention, which differed in terms of targeted behaviours ("smoking only" versus smoking and other addictions or experiences that may affect quitting ability – "smoking plus"). No other control group present.**

14.	**O'Toole (2009)**	**"Engaging Homeless Veterans in Primary Care"**	**Results publication was sourced for full text review (15)** **Primary outcome measure was the receipt of primary care after the intervention (personal health assessment/brief intervention), at 4 weeks follow up. Study participant inclusion criteria did not explicitly state any substance or alcohol use as a condition for enrolment. Addiction services access was analysed post hoc, only in the sub-group which accessed primary care following initial intervention.** **Thus, the record was excluded as the trial did not test direct brief MI session effect on substance abuse treatment entry.**
15.	**Field et al (2020)**	**"Randomized Trial of Screening and Brief Intervention to Reduce Injury and Substance Abuse in an urban Level I Trauma Center"**	**Only 17.2% of the study sample was homeless.**
16.	**Kidd et al (2019)**	**"More Than Four Walls and a Roof Needed: A Complex Tertiary Prevention Approach for Recently Homeless Youth"**	**Not an RCT or comparative study. Intervention does not include MI components.**
17.	**Stopa et al (2019)**	**"Meeting the needs of dual diagnosis in consumers in residential mental health rehabilitation"**	**Not an RCT or comparative study. Intervention does not include MI components.**

18.	**Thompson et al (2020)**	**"Smartphone Application Plus Brief Motivational Intervention Reduces Substance Use and Sexual Risk Behaviors Among Homeless Young Adults: Results From a Randomized Controlled Trial."**	**The intervention's motivational component does not meet the criteria for motivational interviewing.**

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