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Review

Prevalence of at-risk drinking recognition: A systematic review and meta-analysis

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ABSTRACT

Background: There is a prominent "treatment gap" in relation to at-risk drinking (ARD), whereby a minority of at-risk drinkers ever access treatment. Research suggests that recognition of problem drinking is a necessary precursor for help-seeking and treatment.
Objective: This systematic review and meta-analysis aimed to estimate the prevalence of ARD recognition within those meeting criteria for ARD.
Method: PsycINFO, Web of Science, Scopus, and MEDLINE were searched using the terms: problem* AND (recogni* OR perceive* OR perception OR self-identif*) AND alcohol - to identify studies published in English between 2000 and 2022. Studies reported the frequency (weighted or unweighted) of participants meeting ARD criteria that also directly identified ARD, perceived a need for help, or endorsed a readiness to change. The prevalence of ARD recognition was estimated using a random-effects meta-analysis with 95% confidence intervals (CIs).
Results: 17 studies were included which provided data for 33,349 participants with ARD. Most (n = 14) were US studies. ARD was self-identified via a single indicator in 7 studies, whereas recognition was assessed via stages of change in 4 studies and need for help in 6 studies. The pooled prevalence of ARD recognition was 31% (95% CI: 25%–36%), and subgroup analyses indicated alcohol use severity, measure of recognition, and population type to be significant sources of heterogeneity.
Conclusions: Most individuals with ARD fail to recognise their drinking problem so preventive approaches that promote recognition may be helpful. However, we must be cautious of how inconsistency in question framing affects self-reported problem recognition.

1. Introduction

Alcohol use remains a major contributor to the global burden of disease (Shield et al., 2020), and is the seventh leading risk factor for disability and death globally (GBD, Alcohol Collaborators, 2016, 2018; World Health Organization [WHO], 2019). Problematic drinking can be categorised (in order of severity) as hazardous, harmful or dependent (Babor et al., 2001). Hazardous use refers to drinking patterns that confer an increased risk of alcohol-related harm, whereas harmful use refers to drinking behaviour that is already causing mental, physical and/or social harm (Babor et al., 2001). Alcohol dependence is a condition that is often characterised by a combination of the following: compulsion to drink, continued misuse despite the harmful effects, prioritising alcohol over other interests and obligations, increased tolerance, and withdrawal upon cessation (Babor et al., 2001). Regularly drinking above recommended limits over a prolonged period increases the risk of alcohol use disorders (AUD), which exist along a spectrum of severity (i.e., mild, moderate or severe) (American Psychiatric Association, 2013). While populations endorsing AUD diagnoses are heterogeneous with regards to their socio-demographic and clinical

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characteristics (Casey et al., 2013; Linden-Carmichael et al., 2019), their profiles and treatment needs are distinct from drinkers without AUD (Gilbert and Marzell, 2018).

Given that thresholds and terminology for risk drinking subtypes are inconsistent (Kalinowski and Humphreys, 2016; Pearson et al., 2016), the term "at-risk drinking" (ARD) will be used throughout this paper, thus encompassing both AUD and any alcohol use that is deemed hazardous or above (e.g. exceeding drinking guidelines). There is uncertainty regarding the definition of ARD recognition, the facets included, and the mechanisms through which it occurs. One approach to understanding problem recognition is Zaborowski and Slaski's (2003) four modes of self-awareness (individual, defensive, outer, and reflective), which are explained to serve different functions – such as self-protection, social adaptation and identity formation – and highlight the complex nature of cognitive processes like ARD recognition. The term "ARD recognition" will also be used in this paper to describe self-identified ARD (i.e., participants with ARD indicate that they recognise their ARD either directly or via the proxy variables outlined in Section 2.4.2.).

There are at least 30 health conditions that are wholly attributable to ARD according to the International Classification of Diseases - 10th edition (ICD-10, Rehm, 2011), while alcohol has also been rated as the most harmful psychoactive substance for the combined harm caused to self and to others (Nutt et al., 2010). Despite the negative consequences, treatment utilisation rates for AUD are low and most individuals with an AUD do not seek or receive any help (Grant et al., 2015; Mekonen et al., 2021). This disparity between the need for, and receipt of, treatment – termed the "treatment gap" (Kohn et al., 2004) – highlights that many individuals with ARD do not perceive a need for help and so do not engage in treatment (Edlund et al., 2009). There are many socio-economic and attitudinal barriers to alcohol treatment, such as inaccessibility, lack of information about services, and stigma (Mojtabai et al., 2014; Schuler et al., 2015). However, the extent to which individuals recognise their problems has been shown to play an important role in their initial decision to engage with the process of change and help-seeking (Oleski et al., 2010). The Transtheoretical Model of Therapy describes a process of behaviour change, in which people may not initially recognise, or intend to change, a maladaptive behaviour (pre-contemplation stage), but they might subsequently contemplate change and eventually take action (Prochaska and DiClemente, 1983). This has been corroborated by analysis of the temporal sequence of events in the drinking history of at-risk drinkers, which revealed that problem recognition almost always (90% of cases) preceded any help seeking (Simpson and Tucker, 2002). Previous studies have found that those who recognise their ARD have higher odds of seeking help (Small et al., 2012) compared to those who do not recognise the problem, and the established association between level of alcohol use severity and help seeking is mediated by problem recognition (Glass et al., 2015).

At the time of conducting this work, we were not aware of any systematic reviews assessing the prevalence of ARD recognition. These findings can help us to understand the need for interventions which increase self-awareness of ARD, as estimating the prevalence of ARD recognition (or lack of) can help to inform commissioners and services of unmet need (for ARD support) so to ensure adequate service provision. This work may also provide the basis for future research into better understanding differences in the profiles of risky drinkers who do and do not recognise their ARD, which can help to inform the development of targeted interventions. The aim of this systematic review and meta-analysis was to estimate the pooled prevalence of problem recognition within those meeting criteria for ARD, with secondary aims to conduct subgroup analyses comparing differences in ARD recognition by drinking severity and measure of problem recognition.

2. Method

The methods used were informed by the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Moher et al., 2009; Page et al., 2021) and Joanna Briggs Institute (JBI) methodological guidance for prevalence and incidence studies (Munn et al., 2015).

2.1. Search strategy

The electronic databases PsycINFO, Web of Science, Scopus, and MEDLINE were searched on 14th January 2022, using the following search phrase: problem* AND (recogni* OR perceiv* OR perception OR self-identif*) AND alcohol. The search was restricted to identify studies published in the English language between January 2000 and January 2022. January 2000 was chosen to coincide with the development of the Alcohol Use Disorder Identification Test (AUDIT, Babor et al., 2001; Saunders et al., 1993) and the shift towards more coordinated global efforts in tackling alcohol harms (e.g. the first WHO Global Status Report on Alcohol, WHO, 1999a; the European Alcohol Action Plan, WHO, 1999b). Additional limiters were applied (when permitted by the database search engines) to retrieve only articles in peer-reviewed journals that used samples of human adults. Studies were eligible for inclusion if they quantitatively reported the proportion of ARD recognition (via direct or proxy measures) out of those meeting criteria for ARD (e.g. clinical diagnostic criteria). Further exclusion criteria were as follows (and are described in further detail in supplementary Table S1):

- The majority or entirety of the sample were adolescents or students;
- Studies referring to recognition of ARD by a third person only (e.g. healthcare practitioners, friends and family);
- Samples comprised exclusively of participants with other substance use disorders or polysubstance abuse;
- If 100% recognition could be inferred (e.g. all participants were alcohol-dependent patients in a treatment programme) or the participants were recruited in a way that would bias their perception of their alcohol use prior to assessment of recognition (e.g. advertising an intervention aimed at reducing alcohol consumption for heavy drinkers, receiving feedback on drinking following an initial screen but prior to self-reporting ARD recognition);
- Reviews, meta-analyses, study protocols, and qualitative studies (with the exception of mixed methods studies);
- In the case of widely cited epidemiologic datasets consisting of multiple cross-sectional waves, studies using data from the same survey were eligible only if they assessed samples from different waves, which consisted of different participants.

2.2. Study selection

The database searches identified 10,741 studies, including 5098 duplicates, which were removed. After the duplicates were removed, the titles, abstracts and full texts were screened independently by two of the authors and 10% of the studies screened by each author were cross-checked at each stage of the screening process to establish concordance rates. There was substantial inter-rater agreement at the title/abstract stage ($\kappa = 0.692$) and 100% agreement at full-text stage ($\kappa = 1.00$). Any discrepancies were discussed among JS, PS and LG to reach consensus regarding eligibility.

The titles and abstracts of 5643 studies were screened and, of these, 5228 were excluded. We were unable to retrieve 4 papers, and this left 411 articles for full-text screening. A further 399 studies were discarded for reasons stipulated in the PRISMA diagram. An additional four papers (Edlund et al., 2009; Hines et al., 2014; Sacco et al., 2013; Sacco, personal communication) that were not identified by the current search were included in the review. The reason for this is that the papers report findings based on nationally representative datasets or large cohort studies which we were aware assessed alcohol use. In total, 16 articles (including the four identified from other sources) met the inclusion criteria (Fig. 1). One article (Edlund et al., 2009) provided data from two different national US surveys: National Epidemiologic Survey on Alcohol and Related

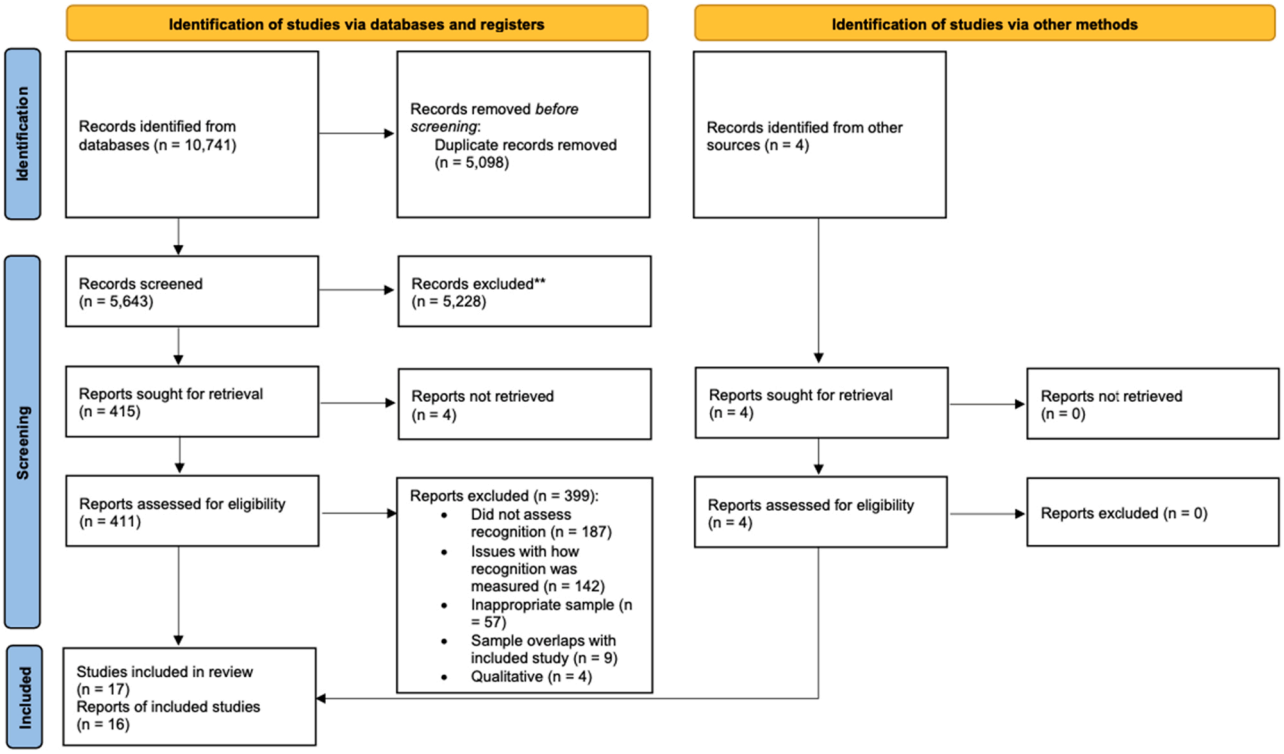

Fig. 1. PRISMA flow diagram of the search strategy.

Conditions (NESARC, 2001–2002) and National Survey on Drug Use and Health (NSDUH, 2004–2005), which were therefore classed as two different studies and entered separately into the meta-analysis. Thus, in total, 17 studies were included in the meta-analysis. Fig. 2.

The most common reasons for exclusion at full-text stage were not measuring recognition and issues with how recognition was measured (for example, prevalence could not be derived if recognition is assessed as a continuous variable), while a smaller proportion of studies were excluded due to the use of ineligible samples and qualitative methods. Further information on exclusions is provided in Fig. 1 (note that one of the papers provided information on 2 studies which analysed different datasets (Edlund et al., 2009)).

2.3. Data extraction

We extracted the citation content, aims, sample characteristics and sampling method, study design and duration, response rates, measures used to identify ARD cases and ARD recognition, and the prevalence of both ARD cases and ARD recognition from each study. For studies that reported weighted data, the percentage was applied to the sample size in order to derive raw figures. Two of the authors independently extracted information and 10% of the studies from which each author extracted information were cross-checked. Any discrepancies were resolved through discussion.

2.4. Data preparation

2.4.1. Measures of ARD

For the purpose of subgroup analyses, each study was allocated to one of three groups according to the lowest level of drinking severity reported by all participants in a given sample:

- At least hazardous – all participants meet criteria for hazardous drinking or above. Note that these samples may consist of hazardous, harmful and dependent drinkers, although it is likely that the majority of these individuals drink at hazardous levels with lower proportions of higher severity levels;
- At least harmful – all participants meet criteria for harmful drinking or dependent drinking;
- Dependence – all participants meet criteria for alcohol dependence.

We decided on this approach to organising subgroups for several reasons. Firstly, due to variation in ARD assessment and diagnosis across the included studies (e.g. “problem drinkers”, “alcohol use disorder”, “risk drinking”), which did not align with homogenous categories of severity; secondly, due to differences in recruitment strategies and study populations (e.g. nationally representative surveys would have captured a broad range of alcohol consumption levels whereas other studies specifically recruited people drinking at certain levels e.g. “risk drinking but not dependent” as in Harrington et al., 2014); and thirdly, because most studies did not stratify ARD recognition data by drinking severity, thus it was impossible to group studies neatly into ‘hazardous’, ‘harmful’ and ‘dependent’ categories. Where studies had stratified ARD recognition results by drinking severity categories, these data were analysed as separate entries in subgroup analyses.

2.4.2. Measures of ARD recognition

The studies that were deemed eligible for inclusion in the meta-analysis operationalised recognition of ARD as follows:

- Self-identification of ARD (direct measure) – asking participants if they think they have (ever had) a drinking problem (yes/no). For example, “have you ever thought you had a drinking problem?” (Glass et al., 2015) or “do you currently think of yourself as a problem drinker?” (Montes et al., 2017);
- Perceived need for help (proxy measure) – recognition in this case is conceptualised as the combined prevalence of help-seeking (from any formal or informal source) and unmet need. The latter requires participants to have considered help-seeking but, for whatever reason, have not taken action. Studies reporting data for only one of these variables were excluded;

- Readiness to change (proxy measure) – in line with the Trans-theoretical Model (Prochaska and DiClemente, 1983), participants must have been categorised as being in any stage of change beyond pre-contemplation (i.e., contemplation, preparation, action) to be classed as recognising their ARD.

Table S2 provides a summary of the items and tools used to assess ARD recognition in each of the included studies.

2.5. Quality control

A modified version of the 9-item JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data (Munn et al., 2015) was used to assess the quality of included studies. The original JBI items remained the same, however, more specific criteria (e.g. exact sample size and response rates cut-off points) were used in the current study to improve inter-rater reliability. The individual criteria related to: the representativeness of the sample and whether random/stratified sampling techniques were used, the description of the subjects and setting, sample size (cut-off point to gain a point: >500 respondents) and response/follow-up rate (cut-off point to gain a point: >60%), whether standardised, validated measures were used, and if appropriate statistical analysis was carried out (e.g. using weights where applicable).

Each criterion could receive a score of 0 (criterion not met) or 1 (criterion met). Alternatively, if the item was not applicable to the study being assessed, it was removed, thus producing a total score out of 9 unless items were removed. To allow comparison, scores were converted into percentages, which were calculated based on the number of criteria met out of the total number of applicable criteria for each study. Higher percentages were indicative of greater quality. The JBI tool does not specify thresholds for interpreting study quality from these scores, so the current authors agreed on predefined cut-off values of > 67% for high-quality studies, 33–66% for medium-quality studies, and < 33% for low-quality studies. Again, two of the authors independently rated study quality, and cross-checked 10% of their studies. Inter-rater agreement was 100% concordant except for scoring for item seven of the JBI checklist. This was resolved through discussion with a third assessor.

2.6. Data analysis

Meta-analysis was conducted in STATA (StataCorp, 2019) using the *metaprop* command (Nyaga et al., 2014). A random-effects model with inverse-variance weighting was used. Ninety-five percent confidence Intervals (95% CIs) of the individual studies' estimates were calculated with the score method, while 95% CIs for the pooled estimate were calculated using the Freeman-Turkey double arcsine transformation (Nyaga et al., 2014). Presence and magnitude of statistical heterogeneity was assessed with the Cochran's Q and I^2 statistic, respectively.

To explore potential sources of heterogeneity, sensitivity analysis and meta-regression were also performed in STATA, both with 95% CIs. Sensitivity analysis was carried out by restricting studies based upon measure of ARD. The same approach to the full meta-analysis (as above) was replicated but without the inclusion of the four papers that assessed ARD with quantity/frequency measures only. The *metaprop* and *metareg* commands were used to run an exploratory, random-effects meta-regression with Knapp-Hartung modification in order to investigate whether ARD recognition prevalence was associated with the percentage of males within the study samples.

3. Results

3.1. Overall sample

In total, 17 studies (reporting data from 16 papers) were included, from

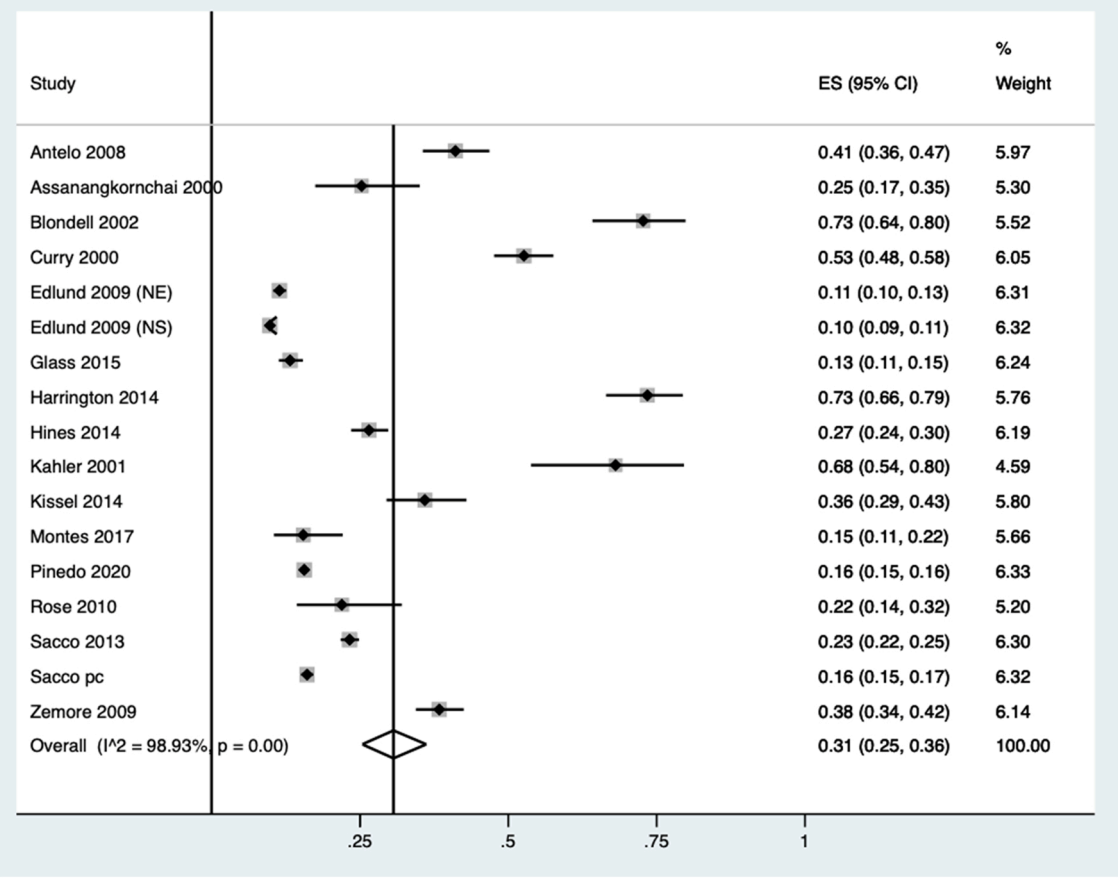

Fig. 2. Forest plot of the prevalence of ARD recognition within those meeting ARD criteria.

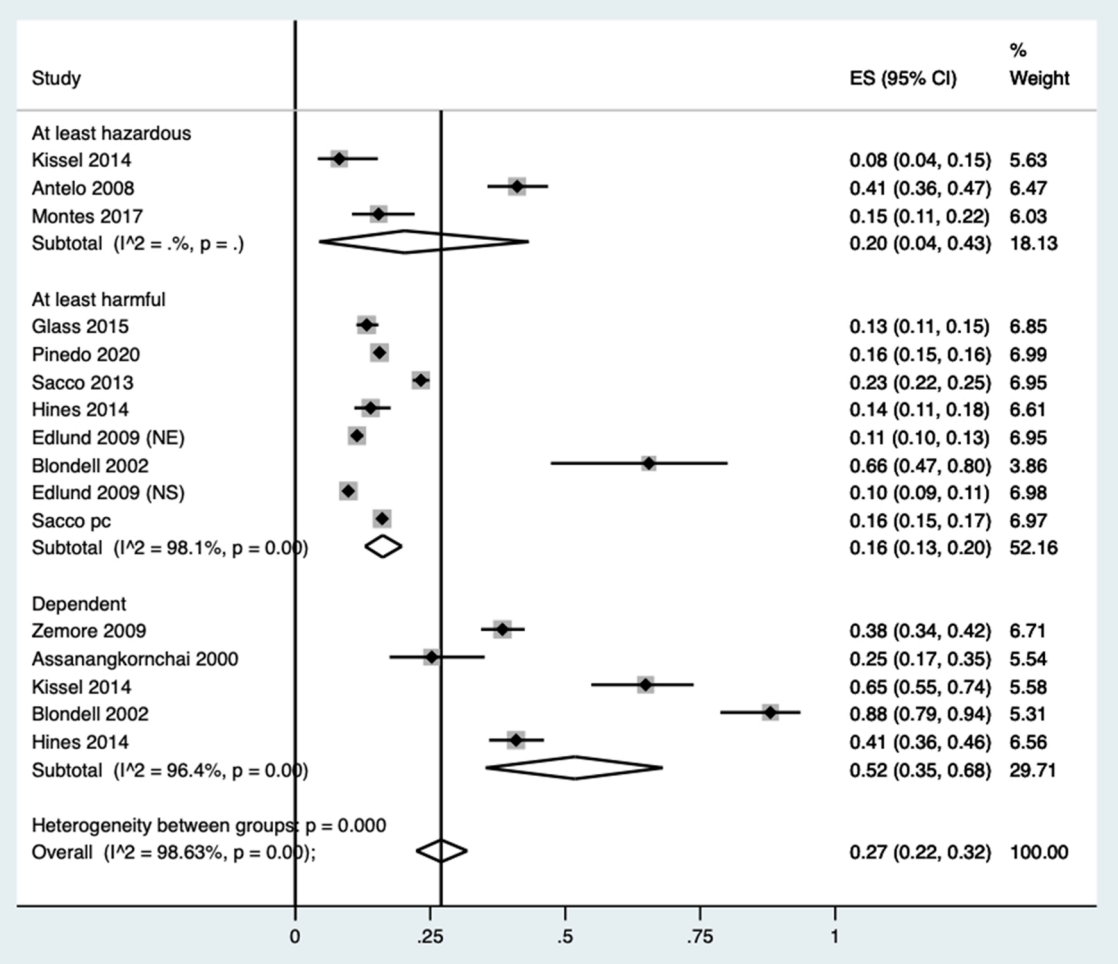

Fig. 3. Forest plot of ARD recognition according to drinking severity (at least hazardous, at least harmful, dependence).

which 33,349 respondents with ARD provided ARD recognition data. Mean age was reported by nine studies, from which a mean age of 34.8 years was calculated. Five studies reported frequencies of age categories, while three studies did not provide any age information. Regarding gender, three studies did not provide this information, while the majority of remaining studies reported that most participants were male. Two studies included only males and the mean percentage of males across the remaining 12 samples was 66.5% (note that our estimates of mean age and percentage of male participants is based on the entire sample for each included study – as reported in, or calculated from, the original paper – and not only those with ARD and recognition data).

3.2. Samples of individual studies

Most studies were conducted in the US (n = 14) while the remaining studies were conducted in the UK (n = 2) and Thailand (n = 1). Regarding study design, most were cross-sectional (n = 11) and the rest were longitudinal (n = 4), archival (n = 1), and a pre-post feasibility study (n = 1). Eight studies sampled members of the general population and this included six studies that drew their samples from large epidemiologic surveys (e.g. NESARC). Further information relating to individual studies is available in Table 1.

3.3. Measures of ARD

Seven studies used criteria from the Diagnostic and Statistical Manual fourth edition (DSM-IV) to identify alcohol abuse or dependence, one study used DSM-V criteria for AUD, and one study used both DSM-IV and ICD-10 criteria for alcohol dependence. While DSM-IV recognises alcohol abuse and alcohol dependence as two separate diagnostic entities, DSM-V describes AUD along a continuum from low to high severity. Regarding the methods of assessment for studies basing ARD on DSM criteria, six of these studies used structured, diagnostic interviews, with the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) being employed in four of them. This includes one study (Assanangkornchai et al., 2000) that used the AUDADIS as well as the WHO tri-level questionnaire to algorithmically categorise ARD based on both DSM and ICD-10 criteria. A further two studies interviewed participants using survey questions based on DSM-IV criteria, and one study established ARD based on an addiction medicine consultant's evaluation.

ARD was assessed via standardised questionnaires (manually self-reported or as an in-person/telephone screen) such as the Alcohol Use Disorder Identification Test (AUDIT) in four studies, and self-reported quantity/frequency in a further four studies (e.g. weekly alcohol consumption). For quantity/frequency measures, if participants' drinking was in excess of the recommended guidelines (such as those provided by WHO), they were classed as having ARD. On the AUDIT, which was the most used questionnaire, scores above eight indicate ARD, including hazardous and harmful drinking, while scores above 20 suggest alcohol dependence (Babor et al., 2001). Although scoring above this threshold does not provide a diagnosis for alcohol dependence, the AUDIT is reported to be a satisfactory measure for identifying alcohol problems in terms of reliability and validity (Hays et al., 1995; Meneses-Gaya et al., 2009).

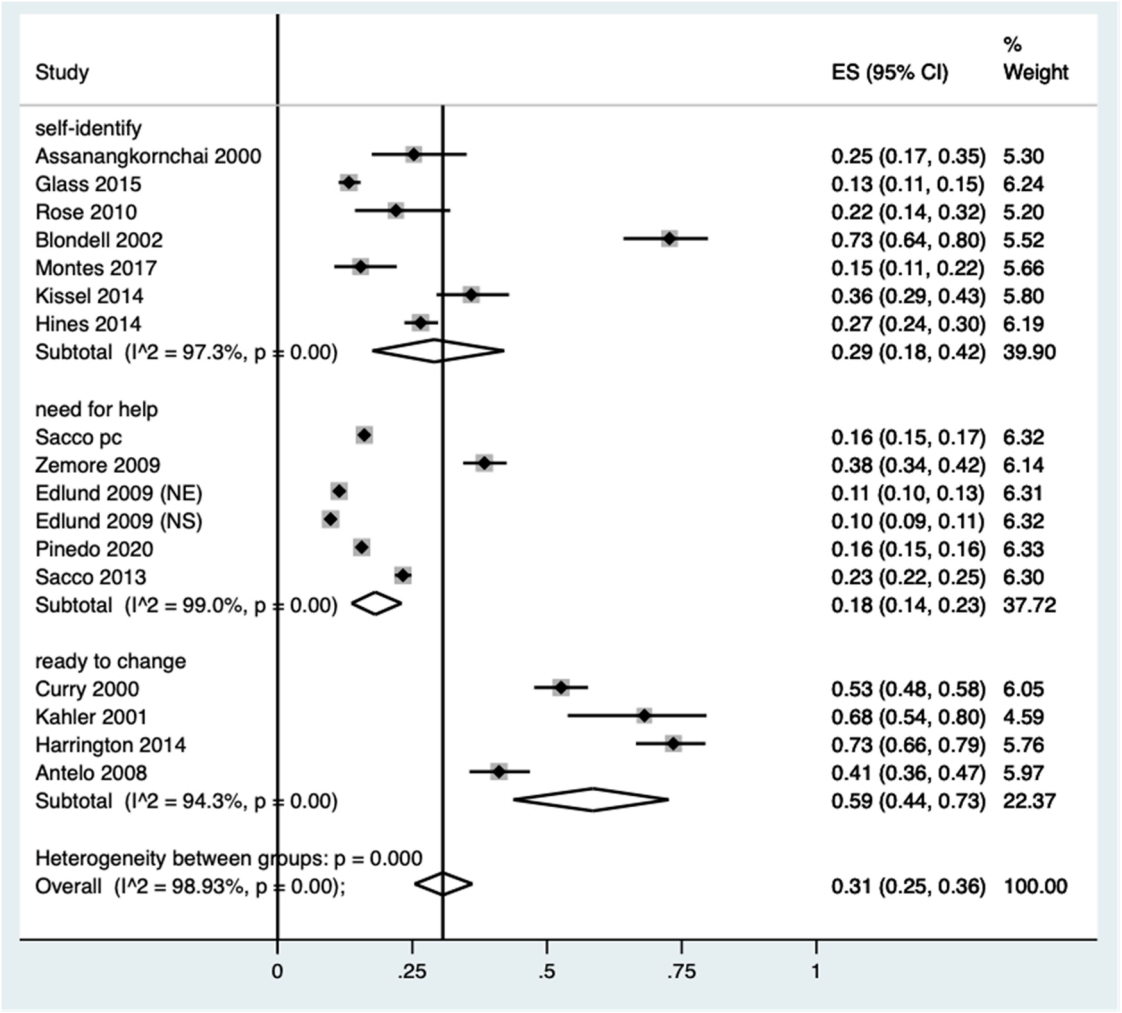

Fig. 4. Forest plot of ARD recognition according to type of ARD recognition (self-identification, need for help, readiness to change).

3.4. Measures of ARD recognition

ARD recognition was measured directly (self-identification) in seven studies, whereas six studies reported perceived need for help and four studies reported participants' readiness to change. For further detail regarding the types of questions asked to assess ARD recognition, directly or indirectly, see supplementary Table S2.

3.5. Study quality

Inter-rater agreement was 100% for all items on the JBI quality appraisal tool with the exception of item 7, for which there was disagreement on two studies. This was discussed with a third assessor to reach full consensus. Six studies were of high quality (Antelo et al., 2008; Edlund et al., 2009; Hines et al., 2014; Sacco et al., 2013; Sacco, pc; Zemore et al., 2009), while nine studies were of medium quality (Assanangkornchai et al., 2000; Blondell et al., 2002; Curry et al., 2000; Glass et al., 2015; Kahler, 2001; Kissell et al., 2014; Montes et al., 2017; Pinedo and Villatoro, 2020; Rose et al., 2010), with one low quality study (Harrington et al., 2014). JBI scores were highest for items assessing whether there was appropriate statistical analysis, if valid measures were used to ascertain ARD, and adequacy of sample size (>500). However, quality ratings indicated shortcomings in response rates, accounting for non-response, and sampling methods. Seven studies failed to provide a response rate, although all remaining studies except for two (56%, Hines et al., 2014; 46.3%, Kissell et al., 2014) reported a response rate of > 60%. Further details of risk of bias assessments can be found in Table S3 in supplementary files.

3.6. Prevalence of ARD recognition

The final analysis included 17 studies, giving a pooled prevalence of problem recognition within those meeting criteria for ARD of 31% (95% CI: 25%−36%, $df = 16$, $\text{tau}^2 = 0.06$). There was substantial heterogeneity between the studies ($I^2 = 98.93$, $P < .001$) and prevalences ranged from 10% to 73% across all 17 studies. No subgroup analysis based on study location was performed as the study pool was largely dominated by studies conducted in the USA (n = 14).

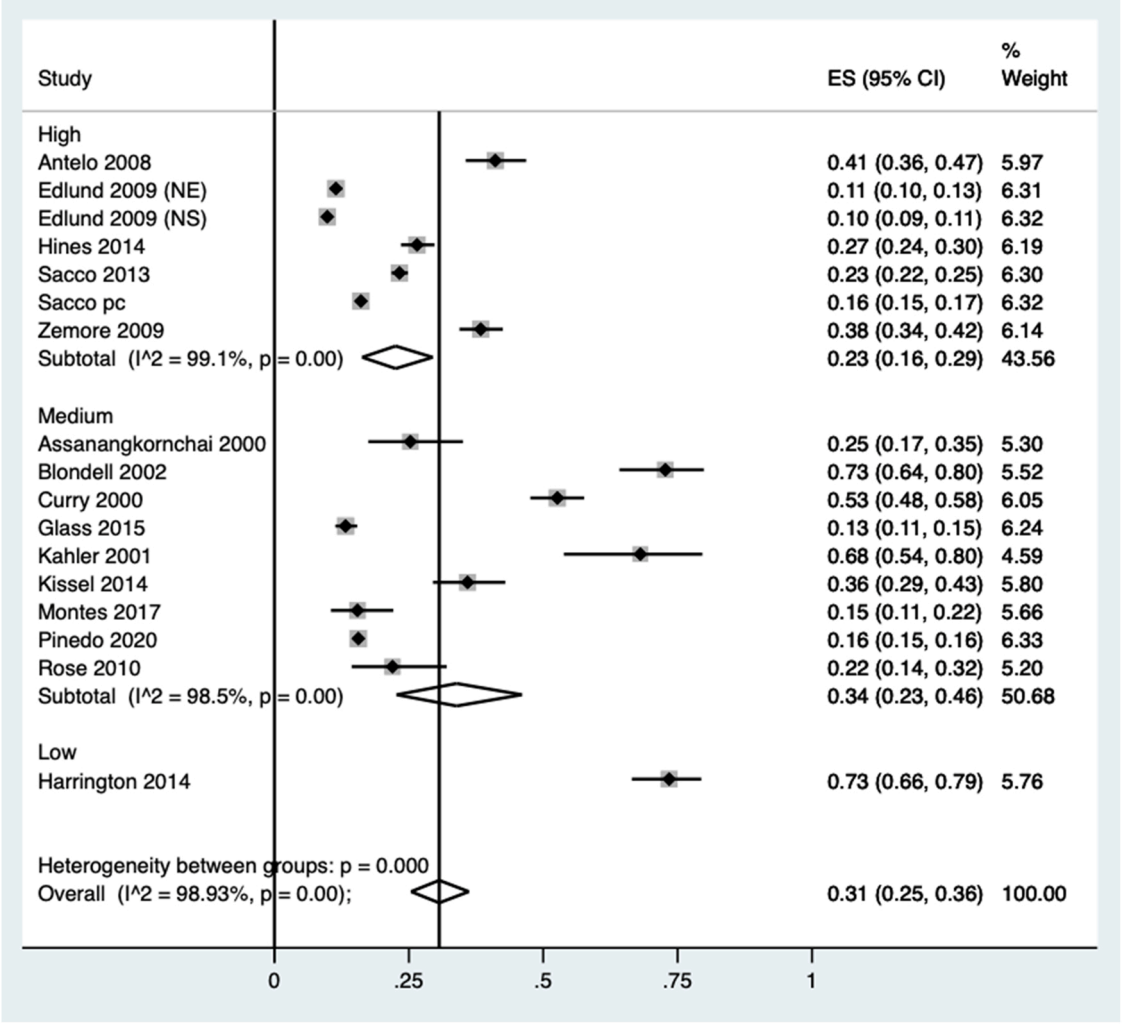

Fig. 5. Forest plot of ARD recognition according to study quality (high, medium, low).

3.7. Subgroup analyses

3.7.1. Prevalence of ARD recognition per drinking severity

Subgroup analysis to estimate the prevalence of ARD recognition within those meeting criteria for ARD, per drinking severity, was based on 13 studies. The pooled prevalence of ARD recognition was 20% (95% CI: 4%−43%) for at least hazardous drinkers, 16% (95% CI: 13%−20%) for at least harmful drinkers, and 52% (95% CI: 35%−68%) for dependent drinkers. There was significant variation between ($P < .001$) subgroups, primarily due to the high heterogeneity present in the dependence subgroup. Note that three studies appear twice on the forest plot because they stratified ARD recognition by drinking severity.

3.7.2. Prevalence of ARD recognition per type of recognition

Prevalence estimates of ARD recognition were found to be: 29% (95% CI: 18%−42%) when ARD was self-identified, whereas proxy measures elicited 18% (95% CI: 14%−23%) for 'perceived need for help' and 59% (95% CI: 44%−73%) for 'readiness to change'. There was significant heterogeneity between subgroups ($P < .001$).

3.7.3. Prevalence of ARD recognition per study quality

The pooled prevalence of ARD recognition was 23% (95% CI: 16%−29%) across high-quality studies and 34% (95% CI: 23%−46%) across medium-quality studies. Only one study was categorised as low-quality, for which ARD recognition was estimated to be 73% (95% CI: 66%−79%). There was significant heterogeneity between subgroups ($P < .001$).

3.7.4. Prevalence of ARD recognition per population type

An ad hoc subgroup analysis stratified by population type found the prevalence of ARD recognition to be 21% (95% CI: 16%−26%) in general population samples, 48% (95% CI: 33%−63%) in clinical samples, and 24% (95% CI: 13%−38%) in specific, non-clinical samples. There was significant heterogeneity between subgroups ($P = .003$).

3.8. Sensitivity analysis and meta-regression

Sensitivity analysis showed that, when the four studies that assessed ARD with quantity/frequency measures only were omitted, the prevalence of ARD recognition (25%, 95% CI: 20%−29%) was a similar, but

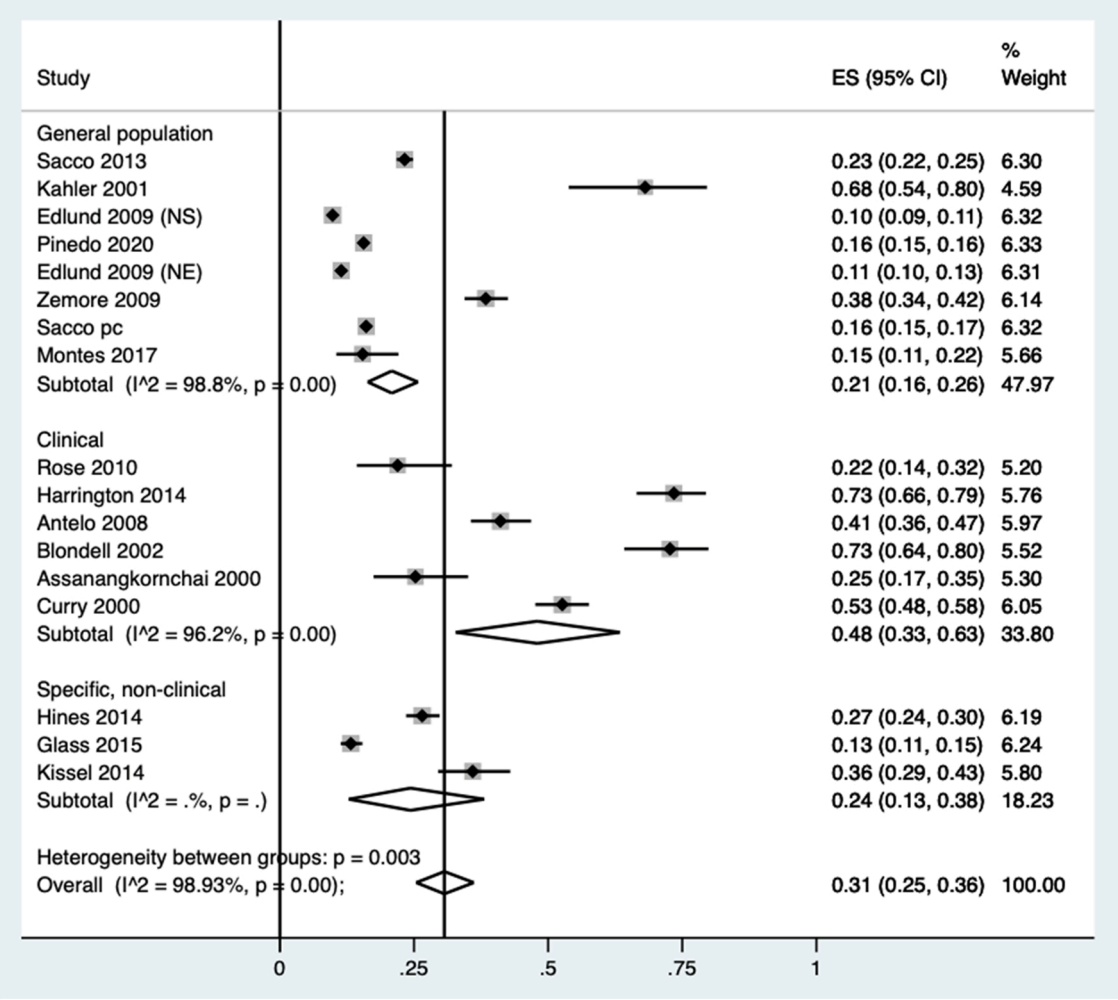

Fig. 6. Forest plot of ARD recognition according to population type (general population, clinical, specific non-clinical).

slightly lower, estimate than found by the main analysis (31%, see Section 3.6.).

The meta-regression was based on the 14 studies that reported the proportion of males in the sample. No significant effect of gender (i.e., percentage of males) on ARD recognition prevalence was found (Coef. = −0.002, $p > .05$, 95% CI: −0.009 to.005).

4. Discussion

The main finding of this study was that approximately one third (31%) of those meeting criteria for ARD are aware that they have a drinking problem, which confirms findings from previous studies that ARD recognition and treatment utilisation rates are generally low (Grant et al., 2015; Mekonen et al., 2021; Probst et al., 2015). However, the overall percentage does not represent all studies because of the marked heterogeneity between studies. The current estimate of ARD recognition prevalence is similar to Degenhardt and colleagues' (2017) large-scale study that found only 39.1% of their sample recognised a treatment need for a substance use disorder.

In line with previous research suggesting higher drinking severity is associated with greater perceived need for help (Oleski et al., 2010), more than half of dependent drinkers (52%) recognised their ARD whilst a much smaller proportion of participants drinking at hazardous and harmful levels did. With increasing drinking severity, it is likely that alcohol-related health problems, as well as psychosocial, legal and/or economic problems, facilitate appraisal of drinking behaviour and problem recognition, if ARD recognition has not already occurred (Oleski et al., 2010; Simpson and Tucker, 2002). Previous research also indicates comorbid mental disorder to be a predictor of help-seeking for alcohol problems (Blanco et al., 2015; Oleski et al., 2010). The 'at least hazardous' and 'at least harmful' subgroups did not differ significantly with regards to ARD recognition (20% and 16% respectively), but the stark disparity between 'at least harmful' and 'dependence' subgroups might reflect research indicating that harmful drinkers tend to "down-play" their drinking problems and, through "othering", evade the stigma associated with more severe drinking problems (Morris et al., 2021). "Othering" involves distinguishing the self from "others" who are negatively stereotyped (as "alcoholics", for example) and marginalised, thereby reinforcing the salience of ingroup/outgroup disunity and distancing themselves from denigrating labels.

ARD recognition rates varied depending on how recognition was measured – specifically, when ARD was self-identified (29%) and measured via perceived need for help (18%), the majority of participants did not acknowledge their drinking problem. Contrastingly, over half (59%) of the participants in the readiness to change category recognised their ARD, however all but one study (Antelo et al., 2008) that assessed recognition via readiness to change measures relied on self-reported quantity/frequency of alcohol consumption (e.g. according to recommended drinking limits) to gauge drinking severity. It is likely that these samples predominantly include individuals with lower-risk drinking, suggesting a readiness to reduce alcohol consumption from hazardous levels. However, more pervasive barriers to change typically persist in cases of alcohol dependence (Probst et al., 2015). Similarly, in relation to studies recording self-reported quantity/frequency of alcohol use, the

Table 1
Summary of studies included in the meta-analysis.

Study first author (year)	Country	Population	Sample size	Percentage male	Response rate	ARD diagnosis	ARD criteria	Type of recognition	ARD recognition, % (ARD recognition/ ARD cases)
Antelo (2008)	USA	Adult problem drinkers attending emergency department	295	80.3%	97.9%	Problem drinkers	CAGE of 1 or more	Readiness to change	41% (120/ 292)
Assanangkornchai (2000)	Thailand	Thai adult males that were hospital patients (help-seeking not alcohol-related), personnel, known to hospital personnel, or known cases of dependence from a psychiatric clinic	312	100%	Not reported	Current alcohol dependence	At least 3 ICD-10 criteria	Self-identification	25% (23/91)
Blondell (2002)	USA	Trauma patients admitted to hospital	184	80%	Not reported	Current problem use, dependence, withdrawal or withdrawal delirium	Evaluated by Addiction Medicine Consultant + DSM-IV criteria	Self-identification	73% (88/ 121)
Curry (2000)	USA	Adults with routine primary care visits	3439	35%	75%	At least hazardous drinking	Self-reported alcohol behaviour Meeting at least one of the following criteria: - $\geq$ 2 drinks per day in the past month - $\geq$ 2 episodes of binge drinking ($\geq$ 5 drinks in one occasion) in the past month - $\geq$ 1 episodes of driving after consuming $\geq$ 3 drinks in the past month	Readiness to change	53% (200/ 380)
Edlund (2009)	USA	National Epidemiologic Survey on Alcohol and Related Conditions (NESARC) 2001–2002: Adult US general population (oversampled Hispanics, non-Hispanic blacks and younger adults aged 18–24) with past year alcohol abuse or dependence	3305	69.9%	81%	Current abuse or dependence	Alcohol Use Disorder and Associated Disabilities Interview Schedule-4 (AUDADIS-IV) (At least 1 of 11 DSM-IV criteria for current abuse or dependence)	Need for help	11% (378/ 3305)
Edlund (2009)	USA	National Survey on Drug Use and Health (NSDUH) 2004–2005: US civilian, non-institutionalized population – adults with current alcohol abuse or dependence	7009	67.8%	NSDUH 2004: 75% NSDUH 2005: 74.4%	Current abuse or dependence	At least 1 of 11 DSM-IV criteria for current abuse or dependence	Need for help	10% (689/ 7009)
Glass (2015)	USA	Individuals with AUD who were offspring of twin fathers with or without AUD	1073	54.7%	Children of Alcoholics study: 85% Twins as Parents study: 88%	Lifetime abuse or dependence	At least 1 out of 11 DSM-IV criteria for lifetime alcohol abuse or dependence	Self-identification	13% (142/ 1073)
Harrington (2014)	USA	Risk-drinking adult ambulatory patients with major depression	200	41.5%	Not reported	Risk drinking but not dependent	Self-reported alcohol behaviour Meeting at least one of the following criteria:	Readiness to change	73% (130/ 177)

(*continued on next page*)

Table 1 (*continued*)

Study first author (year)	Country	Population	Sample size	Percentage male	Response rate	ARD diagnosis	ARD criteria	Type of recognition	ARD recognition, % (ARD recognition/ ARD cases)
							- > 14 drinks/week for males or > 7 drinks/week for females - ≥ 5 drinks on one occasion for males or ≥ 4 drinks on one occasion for females in the month prior to recruitment.		
Hines (2014)	UK	Serving military personnel (regulars and reservists) who have been deployed to Iraq or Afghanistan (or both) - phase 2 of cohort study	4725	92%	56%	Harmful or above	Harmful: AUDIT score of 16 or more Probable dependence: AUDIT score of 20 or more	Self-identification	27% (203/ 765)
Kahler (2001)	USA	Adult non-treatment seeking "excessive" drinkers (hazardous or above)	47	70.2%	Not reported	At least hazardous drinking	Self-reported alcohol behaviour WHO criteria (for men: >28 drinks/ week or 8 + drinks on one occasion at least twice a month, for women: >24 drinks/week or 5 + drinks at least twice a month)	Readiness to change	68% (32/47)
Kissell (2014)	UK	Pre-trial males, newly imprisoned in Wales and the south west of England	257	100%	46.3%	Hazardous drinking or alcohol dependence	AUDIT Hazardous: 8–19 Dependence: 20 +	Self-identification	36% (69/ 192)
Montes (2017)	USA	Adult members of the general public (meeting criteria for hazardous drinking but not help-seeking or in alcohol/drug treatment during the past year)	208	52.4%	77%	At least hazardous drinking	AUDIT score of 7 or more for men above 65 and for womenAUDIT score of 8 or more for men below 65	Self-identification	15% (23/ 149)
Pinedo (2020)	USA	Adult NSDUH participants (from waves conducted in 2014, 2015, 2016 and 2017) who met DSM-IV criteria for substance use disorder	16,939	64%	Not reported	Alcohol use disorder	AUDADIS-5 based on DSM-IV criteria	Need for help	16% (1728/ 11,068)
Rose (2010)	USA	Primary care patients	188	Not reported	Not reported	At-risk drinking	Self-reported alcohol behaviour First item of the AUDIT-C: "How often do you have five (four for women) or more drinks on one occasion?"	Self-identification	22% (18/82)
Sacco (2013)	USA	National Longitudinal Alcohol Epidemiologic Survey (NLAES) 1991–1992: General US adult population	42,862	Not reported	90%	Current abuse or dependence	At least 1 out of 11 DSM-IV criteria for current alcohol abuse or dependence	Need for help	23% (677/ 2910)
Sacco (personal communication)	USA	NESARC-III 2012–2013: General US population	Not provided	Not provided	Not provided	Alcohol use disorder	At least 2 out of the 11 DSM-V criteria for current AUD	Need for help	16% (826/ 5133)
Zemore (2009)	USA	Latino participants from the National Alcohol Survey (NAS)	4204	48.1%	1995: 77% 2000: 58% 2005: 56%	Lifetime alcohol dependence	Scale developed by the Alcohol Research Group (17 symptoms	Need for help	38% (213/ 555)

(*continued on next page*)

Table 1 (*continued*)

Study first author (year)	Country	Population	Sample size	Percentage male	Response rate	ARD diagnosis	ARD criteria	Type of recognition	ARD recognition, % (ARD recognition/ ARD cases)
		1995, 2000 and 2005 waves					under 7 domains, as specified in the DSM-IV. 1 + symptoms in 3 + domains indicates lifetime alcohol dependence)		

subgroup analysis per type of recognition measure may therefore capture drinkers who want to reduce their alcohol use but may not actually perceive (or even have) a clinically-relevant drinking problem. Recognition may also be particularly high when assessed via stage of change measures as the items do not emphasise binary beliefs about alcohol use in the way that questions used to assess self-identification and need for formal help do.

The dichotomous categorisation of ARD recognition can be considered reductionist, although this approach is in line with the (binary) disease model (i.e., 'alcoholic' vs. 'non-alcoholic'), which remains a topic of debate in the addiction field. Our findings are also supported by a recent systematic review (Raftery et al., 2020) of "insight" in substance use disorders, which is defined as "a dynamic process through which one gains the ability to acknowledge the existence of the disease and the contribution of the environment" (Kim et al., 1998, p. 53). Raftery and colleagues (2020) estimate that only 36% of people with AUD have 'fair' insight in AUD. This is similar to our estimate of ARD recognition prevalence, and confirms that, even when measured as a continuous (rather than binary) variable, self-awareness of ARD is uncommon in risk drinking populations. The disparities in ARD recognition across subgroups may be attributed to the ways in which the questions were framed (Morris et al., 2020; Singer et al., 2010), such that subtle nuances in their phrasing might reflect stigmatised views of ARD. For example, asking "have you ever thought you had a drinking problem" (Glass et al., 2015) might reinforce internalised stigma and activate defensive response mechanisms and maladaptive schemas, leading respondents to deny their ARD (Rogers et al., 2019; Morris et al., 2021). We recognise that conceptualisation of ARD recognition via self-reported need for help might have excluded cases where participants attended any help services, not because they perceive their drinking as problematic, but because they were under pressure from friends/family or because they have been obliged to (e.g. court order). Those that did not seek, or consider seeking treatment were classed as not recognising their ARD, but it is well established that there are many attitudinal barriers to help-seeking besides lack of problem awareness (Emiliussen et al., 2017; Mojtabai et al., 2014). Indeed, a large international study (Davies et al., 2019) found that most people reporting that they intend to cut down their alcohol use do not want help with drinking less (92.4%). They may not have considered treatment due to stigma, being uninformed about available services, thinking the problem would resolve by itself, or preferring to self-manage their ARD (Schuler et al., 2015).

It is important to consider how social norms within a given community or social network shape individuals' alcohol consumption and perceptions of drinking behaviour, such that heavy drinking may be "normalised" in some networks where an individual may modify their intake to align with that of friends or family members (Borsari and Carey, 2001; Keyes et al., 2012; Pedersen and von Soest, 2013). If other members of one's social network (or community) drink at higher levels, problem recognition may be less likely. Recognition of substance use problems is also reported to vary by country-level income, with recognition (of a treatment need) and treatment receipt being more prevalent in high-income countries compared to low-middle income countries (Degenhardt et al., 2017). Many other socio-environmental factors may impact ARD recognition, such as educational attainment, personality traits, drinking locations, alcohol accessibility, and cultural or work environments. Further research investigating these relationships would be useful for informing targeted interventions and promoting support for ARD.

4.1. Strengths and limitations

This study has some notable strengths that have wide implications for the identification and management of ARD. Current findings are based on a large sample of over 33,000 participants from 17 studies, and can provide valuable insight into the scale of the treatment gap problem (Kohn et al., 2004) by revealing how differences in ARD recognition occur across severity categories and when using various different measures of recognition. Almost all studies were of a high or medium quality, which would indicate that these results could be generalised to many settings. It is also advantageous that the prevalence of ARD recognition was assessed only within those meeting ARD criteria as this prevents inclusion of individuals without ARD that might want to change their drinking behaviour for reasons other than problem recognition (e.g. for weight loss, financial reasons).

Perhaps the most palpable limitation of the current study is that it was not possible to stratify recognition prevalence by typical severity categories (i.e., 'hazardous', 'harmful', 'dependent'). Categorising papers according to the lowest severity drinking pattern reported by all participants in a given sample was the most appropriate method to draw meaningful comparisons across severity subgroups, but there are problems with this categorisation. For example, the 'at least harmful' group may also include a small proportion of dependent drinkers. Although we could not assess changes in ARD recognition prevalence over time (e.g. before publication of the AUDIT), retaining only studies published between 2000 and 2022 provides a more temporally valid statistic that can help to gauge the scope of ARD and recognition in the 21st century.

Although a protocol for the review was not pre-registered, our methodology adhered to JBI and PRISMA guidelines. Another weakness of the current study is that the search was restricted to papers published in English, which is a potential reason for why we identified only one study conducted with a non-Western sample. This ethnocentric bias should be taken into account as the results are not representative of drinkers from other regions beyond the US and UK, where alcohol use may be considered taboo or, alternatively, may play a central role in cultural customs. There may also be key differences in ARD recognition and access to treatment for ARD between Western countries, as financial constraints are more likely to be cited as a treatment barrier in the USA, compared to the UK where there is a universal healthcare system (Mojtabai et al., 2014). In the US, socioeconomic hardship can majorly impede efforts to reduce alcohol use and related harms as treatment can be extremely costly. This is of utmost importance for policy advocates given the increased risk of developing further comorbid conditions with prolonged ARD as well as the moral issue of equitable healthcare for all.

With regards to limitations of the included papers, seven studies did

not report a response rate, so there may have been a non-response bias that precluded accurate estimation of ARD recognition. Non-response rates are found to be higher among those with greater alcohol-related risks, possibly due to stigma, mortality or homelessness (Christensen et al., 2015; Johnson, 2014). However, a study using NESARC data assures that it is unlikely non-response would have significantly impacted the prevalence estimate since lower odds of drinking counteracted the increases in other measures of consumption in non-respondents (Dawson et al., 2014). The inclusion of both general population and selective samples in the review means recognition rates are not directly comparable and is a key reason for variability in our estimates. ARD recognition was higher in clinical populations than in non-clinical populations, which is not surprising given that they are already engaged in some form of medical service, and worsening health conditions facilitates recognition.

Finally, the total sample obtained for this review consisted mostly of male participants, reflecting decades of research indicating a greater prevalence of AUD and related consequences in men. However, the gender gap in alcohol use and harms is narrowing as women's alcohol use is rising (Bratberg et al., 2016; White, 2020), making the issue of ARD recognition evermore pertinent to women's health. The meta-regression found no effect of gender on the prevalence of ARD recognition, so case-finding interventions should target all drinkers, regardless of gender, in order to minimise alcohol-related harm.

4.2. Implications

Implementing preventive approaches, such as routine screening procedures in healthcare facilities in order to maximise ARD case identification, may be one way to tackle high levels of population alcohol use (Rehm et al., 2016; Schmidt et al., 2016), but this may not be associated with increased help-seeking (Rona et al., 2017). Screening, Brief Intervention and Referral to Treatment (SBIRT) is a public health approach to identify ARD that has been widely implemented in a range of settings, such as primary healthcare, emergency departments and mental health treatment. Evidence suggests that SBIRT is a cost-effective strategy that can elicit improvements in drinking (i.e., reduced consumption and negative consequences) (Barata et al., 2017; Barbosa et al., 2015; Karno et al., 2021; O'Donnell et al., (2014). However, this is not consistently reported (Drummond et al., 2014; Saitz, 2010; Saitz et al., 2010) and screening is rarely carried out routinely in practice due to barriers to implementation (Brown et al., 2016; Knox et al., 2019). It may be important to first address the structural (e.g. not knowing where to go for help, not having the means to get to the service) and financial barriers to alcohol treatment, even though they are less often reported than attitudinal barriers (Oleski et al., 2010; Schuler et al., 2015). As so few people with ARD recognise their drinking is problematic, we should ensure that those who are receptive to help are able to receive it. For people with more severe AUDs, detoxification and specialty/residential treatment may be necessary, but this is likely not the case for people who do not have AUD but exceed drinking guidelines and/or present with binge drinking behaviours. For the latter group, research suggests that smartphone apps designed to help reduce drinking could be an affordable method for reducing population alcohol consumption in people with lower-severity ARD (Attwood et al., 2017; Colbert et al., 2020).

Future research should investigate the processes involved in recognition of ARD as this remains a gap in our knowledge. Academics should be mindful that various tools used to assess ARD recognition may measure different constructs or facets of recognition, so consideration should be given to construct validity as well as taking caution when interpreting findings. In practice, physicians and nurses should be mindful of the language they use to initiate conversations about alcohol consumption with their service users. For example, there have been recent calls to adopt less stigmatising terminology in the addiction field, whereby a shift towards using person-first language (e.g. an individual with alcohol dependence) instead of pejorative terms like "alcoholic" or "addict" has been recommended (Baker et al., 2022; Volkow, Gordon and Koob, 2021). Promoting an understanding of ARD/AUD as existing along a continuum, among both lay people and professionals, is likely to help with eliminating stigma surrounding ARD and, in turn, may have positive impacts on (formal or informal) help-seeking.

4.3. Conclusion

Current findings suggest that approximately a third of people with ARD are aware of their drinking problem. It is important to note that those endorsing some readiness to change may not necessarily be receptive to formal treatment due to structural or attitudinal barriers besides problem awareness, but promoting an understanding of drinking problems along a continuum can help to reduce stigma associated with ARD and therefore foster positive help-seeking intentions. This study has the potential to inform healthcare providers and relevant stakeholders of the scope of the problem, which can enable development and implementation of help-seeking interventions. The prospect of increased rates of ARD recognition and help-seeking could be a first step in the goal of reducing alcohol-related harm.

CRediT authorship contribution statement

The study was conceptualised and designed by Panagiotis Spanakis, whilst supervised by Laura Goodwin. Panagiotis Spanakis and Jessica J. Smith carried out database searching, screening, data extraction, quality assessment and analyses – and received guidance from Laura Goodwin where there was disagreement. Jessica J. Smith was responsible for write-up and all authors read, provided feedback on, and approved the final manuscript.

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Contributors

The study was conceptualised and designed by PS, whilst supervised by LG. PS and JS carried out database searching, screening, data extraction, quality assessment and analyses – and received guidance from LG where there was disagreement. JS was responsible for write-up and all authors read, provided feedback on, and approved the final manuscript.

Conflict of interest

NTF is a trustee (unpaid) of The Warrior Programme, is Chair of the Emergency Responders Senior Leaders Board and is an independent advisor to the Independent Group Advising on the Release of Data (IGARD) for NHS Digital. The other authors declare no conflicts of interest.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.drugalcdep.2022.109449.

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