

SYSTEMATIC REVIEWS

Interventions to prevent and reduce excessive alcohol consumption in older people: a systematic review and meta-analysis

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Abstract

Background: harmful alcohol consumption is reported to be increasing in older people. To intervene and reduce associated risks, evidence currently available needs to be identified.

Methods: two systematic reviews in older populations (55+ years): (1) Interventions to prevent or reduce excessive alcohol consumption; (2) Interventions as (1) also reporting cognitive and dementia outcomes. Comprehensive database searches from 2000 to November 2016 for studies in English, from OECD countries. Alcohol dependence treatment excluded. Data were synthesised narratively and using meta-analysis. Risk of bias was assessed using NICE methodology. Reviews are reported according to PRISMA.

Results: thirteen studies were identified, but none with cognition or dementia outcomes. Three related to primary prevention; 10 targeted harmful or hazardous older drinkers. A complex range of interventions, intensity and delivery was found. There was an overall intervention effect for 3- and 6-month outcomes combined (8 studies; 3,591 participants; pooled standard mean difference (SMD) -0.18 (95% CI $-0.28, -0.07$) and 12 months (6 studies; 2,788 participants SMD -0.16 (95% CI $-0.32, -0.01$) but risk of bias for most studies was unclear with significant heterogeneity. Limited evidence (three studies) suggested more intensive interventions with personalised feedback, physician advice, educational materials, follow-up could be most effective. However, simple interventions including brief interventions, leaflets, alcohol assessments with advice to reduce drinking could also have a positive effect.

Conclusions: alcohol interventions in older people may be effective but studies were at unclear or high risk of bias. Evidence gaps include primary prevention, cost-effectiveness, impact on cognitive and dementia outcomes.

Keywords: *alcohol, systematic review, older people, interventions, dementia*

Background

Modifiable lifestyle risk behaviours are the leading cause of major non-communicable diseases, such as cardiovascular disease, diabetes, cancer, cognitive decline and dementia. Due to population ageing, the burden of ill health due to modifiable lifestyle factors is likely to increase. Many older adults, both in the UK and internationally, drink at levels that are hazardous or harmful to health [1, 2]. In England, 19.3% of adults aged 55–64 years, 14.1% of adults aged 65–74 years and 10.5% of adults aged 75 years and older

drink at hazardous or harmful levels, compared to 24.2% in the general adult population [1, 3]. Recent reviews and recommendations have linked alcohol consumption with a range of health conditions including dementia [4, 5].

Clear evidence-based information is needed on effectiveness, key components of effective interventions and barriers and facilitators to inform the development and implementation of contextualised and tailored programmes for older adults and for public health managers, policy makers and commissioners. The work reported here was part of a

comprehensive evidence synthesis of preventive health behaviour interventions to inform policy relating to ageing well and cognitive health, conducted for the NIHR School of Public Health Research Ageing Well Programme.

The specific questions addressed in the two reviews reported here are

- (1) What interventions in people in older age (55+ years) are effective for prevention or reduction of excess alcohol consumption?
- (2) What individual-level interventions targeting alcohol consumption in people in older age (55+ years) are effective for the primary prevention or delay of cognitive decline or dementia?

Methods

Two complementary systematic reviews in older populations to identify: (1) Interventions to prevent or reduce excessive alcohol consumption; (2) Interventions as (1) also reporting cognitive or dementia outcomes. Alcohol dependence treatment was excluded. Protocols were pre-registered on PROSPERO [6–8]. The reviews have been reported according to PRISMA [9].

Search strategy and selection criteria

Multiple databases (MEDLINE, EMBASE, PsycINFO, CINAHL, CENTRAL, Social Sciences Citation Index, York Centre for Reviews and Dissemination, Cochrane database, grey literature, including relevant websites) were searched from 2000 to November 2016, for studies in English from Organisation for Economic Co-operation and Development (OECD) countries, using MeSH terms and text words for alcohol consumption and behaviour combined with older age terms (see Supplementary data, Supplement 1, available at *Age and Ageing* online). The alcohol searches were part of broader searches for a series of reviews covering a range of health behaviours. Searches were conducted in two stages: (i) for relevant systematic reviews; (ii) for primary intervention studies using appropriate search filters [10]. Reference lists of included studies and related reviews were also searched. One pre-2000 study [11], identified from searching reference lists, was also included for completion as it is directly relevant and widely cited.

Types of study design

Primary intervention studies of any design; systematic reviews.

Population

Older people aged 55 and over, living in the community; including healthy participants; with pre-conditions for later ill health such as high blood pressure, high cholesterol, overweight or obese, impaired cognitive function, functional limitations; on medication that did not affect outcomes;

disadvantaged and minority groups. Studies primarily focused on populations with previous ill health, e.g. stroke, coronary heart disease and mental health conditions were excluded.

Intervention

Interventions that aimed to prevent or reduce excessive alcohol consumption. Treatment of alcohol dependence; prescription drugs; or interventions aimed at national policies, laws and taxation were excluded.

Comparator

Any relevant, including usual care, minimal intervention or no intervention.

Outcomes

Measures of effectiveness or cost-effectiveness including: (i) absolute or risk measures of alcohol consumption; (ii) prevalence, incidence or level of dementia or cognition by any appropriate measure, including cognitive tests, scans or imaging, clinical assessment or dementia biomarkers.

Identification of relevant studies

Titles, abstracts and papers were screened for inclusion by two reviewers. Differences were resolved by discussion with a third reviewer. Studies excluded at the full paper screening stage are listed in Supplementary data, Supplement 3, available in *Age and Ageing* online.

Data extraction and synthesis

Data were extracted by one reviewer and independently checked by another reviewer. Differences were resolved by discussion. Data were synthesised narratively to describe effective interventions and components, and also pooled in meta-analysis. Meta-analysis was conducted using RevMan 5.3 (Cochrane Collaboration) using continuous measures of alcohol consumption in a random effects model. Outcomes at 6 and 12 months were the primary outcomes, but if 6-month data were not reported, 3 month data were used. As outcomes were presented in different ways (e.g. mean drinks/day, week or month; mean drinks/drinking day, different units, country standards), standard mean difference (SMD) was used as the summary statistic. SMD expresses the size of the intervention effect in each study relative to the variability [12].

Risk of bias

Risk of bias was assessed using NICE methodology by one reviewer and checked for accuracy by a second reviewer [13]. Differences were resolved by discussion. No studies were excluded on the basis of quality. The non-randomised study was assessed as being at high risk of bias.

Results

The study selection process is shown in Figure 1. Thirteen primary intervention studies were identified—12 randomised controlled trials (RCTs) and one before and after intervention study [14]. No studies were identified that targeted alcohol consumption and also reported the impact on cognition or dementia. A summary of included studies and results is shown in Table 1 (see Supplementary data, Supplement 2, available at *Age and Ageing* online).

Description of included studies

Population

Of the 13 included studies, 3 were broadly relevant to primary prevention and recruited people reporting at least one alcoholic drink in the last 3 months [17]; those that visited their GP for any reason [25]; and from GP lists [24]. The other 10 studies first screened for alcohol use and included only at-risk, heavy or hazardous drinkers.

Eleven studies specifically targeted alcohol use and two aimed to address a range of health behaviours including alcohol consumption, i.e. multi-domain interventions [24, 25].

Setting

Nine studies were conducted in the USA, two in UK, one in Denmark, one in Croatia. Most interventions were conducted in primary care settings, except one that used a mailed screening and intervention [20]. In two studies, the setting was unclear [14, 19]. Most studies recruited from people attending regular GP appointments, not specifically relating to alcohol.

Interventions

A complex range of intervention types, intensity and delivery were found (Table 1, see Supplementary data, Supplement 2, available at *Age and Ageing* online). Seven interventions were described as brief interventions, based on the study authors' description, but these included a diverse range of components, delivery and intensity. Three examined combined motivational interviews or motivational enhancement with other educational material [14, 18, 19]; one a brief web intervention in addition to treatment as usual [15]; one was delivered by mail with personalised feedback on alcohol [20]; one brief physician advice to reduce alcohol with personalised feedback, education and aids for drinking reduction and telephone follow-up [11]. A brief minimal intervention was the control in another study [23].

Three studies combined multiple intervention components, personalised feedback reports, drinking diaries, education and advice and follow-up telephone counselling compared to usual care or minimal intervention [11, 16, 21]. One compared provision of feedback about personal drinking risks and education given to the participant only to feedback given to both the participant and their physician [17]. One

compared an integrated care approach to enhanced referral to services in a separate location [22].

Two studies incorporated alcohol counselling and education within broader multi-domain interventions that also targeted other health behaviours such as physical activity, smoking and preventive care [24, 25].

Comparators

In four studies, the comparator was usual care [15, 16, 18, 25]; in four, it was a minimal intervention such as leaflets or brief advice [11, 19, 21, 23]; in two, the comparator received no intervention [20, 24]; in one, the comparator was an enhanced referral [22]; and one used both feedback to patients only and a usual care control [17]; one study had no control group [14].

Cost-effectiveness

Only one study reported cost-effectiveness. For a three-stage stepped care approach compared to a brief minimal intervention there was no significant difference in cost-effectiveness [23]. One study reported costs only (see Supplementary data, Supplement 2, available at *Age and Ageing* online) [16].

Summary of results

Evidence from individual studies

Of the 13 included studies, 3 were broadly aimed at primary prevention. Of these, the 2 multi-domain intervention studies that targeted a range of health behaviours found no effect of intervention for improving alcohol outcomes [24, 25]. The other study found feedback of personalised risks to both participants and their physicians reduced alcohol consumption and drinking risk [17].

Of the other 10 studies, in at-risk drinkers: 5 reported positive effects of alcohol interventions in older people, of which 3 found improvements in both alcohol consumption and measures of at-risk drinking [11, 16, 21], compared to controls. All three used relatively intensive interventions, including personalised feedback, education and follow-up telephone calls and included physician advice. A brief mailed intervention reported a significant decline in risk score but not absolute numbers of drinks [20]. Another study, reporting a reduction in alcohol problems, used a brief educational and motivational intervention [14].

However, the other five included studies reported no statistically significant effect of the intervention versus control [15, 18, 19, 22, 23].

All seven studies described as brief interventions were in at-risk groups. Two based on motivational interviewing [18, 19], a web-delivered intervention [15] and a study that used a brief minimal intervention as the control group found no differences between intervention and control [23]. A brief intervention delivered by mail with personalised feedback on alcohol risks, and a brief educational and motivational intervention reported beneficial effects on risk score and reduction in

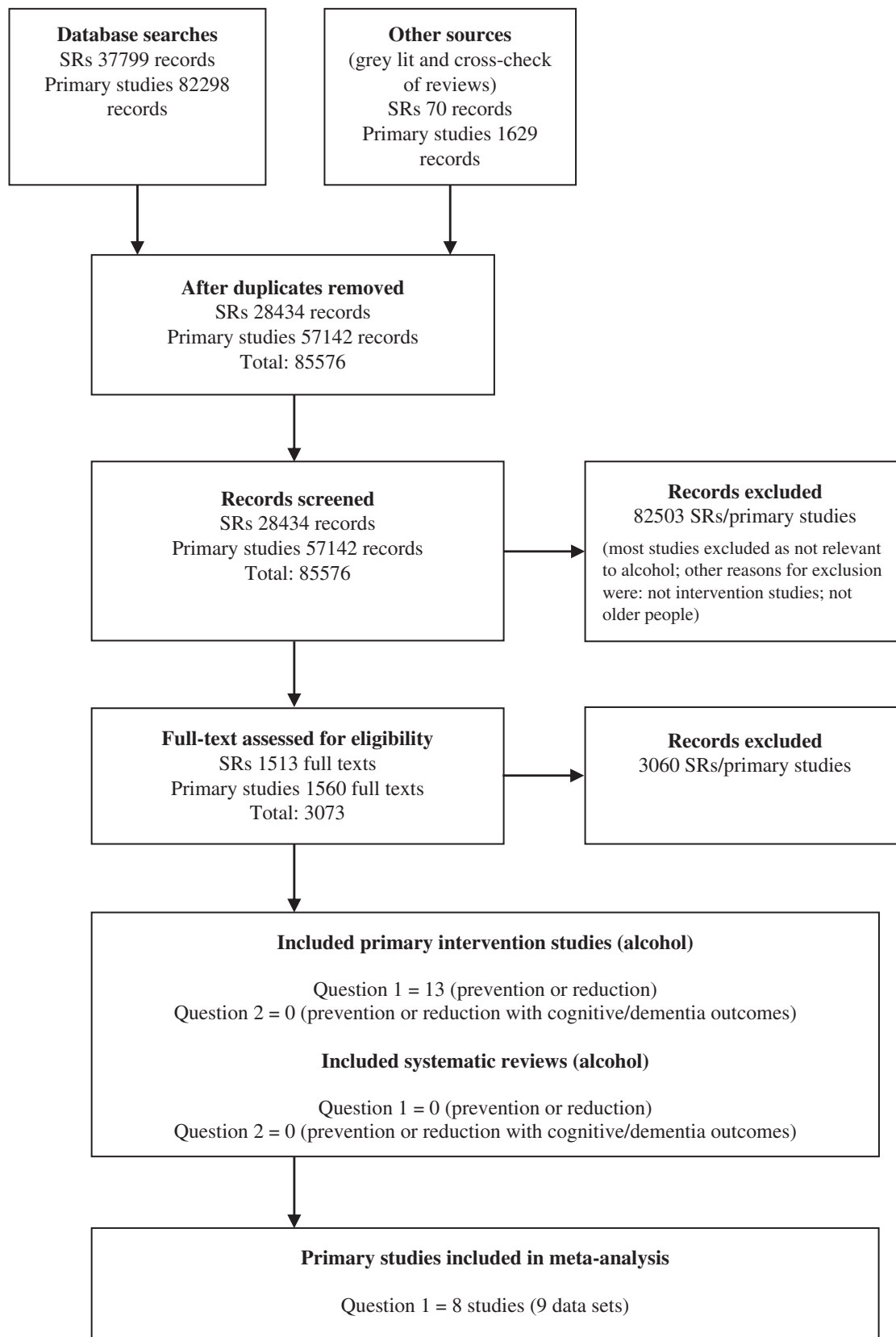


Figure 1 PRISMA flow diagram for searches for primary studies and systematic reviews.

Table 1. Intervention studies to prevent or reduce alcohol consumption in older people: summary of study characteristics and results (all studies were conducted in populations identified as at-risk, heavy or hazardous drinking, except those marked * in first column)

Study/design/ country	Mean age, years (SD)	Intervention and comparator	Follow-up/ outcome measure [‡]	Key results
Cucciare 2013 [15] RCT, US	59 (15)	<i>Intervention:</i> (N = 78) Brief web-delivered intervention using normative feedback plus treatment as usual; <i>Comparator:</i> (N = 89) Treatment as usual	3, 6 m; TLFB	No significant differences between I and C groups for any alcohol outcome at any of the time points examined
Etner 2014 [16] RCT, US	71 (7.3)	<i>Intervention:</i> (N = 546) Personalised reports, educational materials, drinking diaries, physician advice during office visits and follow-up telephone counselling; <i>Comparator:</i> (N = 640) Usual care	3, 6, 12 m; CARET	<i>Mean drinks per week:</i> I: 13.3 (7.9) at baseline to 9.82 at 6 months and 9.45 at 12 months; C: 13.9 (8.0) at baseline to 12.24 at 6 months and 11.64 at 12 months (SD, nr); $P \leq 0.01$ between groups; <i>At risk drinking:</i> At 6, 12 months, significantly greater in the I group compared to C: 6 months (60% vs. 72%; $P \leq 0.01$); 12 months (56% vs. 67%; $P \leq 0.01$)
*Fink 2005 [17] RCT, US	76.6 (6.2)	<i>Combined report intervention:</i> (N = 212) Participants and their GPs received a personalised report of their drinking risks and education; <i>Patient report intervention:</i> (N = 245) Participants only received a personalised report of their drinking risks and education; <i>Comparator:</i> Usual care (N = 238)	12 m; CARPS	<i>Drinks/week:</i> For combined report compared to usual care, consumption decreased by 1.14 drinks per week ($P < 0.05$) at 12 months; for patient report no significant difference ($P < 0.05$); <i>Lower-risk drinking:</i> Both patient report and combined report associated with more lower-risk drinking than usual care (OR 1.59 and 1.23; $P < 0.05$ for each)
Fleming 1999 [11] RCT, US	65+ (most 65–75)	<i>Intervention:</i> (N = 87) Brief physician advice to reduce alcohol with feedback on their health behaviours, adverse effects of alcohol, drinking cues, diary cards and a drinking agreement/prescription, follow-up telephone interviews; <i>Comparator:</i> (N = 71) General health booklet	3, 6, 12 m; TLFB	<i>Number of drinks in previous 7 days:</i> I group, decreased from 15.54 (SD 7.65) to 9.31 (6.50) at 3 months to 10.05 (7.49) at 6 months and 9.92 (6.97) at 12 months; C: 16.58 (11.49) at baseline, 15.51 (11.37) at 3 months, 16.09 (12.71) at 6 months, 16.27 (12.17) at 12 months. Significant between groups at 3, 6, 12 months ($P < 0.001$ for all)
Gordon 2003 [18] Post hoc analysis of RCT, US	65+	<i>Brief Motivational Enhancement intervention:</i> (N = 18) Verbal, visual techniques, discussion, setting goals; <i>Brief advice intervention:</i> (N = 12) Feedback from the assessment, health/social implications of drinking, advice to stop/reduce alcohol consumption; <i>Comparator:</i> Standard Care ($n = 12$)	12 m; TLFB	No significant differences between both I groups and C; but all groups decreased drinks/month
Hansen 2012 [19] RCT, Denmark	60/59 (m/f)	<i>Intervention:</i> (N = 391) Brief Motivational Interview (BMI) and telephone booster plus leaflets and information sheet; <i>Comparator:</i> (N = 381) Same leaflets and information sheet as the intervention group	6, 12 m; Internet-Q	<i>No. of standard drinks in a typical week:</i> No significant differences between I and C groups or by gender
Kuerten 2015 [20] RCT, US	64.7 (8.4)	<i>Intervention:</i> (N = 44) Brief mailed intervention with personalised mailed feedback outlining their specific risks associated with alcohol, educational booklets; <i>Comparator:</i> (N = 42) No intervention	3 m; CARET	<i>Mean drinks per week:</i> No significant differences between I and C; <i>At-risk drinkers:</i> At 3 months, fewer intervention group participants than controls were at-risk drinkers (66% vs 88%; OR 0.32, $P = 0.05$)
Moore 2011 [21] RCT, US	68.4 (6.9)	<i>Intervention:</i> (N = 310) Personalised report (also given to the primary care provider), booklet on alcohol and aging, drinking diary, oral and written advice, telephone counselling using MI; <i>Comparator:</i> (N = 321); General health advice booklet	3, 12 m; CARET and TLFB	<i>No. of drinks in the past 7 days:</i> I group consumed significantly fewer drinks at 3 months (RR 0.79 (0.70–0.90); $P < 0.001$) and at 12 months (RR 0.86 (0.76–0.98); $P < 0.05$); <i>At-risk drinkers:</i> Significantly lower proportion in the I group compared to C group at 3 months: 49.6% vs 61.2%; OR 0.45 (95% CI 0.28, 0.81; $P < 0.01$); 12 months, not significant
Oslin 2006 [22] RCT, US	72.0 (5.3)	<i>Intervention:</i> Integrated care (N = 280) Services integrated into primary care (including psychotherapy, case management, brief behavioural alcohol intervention using MI), workbook, drinking agreement. <i>Comparator:</i> Enhanced referral: (N = 280) Community-based services in a separate location	6 m; Q	No significant between group differences in drinking or binge episodes at 6 months
Schonfeld 2010 [14]; Before and after study, US	75.0	<i>Intervention:</i> (N = 102) Brief intervention: advice, education and motivational interviewing; future goals, health habits	1, 3 m; AUDIT, SMAST-G	<i>No. of drinks per week:</i> Integrated care: 18.1 (SD 10.6) at baseline to 11.8 (SD 11.8) at 6 months; enhanced referral from 17.5 (SD 11.3) to 11.4 (SD 10.7); $P = 0.913$ (between groups) <i>Mean SMAST-G score:</i> Change from baseline to discharge significantly diff: 1.70 ± 2.52 (95% CI 1.00, 1.92; $P < 0.001$); but from discharge to 30-day follow-up: not significant

Continued

Table 1. Continued

Study/design/ country	Mean age, years (SD)	Intervention and comparator	Follow-up/ outcome measure [±]	Key results
Watson 2013 [23] RCT, UK	63.0 (5.8)	<i>Intervention:</i> (N = 266) Stepped care: behavioural change counselling, with motivational interviewing with referral to step 2 (motivational enhancement therapy) and step 3 (local specialist alcohol services) if indicated <i>Comparator:</i> (N = 263) Brief minimal intervention: including feedback of screening results	6, 12 m; AUDIT-C, DPI	<i>Average drinks/day:</i> No significant differences in average drinks/day (ADD) between the groups at 6 or 12 months: 6 months, mean difference: -0.073 (-0.156-0.011); P = 0.088; 12 months mean difference: 0.025 (-0.062-0.112); P = 0.575
*Harari 2008 [24] RCT, UK	74	<i>Intervention:</i> Multi-domain health promotion study targeting a wide range of behaviours using a mailed health risk appraisal followed by computer-generated individualised written feedback to participants and GPs; <i>Comparator:</i> No intervention	12 m; HRA-O	No significant difference between groups in people reporting 'no or moderate' alcohol use: 80.2% in the I group and 79.7% in the control group (OR: 1.1 (95% CI 0.8, 1.3); P = 0.63)
*Vrdoljak 2014 [25]; RCT, Croatia Multidomain	72.3 (5.2)	<i>Intervention:</i> (N = 371): Lifestyle intervention, delivered by GPs, targeting a range of health behaviours: PA, smoking, alcohol; Included educational leaflets for their detected CV risk factors; follow-up appointment; <i>Comparator:</i> (N = 367): GP usual care	18 m; Q	No significant difference between groups for alcohol consumption ($\chi^2 = 0.73$, df = 1, P = 0.394) at the end of intervention

N, number of participants in group; I, intervention; C, comparator; nr, not reported; OR, odds ratio; 95% CI, 95% confidence interval; MI, motivational interviewing; TLF, timeline follow back questionnaire; CARET, Comorbidity Alcohol Risk Evaluation Tool; CARPS, Computerised Alcohol-Related Problems Survey; AUDIT, Alcohol Use Disorders Identification Test; SMAST-G, Short Michigan Alcoholism Screening Test, Geriatric Version; DPI, Drinking Problems Index; HRA-O, Health risk appraisal for older persons questionnaire; Q, questionnaire; \pm , All outcome data were self-reported.

alcohol problems respectively [14, 20]. One study was described as a brief intervention, but included a range and intensity of intervention components including physician counselling, personalised feedback, education and follow-up (so also discussed previously as an intensive intervention), and reported significant effects for all alcohol outcomes [11].

Only 6 (of the 11 individual studies specifically targeted at alcohol) report statistically significant differences in outcomes between the intervention and control at follow-up. However, there is some evidence that the control groups reduced alcohol consumption between baseline and follow-up in many studies (Table 2). This suggests that even the minimal, usual care or no intervention control groups (just receiving an alcohol assessment as part of the research study) may also be motivated to reduce alcohol consumption.

Overall, from individual studies, there is some evidence (three studies) that more intensive interventions that include personalised feedback reports, physician advice, educational materials and follow-up may be more effective in older people with reduction in alcohol consumption maintained up to a year. There is limited evidence (one study) that feedback of risks to both the participant and their physician may be more effective than to the participant alone. The evidence for brief interventions in older people is mixed.

All included studies recruited male and female participants. In the 10 studies that screened for at-risk drinking, most recruited predominantly male populations. One reported outcomes in male and female participants separately and found no significant differences by gender [19]. Another found no significant effect by gender in post hoc analyses controlled for baseline consumption [11]. There is insufficient data to present findings disaggregated by socio-economic status or ethnic group (see Supplementary data, Supplement 2, available at *Age and Ageing* online).

Evidence from meta-analysis

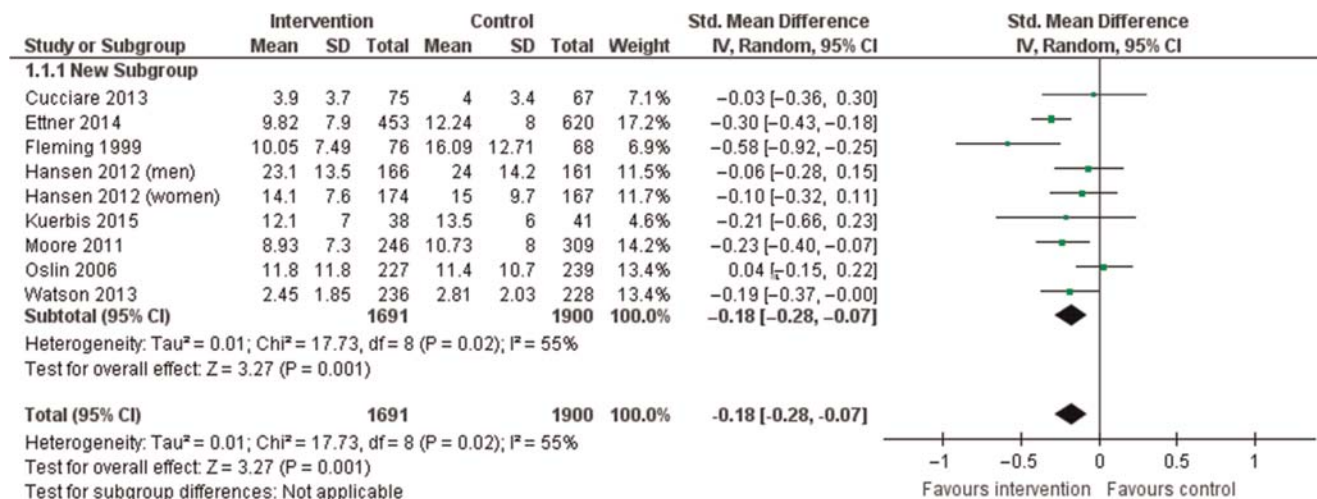
From data from 8 studies (9 data sets: one study reported men and women separately; 3,591 participants) that report absolute measures of alcohol at 3 or 6 months, pooled SMD was -0.18 (95% CI -0.28, -0.07; P = 0.001) (Figure 2). However, there was moderate, statistically significant heterogeneity; $I^2 = 55\%$. For six of these studies that followed up to 12 months, SMD was -0.16 (95% CI -0.32, -0.01; P = 0.04), but there was substantial heterogeneity ($I^2 = 73\%$) (see Supplementary data, Supplement 4, available at *Age and Ageing* online). All pooled studies were in 'at risk' groups. Two studies in 'at-risk' participants were not pooled. One had no control group [14], the other did not report continuous outcome data [18], and had few participants so would be unlikely to substantially influence the overall analysis. The three studies not specifically in 'at risk' populations were not pooled as there was insufficient suitable data. Overall, there is some evidence that alcohol interventions in older at-risk drinkers can be effective.

Interventions to prevent and reduce excessive alcohol consumption in older people

Table 2. Alcohol consumption trends in control groups (for studies that report absolute measures of alcohol)

Study	Control group	Units (alcohol)	Alcohol consumption at baseline and follow-up							
			Baseline	SD/95% CI	3 months	SD/95% CI	6 months	SD/95% CI	12 months	SD/95% CI
Hansen 2012 [19] (women)	Leaflets and information sheet	Mean drinks per week	21.3	20.2–22.4	NR	NR	15	13.5–16.5	14.9	13.4–16.4
Hansen 2012 [19] (men)	Leaflets and information sheet	Mean drinks per week	32.6	30.9–34.3	NR	NR	24	21.8–26.1	23.4	21.3–25.4
Moore 2011 [21]	Booklet on healthy behaviour	Mean drinks in past seven days	15.2	7.4	10.73	8	NR	NR	10.7	8.4
Watson 2013 [23]	Brief advice intervention (5 min)	Mean drinks/day	3.41	2.19	NR	NR	2.81	2.03	2.49	1.93
Fleming 1999 [11]	General health booklet	Number of drinks in previous seven days	16.58	11.49	15.51	11.37	16.09	12.71	16.27	12.17
Cucciare 2013 [15]	Usual care	Mean drinks per drinking day	4.8	4.1	3.5	2.3	4	3.4	NR	NR
Ettner 2014 [16]	Usual care	Mean drinks per week	13.9	8	NR	NR	12.24	NR	11.6	NR
Gordon 2003 [18]	Usual care	Mean drinks per month	61.9	NR	51.6	NR	50.1	NR	48.3	NR
Oslin [22]	Enhanced referral	Number of drinks per week	17.5	11.3	NR	NR	11.4	10.7	NR	NR
Kuerbis 2015 [20]	No intervention (but alcohol intake assessed)	Mean drinks per week	14.4	7	13.5	6	NR	NR	NR	NR

NR, not reported; SD, standard deviation, 95% CI, 95% confidence interval.



¹Summary statistic is standardised mean difference (SMD)

²Data presented for eight studies (nine datasets) that reported alcohol consumption as continuous outcome

³All 8 studies (9 datasets) included in the Forest plot were assessed as 'Unclear' risk of bias.

⁴6 month outcome data available for: Cucciare 2013, Ettner 2014, Fleming 1999, Hansen 2012, Oslin 2006, Watson 2013.

⁵Only 3 month outcome data available for: Kuerbis 2015, Moore 2011.

Figure 2. Forest plot^{1,2,3} for alcohol consumption in intervention groups versus control groups at 3⁵ or 6 months⁴ follow-up, in 'at-risk' populations.

In *post hoc* subgroup analyses, using outcomes at 3 or 6 months, for the 3 intensive interventions [11, 16, 21] using personalised feedback, education and telephone follow-up: SMD -0.32 (95% CI -0.45, -0.18; $P < 0.00001$), $I^2 = 41\%$. For studies described as brief interventions, (five studies;

six data sets: [11, 15, 19, 20, 23]: SMD -0.17 (95% CI -0.30, -0.04), $I^2 = 38\%$. Without the Fleming 1999 study [11] (intensive 'brief' intervention), a significant effect remained (SMD -0.12 (95% CI -0.22, -0.01; $P = 0.03$, $I^2 = 0\%$). While these analyses provide some further evidence of the

effectiveness of intensive interventions and some support that brief interventions overall also may be effective in older people, they should be interpreted with caution because of the small number of studies and heterogeneity.

Assessment of risk of bias

Most studies were assessed as at unclear risk of bias, and three studies at high risk (see Supplementary data, Supplement 5, available at *Age and Ageing* online). All alcohol outcome data was self-reported by participants, although generally using validated instruments. Seven of the 13 included studies reported pre-registration of the trial, six did not [11, 14, 15, 17, 18, 20]. National or government funding was reported for most studies, one reported no funding [25].

There is little evidence of publication bias. Several studies reported no intervention effect and preliminary funnel plots (eight studies) suggested little evidence of publication bias. However, funnel plots are not recommended with less than 10 studies [12].

Discussion

The focus of this review is to provide evidence to inform local authorities, commissioners and other stakeholders about interventions that may be effective in older people. No evidence from intervention studies in older people was found about the impact of alcohol prevention or reduction strategies on cognition or dementia. This is a key gap in the evidence. We are also not aware of any alcohol prevention or reduction interventions started earlier in life that report cognition or dementia outcomes [26, 27].

Little information is available about primary prevention or health promotion to prevent development of harmful drinking in older adults. About a third of older people with drinking problems develop them for the first time in later life [28], often linked to bereavement, physical ill health, lack of mobility, social isolation and depression.

There is, however, evidence about interventions to reduce harmful or hazardous levels of drinking in older people, which is likely to have a beneficial impact on a range of health conditions including dementia [4, 5]. There are limitations in the available evidence: most studies were at unclear or high risk of bias; the range of interventions, intensity and delivery makes interpretation complex; in some studies the control group, generally receiving either less intervention or just assessments of alcohol consumption as part of the research study, also reduced their alcohol consumption; searches were limited to studies in English and OECD countries so there is a risk that other relevant studies were not identified.

However, there is some evidence (three studies) that more intensive interventions involving personalised feedback, physician advice, educational materials and follow-up could be most effective. Brief interventions in older people may also be effective overall, but there is not yet consistent information about effective components and the range of brief interventions that

have been examined had mixed effects. Individual brief interventions that had some positive effects included: a brief 'intensive' intervention; a brief mailed intervention with personalised feedback; provision of advice, education and motivational interviewing. Of note, in some studies, minimal control groups also reduced alcohol consumption, suggesting that simple interventions such as leaflets, and alcohol assessments with advice to reduce drinking, might also have some positive effect.

Previous systematic reviews found few alcohol interventions in older people. A 2007 Cochrane review of brief alcohol interventions in primary care in adults in general found that brief interventions lowered alcohol consumption overall [29]. Only one of the included studies was specifically in older people [11]. A more recent overview of 27 systematic reviews of brief alcohol interventions in primary care in adults [30], also found that brief interventions are effective in reducing alcohol consumption in adults in general but highlighted an evidence gap in older people. This overview included the 2007 Cochrane review and also two other reviews that found studies in older people [31, 32], that between them identified only two studies in older people [11, 18]. The VINTAGE project also identified scarce data relating to alcohol interventions in older people [2]. Therefore, this paper fills a clear evidence gap in older people.

Most of the included studies only recruited a small proportion of the at-risk drinkers identified by screening so it is likely those recruited to the trials were motivated to reduce drinking, which may not apply if implemented in practice [33]. Two studies informed participants recruitment was to a healthy behaviour study, not specifically for alcohol, which may have limited those most motivated to reduce drinking [17, 20]. Both trials reported some improvement in alcohol outcomes.

All of the alcohol data was self-reported. People may under-report or not accurately report their drinking, but this is likely to be similar at baseline and follow-up. Little published data relevant to cost-effectiveness of interventions in older people was found but recent work on the general population suggests that brief interventions are likely to be cost-effective [34].

While harmful or hazardous drinking may have started earlier in the lifecourse and alcohol consumption often declines in later life, many older people still drink at levels that are harmful to health [1]. Older people may also have chronic conditions or interactions with medication so the harmful effects of alcohol may manifest at lower levels of consumption [1]. While primary prevention strategies aimed at people earlier in the lifecourse are also important, there is a growing need to address harmful drinking in older people. The current evidence is presented in this review.

The work presented in this paper has contributed to an evidence-based resource for local authority commissioners, clinical commissioning groups and providers of lifestyle behaviour change programmes of interventions to help the uptake and maintenance of healthy behaviours and promote cognitive health among older adults living in the community [35]. This paper provides further details of the methods, analysis and synthesis.

Key points

- Interventions to reduce alcohol consumption in at-risk drinkers may be effective in older people.
- However, there are limitations to the evidence as most studies were at unclear or high risk of bias.
- There is some evidence that more intensive interventions could be more effective in older people.
- There is little evidence from interventions relating to primary prevention of excessive drinking in older people.
- Gaps in the evidence include cost-effectiveness and impact on cognitive and dementia outcomes.

Supplementary data

Supplementary data mentioned are available at *Age and Ageing* online.

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Authors' contributions

S.K. and L.L. designed protocols for the reviews. S.K. conducted searches, study screening and inclusion of studies, data extraction, risk of bias assessment, synthesis of evidence and drafted the paper. O.O. contributed to study screening, inclusion of studies and risk of bias assessment, A.C. contributed to searching, and project coordination, L. L. checked data extraction and synthesis. L.L. supervised the study and C.B. advised on the overall scope of the programme. All authors commented on and approved the manuscript.

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Conflict of interest

None.

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