JAMA | US Preventive Services Task Force | EVIDENCE REPORT

Screening and Behavioral Counseling Interventions to Reduce Unhealthy Alcohol Use in Adolescents and Adults

Updated Evidence Report and Systematic Review for the US Preventive Services Task Force

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IMPORTANCE Unhealthy alcohol use is common, increasing, and a leading cause of premature mortality.

OBJECTIVE To review literature on the effectiveness and harms of screening and counseling for unhealthy alcohol use to inform the US Preventive Services Task Force.

DATA SOURCES MEDLINE, PubMed, PsycINFO, and the Cochrane Central Register of Controlled Trials through October 12, 2017; literature surveillance through August 1, 2018.

STUDY SELECTION Test accuracy studies and randomized clinical trials of screening and counseling to reduce unhealthy alcohol use.

DATA EXTRACTION AND SYNTHESIS Independent critical appraisal and data abstraction by 2 reviewers. Counseling trials were pooled using random-effects meta-analyses.

MAIN OUTCOMES AND MEASURES Sensitivity, specificity, drinks per week, exceeding recommended limits, heavy use episodes, abstinence (for pregnant women), and other health, family, social, and legal outcomes.

RESULTS One hundred thirteen studies (N = 314 466) were included. No studies examined benefits or harms of screening programs to reduce unhealthy alcohol use. For adolescents (10 studies [n = 171 363]), 1 study (n = 225) reported a sensitivity of 0.73 (95% CI, 0.60 to 0.83) and specificity of 0.81 (95% CI, 0.74 to 0.86) using the AUDIT-C (Alcohol Use Disorders Identification Test–Consumption) to detect the full spectrum of unhealthy alcohol use. For adults (35 studies [n = 114 182]), brief screening instruments commonly reported sensitivity and specificity between 0.70 and 0.85. Two trials of the effects of interventions to reduce unhealthy alcohol use in adolescents (n = 588) found mixed results: one reported a benefit in high-risk but not moderate-risk drinkers, and the other reported a statistically significant reduction in drinking frequency for boys but not girls; neither reported health or related outcomes. Across all populations (68 studies [n = 36 528]), counseling interventions were associated with a decrease in drinks per week (weighted mean difference, −1.6 [95% CI, −2.2 to −1.0]; 32 studies [37 effects; n = 15 974]), the proportion exceeding recommended drinking limits (odds ratio [OR], 0.60 [95% CI, 0.53 to 0.67]; 15 studies [16 effects; n = 9760]), and the proportion reporting a heavy use episode (OR, 0.67 [95% CI, 0.58 to 0.77]; 12 studies [14 effects; n = 8108]), and an increase in the proportion of pregnant women reporting abstinence (OR, 2.26 [95% CI, 1.43 to 3.56]; 5 studies [n = 796]) after 6 to 12 months. Health outcomes were sparsely reported and generally did not demonstrate group differences in effect. There was no evidence that these interventions could be harmful.

CONCLUSIONS AND RELEVANCE Among adults, screening instruments feasible for use in primary care are available that can effectively identify people with unhealthy alcohol use, and counseling interventions in those who screen positive are associated with reductions in unhealthy alcohol use. There was no evidence that these interventions have unintended harmful effects.

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Unhealthy alcohol use (including use that exceeds recommended limits, use that is having negative effects on health, or alcohol use disorder) was estimated to be the third leading preventable cause of mortality in the United States in 2000,[1] with 9.8% of deaths attributable to alcohol consumption from 2006 to 2010.[2] Unhealthy alcohol use is relatively common; in 2016 in the United States, 26% of adults and 4.9% of adolescents reported heavy use episodes (≥5 drinks on the same occasion on ≥1 day in the previous month, also referred to as binge episodes) and 6.6% of adults reported engaging in heavy drinking (≥5 drinks on the same occasion on ≥5 days) in the previous month.[3] Alcohol use can exacerbate or cause a wide range of medical conditions commonly encountered in the primary care setting, including gastrointestinal, cardiopulmonary, dermatologic, reproductive, and neurologic conditions.[4] Alcohol also interacts dangerously with many commonly used prescription and over-the-counter medications.[5] Screening and counseling to reduce unhealthy alcohol use may prevent deleterious health effects and help prevent progression to more severe forms of unhealthy use.

In 2013, the US Preventive Services Task Force (USPSTF) recommended that clinicians screen adults 18 years or older for alcohol misuse and provide brief behavioral counseling interventions to those engaged in risky or hazardous drinking behaviors (B recommendation).[6] The USPSTF concluded, however, that the evidence in adolescents was insufficient to evaluate the balance of benefits and harms of screening and behavioral counseling interventions to reduce alcohol misuse (I statement). This review was prepared to inform an updated recommendation by the USPSTF on the evidence related to screening test accuracy and benefits and harms of screening and counseling for unhealthy alcohol use in populations and settings relevant to US primary care.

Methods

Scope of Review

An analytic framework was developed with 5 key questions (KQs) (**Figure 1**) that examined the benefits (KQ1) and harms (KQ3) of screening for unhealthy alcohol use, screening test accuracy (KQ2), and benefits (KQ4) and harms (KQ5) of counseling interventions for unhealthy alcohol use. A draft of the analytic framework, review questions, and inclusion and exclusion criteria was posted on the USPSTF website from August 25, 2016, to September 21, 2016, for the purpose of gathering public input. Detailed methods (eg, more detailed information about inclusion and quality rating criteria, methods for grading the strength of evidence for key questions, expert review, and public comment process) are available in the full evidence report at http://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/unhealthy-alcohol-use-in-adolescents-and-adults-screening-and-behavioral-counseling-interventions.

Data Sources and Searches

MEDLINE, PubMED (for publisher-supplied records only), PsycINFO, and the Cochrane Central Register of Controlled Trials were searched from January 1, 2011, to October 12, 2017, and supplemented by checking reference lists from the prior 2013 review and other relevant reviews, covering literature published since January 1, 1985. ClinicalTrials.gov was searched for ongoing trials. From October 12, 2017, through August 1, 2018, surveillance was conducted through article alerts and targeted searches of journals with a high impact factor and journals relevant to the topic to identify major studies that might affect the conclusions or understanding of the evidence and therefore the related USPSTF recommendation. The last surveillance, conducted on August 1, 2018, identified no new studies. However, 1 recently published diagnostic accuracy study was subsequently identified that met the inclusion criteria; that study did not change the conclusions and therefore is cited in the Discussion section only.

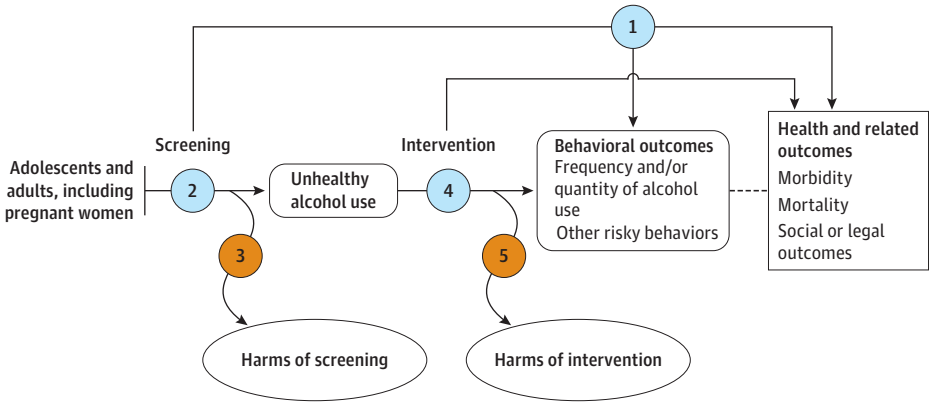
Study Selection

Two reviewers, applying a priori inclusion criteria, independently reviewed 17 149 unique citations and 570 full-text articles (**Figure 2**; eTable 1 in the Supplement). The review included English-language fair- and good-quality studies conducted among adolescents (12 years or older) or adults in countries categorized as "very high" on the United Nations Human Development Index.[8] For benefits and harms of screening (KQ1 and KQ3) and interventions (KQ4 and KQ5), randomized clinical trials were included, as were nonrandomized controlled intervention studies with an eligible control group (eg, usual care, minimal intervention, attention control) that reported an alcohol use outcome. A minimum of 6 months of follow-up was required to assess intervention benefits (KQ1 and KQ4), but there was no minimum requirement for harms (KQ3 and KQ5). For screening test accuracy (KQ2), studies of test accuracy reporting sensitivity and specificity compared with a structured or semistructured clinical interview, or computer-based versions of structured assessments, were included.

For studies of benefits or harms of unhealthy alcohol screening (KQ1 and KQ3) and screening test accuracy (KQ2), studies that were restricted to participants with unhealthy alcohol use were excluded. For benefits or harms of unhealthy alcohol screening (KQ1 and KQ3), trials were sought that tested the effects of a screening program compared with usual care or a similar unscreened control group. Screening test accuracy (KQ2) evidence was limited to screening instruments named in national-level recommendations related to screening for unhealthy alcohol use or that had evidence to support their use based on the previous review (AUDIT [Alcohol Use Disorders Identification Test], AUDIT-C [AUDIT Consumption], SASQ [Single Alcohol Screening Question], and variations of these). Additionally, instruments were selected that target important subpopulations, ie, adolescents (National Institute on Alcohol Abuse and Alcoholism [NIAAA] 2-item screener, BSTAD [Brief Screener for Tobacco, Alcohol, and Other Drugs], and variations of these), pregnant women (TWEAK, T-ACE), or older adults (CARET [Comorbidity Alcohol Risk Evaluation Too]), or that cover both drug and alcohol use (ASSIST [Alcohol, Smoking, and Substance Involvement Screening Test]). For benefits or harms of unhealthy alcohol screening (KQ1 and KQ3) and of counseling interventions to reduce unhealthy alcohol use (KQ4 and KQ5), studies using any screening instrument were eligible.

For evaluating counseling interventions to reduce unhealthy alcohol use (KQ4 and KQ5), trials of behavioral counseling—with or without referral—were included if they were conducted

Figure 1. Analytic Framework: Screening and Interventions to Reduce Unhealthy Alcohol Use



Key questions

1 a. Does primary care screening for unhealthy alcohol use in adolescents and adults, including pregnant women, reduce alcohol use or improve other risky behaviors?

b. Does primary care screening for unhealthy alcohol use in adolescents and adults, including pregnant women, reduce morbidity or mortality or improve other health, social, or legal outcomes?

2 What is the accuracy of commonly used instruments to screen for unhealthy alcohol use?

3 What are the harms of screening for unhealthy alcohol use in adolescents and adults, including pregnant women?

4 a. Do counseling interventions to reduce unhealthy alcohol use, with or without referral, reduce alcohol use or improve other risky behaviors in screen-detected persons?

b. Do counseling interventions to reduce unhealthy alcohol use, with or without referral, reduce morbidity or mortality or improve other health, social, or legal outcomes in screen-detected persons?

5 What are the harms of interventions to reduce unhealthy alcohol use in screen-detected persons?

Evidence reviews for the US Preventive Services Task Force (USPSTF) use an analytic framework to visually display the key questions that the review will address to allow the USPSTF to evaluate the effectiveness and safety of a preventive service. The questions are depicted by linkages that relate interventions and outcomes. A dashed line depicts a health outcome that follows an intermediate outcome. Refer to the USPSTF Procedure Manual for further details.[7]

in or recruited from primary care or a health care system or could feasibly be implemented in or referred from primary care. Since pharmacotherapy is primarily relevant to patients with moderate or severe alcohol use disorder (AUD), studies of pharmacotherapy treatment were excluded.

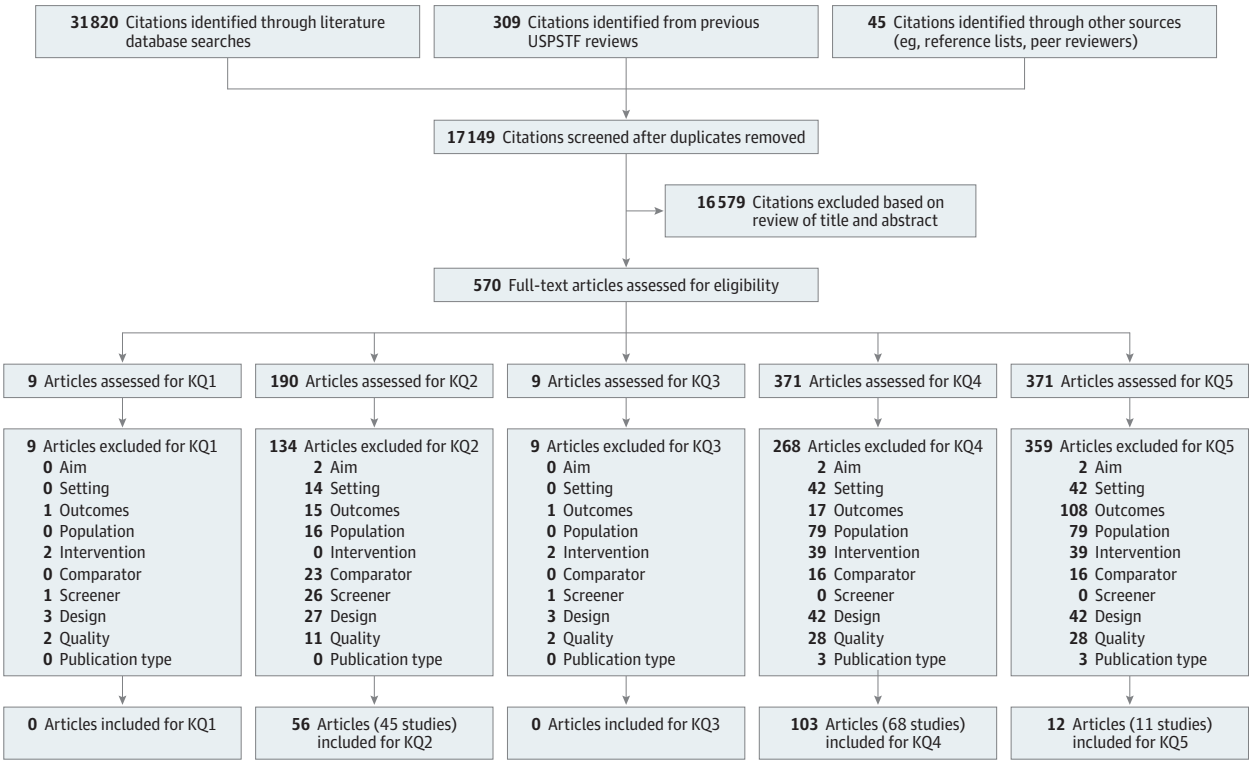
Trials were required to enroll participants through screening for unhealthy alcohol use for at least half of their sample. Screening had to take place in settings comparable or applicable to primary care with a defined population (eg, primary care clinic, Special Supplemental Nutrition Program for Women, Infants, and Children, college freshmen orientation). Trials that identified patients though behavioral or mental health clinics, substance abuse treatment centers, emergency department and trauma centers, work sites (including occupational screening), inpatient or residential facilities, or other institutions (eg, correctional facilities) were excluded. Studies of participants with alcohol dependence or severe AUD (or >50% of the enrolled sample having alcohol dependence or severe AUD) were excluded. Also excluded were studies limited to treatment-seeking individuals, those with concomitant psychotic disorders, those presenting in an emergency setting, and others not generalizable to primary care (eg, inpatients, those court-mandated to treatment, those who were incarcerated).

Data Extraction and Quality Assessment

Included trials were critically appraised by 2 independent reviewers using criteria defined by the USPSTF and for test accuracy studies, supplemented with criteria from the Quality Assessment of Diagnostic Accuracy Studies 2 (QUADAS-2) (eTable 2 in the Supplement).[7,9] Disagreements were resolved by a third reviewer.

Studies were rated as poor quality and excluded if there was an important limitation such as, among treatment trials, very high attrition (generally >40%); differential attrition between intervention groups (generally >20%); substantial lack of baseline comparability between groups without adjustment; or major concerns about the trial conduct, analysis, or reporting of results. For diagnostic accuracy studies, examples of important limitations warranting a "poor" quality rating included use of a reference standard that was not likely to categorize participants accurately, having the participant complete the screener after participating in an in-depth interview on his or her alcohol use, and/or lack of assurance that the study sample was representative of a relevant population. One reviewer abstracted descriptive and outcome data from fair- and good-quality studies into standardized evidence tables; a second checked for accuracy and completeness.

Figure 2. Literature Search Flow Diagram: Screening and Interventions to Reduce Unhealthy Alcohol Use



Articles could appear in more than 1 key question (KQ). Reasons for exclusion: Aim: Study aim was not relevant. Setting: Study was not conducted in a country relevant to United States practice or not conducted in, recruited from, or feasible for primary care or a health system. Outcomes: Study did not have relevant outcomes or had incomplete outcomes. Population: Study was not conducted in an included population. Intervention: Intervention was out of scope. Comparator: Study did not have a comparison group. Screener: Study did not use an included screener. Design: Study did not use an included design. Quality: Study was poor quality. KQ indicates key question; USPSTF, United States Preventive Services Task Force.

Data Synthesis and Analysis

Summary tables of study, population, and intervention characteristics were created, along with forest plots of outcomes, to examine the size, consistency, and precision of effects. Studies were grouped according to population: adolescents (≈12 to 18 years), young adults (≈18 to 25 years), general adult populations (≈18 years or older), older adults (≈65 years or older), and pregnant and postpartum (up to 1 year after childbirth) women.

For the analysis of screening test accuracy, data were not pooled because of variability in cutoffs, populations, and screening tests. Contingency tables were used to calculate confidence intervals for sensitivity and specificity. If contingency tables were not reported, they were estimated using the reported sensitivity, specificity, and prevalence. Positive and negative predictive values were estimated based on the population prevalence of unhealthy alcohol use[3] and 3 combinations of sensitivity and specificity. This article reports the test accuracy to screen for the full spectrum of unhealthy alcohol use (inclusive of exceeding limits and AUD). Test accuracy for other conditions (alcohol dependence, AUD, and exceeding limits) can be found in the full report.

For intervention effectiveness, meta-analysis was conducted for 4 alcohol use outcomes: drinks per week, drinking that exceeded recommended limits, heavy use episodes, and abstinence (for pregnant women). All related outcomes were converted to drinks per week, such as when provided with other time frames (eg, drinks per month) or with grams of ethanol rather than drinks. The conversion factor of 14 g of ethanol was used for 1 standard drink, since this is the definition of a standard drink in the United States. To determine whether meta-analyses were appropriate, clinical and methodological heterogeneity were assessed. In general, when at least 5 similar studies were available or when there were fewer studies but statistical heterogeneity was very low, quantitative synthesis was conducted and reported. Few health outcomes were reported in enough trials to consider pooling; however, a meta-analysis of mortality and alcohol problems or consequences was conducted.

Random-effects models were performed using the DerSimonian and Laird method to estimate pooled effects.[10] For analyses that showed statistically significant pooled effects but that had fewer than 10 trials and I^2 values larger than 50%, a sensitivity analysis was performed that used a more conservative pooling method to determine whether statistical significance was sustained (profile likelihood model or, if the profile likelihood model did not converge, a restricted maximum likelihood analysis with the Knapp-Hartung correction for small samples). For outcomes with 10 or more trials in the meta-analysis (drinks per week, exceeding recommended limits, and heavy use episodes), funnel plots were generated and the Egger test was used to examine funnel plot asymmetry to explore small-study effects, which can be related to publication bias.[11]

Table 1. Summary Population Characteristics for Key Question 2

Population	Participants			Studies, No. (%)				Other Countries Represented	Other Settings
	No.	Age, Mean (SD), y[a]	% Female[a]	No. of Studies	Conducted in Primary Care	Good Quality[b]	Majority of Participants Nonwhite	Conducted in United States	
All populations	277 938	35.3 (13.1)	49.6	45[c]	23 (51)	17 (38)	13 (29)	28 (62)	
Adolescents	171 363	15.5 (0.25)	48.8	10	7 (70)	5 (50)	5 (50)	8 (80)	Chile, Germany	High school (2) Community (1)
Adults (nonpregnant/postpartum)	114 182	38.1 (11.7)	53.1	35	16 (46)	14 (40)	7 (20)	21 (60)		
Young adults	6376	18.5 (1.1)	57.5	6	1 (17)	4 (67)	1 (17)	5 (83)	Belgium	University (4) Other medical (1)
Adults	99 084	43.3 (4.1)	51.8	27	15 (56)	8 (30)	6 (22)	15 (56)	Australia, Finland, France, Germany, Great Britain, Italy, the Netherlands, Spain, Switzerland	Other medical (5) Community (6) University (1)
Older adults	8722	69.0 (0)	49.7	2	0	2 (100)	0	1 (50)	Finland	Community (2)
Pregnant women	1105	25.3 (0.5)	100	3	1 (33)	1 (33)	2 (67)	2 (67)	Argentina	Community (1) Hospital (1)

[a] Weighted by number randomized.

[b] Assessed using criteria from Quality Assessment of Diagnostic Accuracy Studies.[68,69]

[c] Three studies included subgroup analyses in young adults, older adults, and pregnant women, which are shown in the rows for these populations; therefore, the sum of the rows does not add up to the "all populations" totals.

Additionally, for the outcome drinks per week, which was the most commonly reported outcome, meta-regression and subgroup analyses were conducted to explore factors associated with effect size.

Stata version 13.1 (StataCorp) was used for all analyses. All significance testing was 2-tailed, and results were considered statistically significant if the *P* value was .05 or less.

Results

Two reviewers independently assessed 17 149 unique abstracts and 570 full-text articles for inclusion (Figure 2). One hundred thirteen studies (N = 314 466) were included. Overall, 0 studies were included for KQ1, 45 studies (56 articles) for KQ2, 0 studies for KQ3, 68 studies (103 articles) for KQ4, and 11 studies (12 articles) for KQ5.

Benefits of Screening

Key Question 1a. Does primary care screening for unhealthy alcohol use in adolescents and adults, including pregnant women, reduce alcohol use or improve other risky behaviors?

No eligible studies were identified.

Key Question 1b. Does primary care screening for unhealthy alcohol use in adolescents and adults, including pregnant women, reduce morbidity or mortality or improve other health, social, or legal outcomes?

No eligible studies were identified.

Key Question 2. What is the accuracy of commonly used instruments to screen for unhealthy alcohol use?

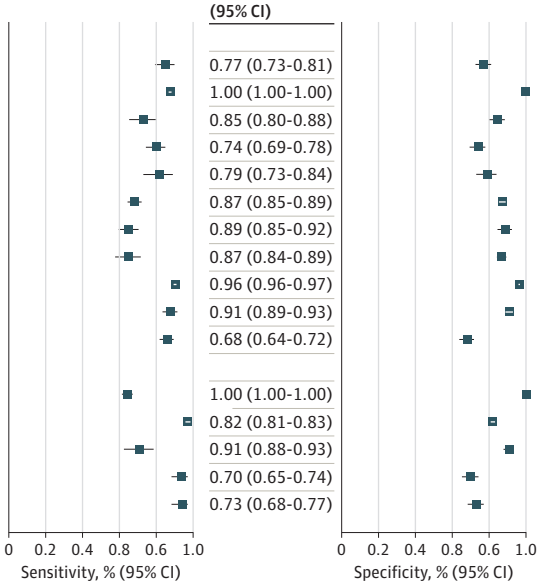
Forty-five studies[12-56] were included (reported in 56 publications[12-67]) (**Table 1**) that addressed the accuracy of screening instruments: 10 in adolescents,[20,21,25,34,36,38,39,43,50,51] 5 in young adults,[14,23,29,40,47] 27 in general adult populations,[12,15-18,22,24,26-28,30-33,35,37,41,42,44-46,48,49,52-54,56] 1 in older adults,[13] and 2 in pregnant[19] or postpartum[55] women. One study in a general adult population provided subgroup analyses of pregnant women and older adults,[26,59] and 1 study of participants aged 12 to 20 years provided subgroup analyses of young adults (18 to 20 years).[21] The majority of studies were conducted in the United States (28/45 [62%]) and recruited patients from primary care (23/45 [51%]) (Table 1). The number of study participants ranged from 95 to 166 165. A variety of 1- and 2-item screening tests were used in the included studies, as well as the AUDIT, AUDIT-C, and ASSIST. Reference standards used in the included studies were most commonly structured diagnostic interviews, and the interview sometimes was used in combination with other instruments (eg, Timeline Followback). Most studies were fair quality (28/45 [62%]).

For adolescents, just 1 study (n = 225) in a German high school reported on test accuracy for detecting the full spectrum of unhealthy alcohol use (eFigure 1 in the Supplement), finding a sensitivity of 0.73 (95% CI, 0.60 to 0.83) and specificity of 0.81 (95% CI, 0.74 to 0.86) for the optimal cutoff of 5 or higher on the AUDIT-C (male and female participants combined). The majority of the test accuracy evidence for adolescents was to detect AUD and is available in the full evidence report.

For adults, studies of the NIAAA-recommended single-item question (How many times in the past year have you had 5 or 4 [males

Figure 3. Test Accuracy of 1- and 2-Item Screening Tests at the Optimal Cutoff to Detect Unhealthy Alcohol Use

Source	Screening Test[a]	Cutoff	No. With Unhealthy Use/Total (%)	Sensitivity, % (95% CI)	Specificity, % (95% CI)
Adults (≥18 y)					
McNeely et al,[46] 2015[b]	4+ drinks	≥1/y	189/586 (32.3)	0.85 (0.79-0.90)	0.77 (0.73-0.81)
Dawson et al,[26] 2005[b]	5/4+ drinks	≥1/y	NR	0.88 (0.87-0.88)	1.00 (1.00-1.00)
McNeely et al,[62] 2015[b]	5/4+ drinks	≥1/y	146/459 (31.8)	0.73 (0.65-0.80)	0.85 (0.80-0.88)
Seale et al,[52] 2006[b]	5/4+ drinks	≥1/3 mo	217/623 (34.8)	0.80 (0.74-0.85)	0.74 (0.69-0.78)
Smith et al,[53] 2009[b]	5/4+ drinks	≥1/y	88/286 (30.8)	0.82 (0.73-0.89)	0.79 (0.73-0.84)
Aalto et al,[12] 2009[b]	6+ drinks	≥12/y	566/1851 (30.6)	0.68 (0.64- 0.72)	0.87 (0.85-0.89)
Levola and Aalto,[42] 2015[b]	6+ drinks	≥12/y	296/542 (54.6)	0.65 (0.60-0.70)	0.89 (0.85-0.92)
McGinnis et al,[45] 2013[c]	6+ drinks	≥1/y	177/837 (21.1)	0.65 (0.58-0.72)	0.87 (0.84-0.89)
Dawson et al,[26] 2005[b]	Maximum drinks	≥4	NR	0.90 (0.89-0.91)	0.96 (0.96-0.97)
Aalto et al,[12] 2009	Quantity × frequency[d]	≥3	250/1011 (24.7)	0.88 (0.83-0.91)	0.91 (0.89-0.93)
	Quantity × frequency[e]	≥4	316/840 (37.6)	0.86 (0.82-0.89)	0.68 (0.64-0.72)
Older adults (≥65 y)					
Dawson et al,[26] 2005[f]	5/4+ drinks	≥1/ y	NR	0.64 (0.61-0.67)	1.00 (1.00-1.00)
	Maximum drinks	≥2	NR	0.97 (0.96-0.99)	0.82 (0.81-0.83)
Aalto et al,[13] 2011[b]	4+ drinks	≥12/y	118/517 (22.8)	0.71 (0.62-0.79)	0.91 (0.88-0.93)
	6+ drinks	≥1/y	118/517 (22.8)	0.94 (0.88-0.97)	0.70 (0.65-0.74)
	Quantity × frequency	≥3	118/517 (22.8)	0.94 (0.88-0.97)	0.73 (0.68-0.77)



NR indicates not reported.

[a] 4+ drinks includes modified 3-Item Alcohol Use Disorders Identification Test (AUDIT-3; lower threshold for females and older adults) and the Substance Use Brief Screen (SUBS). 6+ drinks includes AUDIT-3. Quant × freq includes the first 2 items from the AUDIT (range, 0-8). Maximum drinks asks "During the last 12 months, what was the LARGEST number of drinks that you drank in a single day?" 6+, 5/4+, and 4+ drinks are variations of a screening test that quantifies the number of occasions per year on which a certain amount of drinks (4-6, depending on the test) were consumed in 1 day.

[b] Screened group: all participants.

[c] Study enrolled male participants only.

[d] Female participants.

[e] Male participants.

[f] Screened group: participants aged 65 and older.

or females, respectively] or more drinks in a day?) reported sensitivity ranging from 0.73 to 0.88 (95% CI range, 0.65 to 0.89) and specificity ranging from 0.74 to 1.0 (95% CI range, 0.69 to 1.0) for detecting the full spectrum of unhealthy alcohol use (4 studies [n = 44 461]) (**Figure 3**, labeled "5/4+ drinks"). All of these studies were conducted in the United States, primarily in primary care settings. Other 1- and 2-item screening tests (8 studies [n = 48 211]) generally showed sensitivities of 0.70 or higher, although the standard of 6 or more drinks per occasion tended to have lower sensitivity than the 5/4 or more drinks standard, often with nonoverlapping confidence intervals. Other adult populations (young adults, older adults, pregnant women) had results in similar ranges.

For the AUDIT-C, sensitivity for detecting the full spectrum of unhealthy alcohol use in adults was similar to the 1- and 2-item screeners, excluding 1 Veterans Affairs–based study in HIV-positive patients and matched controls[45] that had substantially lower sensitivity. In most studies, the range of sensitivities was 0.73 to 0.97 for female participants (5 studies [n = 2714]; 95% CI range, 0.62 to 0.99) (eFigure 2 in the Supplement) and 0.82 to 1.0 for male participants (4 studies [n = 1038]; 95% CI range, 0.75 to 1.0) (eFigure 3 in the Supplement) at the standard score cutoffs of 3 or higher for female participants and 4 or higher for male participants, but the range of reported specificity was much wider (0.28 to 0.91 [95% CI range, 0.21 to 0.93] for female participants and 0.34 to 0.89 [95% CI range, 0.25 to 0.92] for male participants). Several studies reported sensitivities of 0.80 or higher at optimal cutoffs on the AUDIT-C, with associated specificities generally in the range of mid-0.70s to mid-0.80s (eFigure 1 in the Supplement). Evidence on the use of the AUDIT-C was very sparse in the adult subpopulations of younger adults, older adults, and pregnant women.

For the AUDIT, when using the recommended score cutoff of 8 or higher, studies (7 studies [n = 8852]) reported a wide range of sensitivity for detecting the full spectrum of unhealthy alcohol use in general adult populations (range, 0.38 to 0.73 [95% CI range, 0.33 to 0.84]) but high specificity (range, 0.89 to 0.97 [95% CI range, 0.84 to 0.98]) (eFigure 4 in Supplement). Sensitivity was relatively high (0.82) in young adults at the standard score cutoff of 8 or higher, but data were sparse in this population (2 studies [n = 660]). In many studies, sensitivity improved at lower cutoffs. Studies conducted in US primary care settings generally showed a more optimal balance of sensitivity and specificity at cutoffs of 3, 4, or 5 (3 trials [n = 2782]; sensitivity range, 0.64 to 0.86 [95% CI range, 0.57 to 0.91]; specificity range, 0.74 to 0.94 [95% CI range, 0.68 to 0.95]) (eFigure 5 in the Supplement).

At a sensitivity of 0.80 and a specificity of 0.90, the positive predictive value was estimated at 74% and the negative predictive value was estimated at 93% among adults with heavy use episodes in the past month (eTable 4 in the Supplement), using prevalence estimates for the US general population. Among population groups with lower prevalence of unhealthy alcohol use—older adults, pregnant women, and adolescents—the estimated positive predictive value was much lower, ranging from 26% to 46%.

Table 2. Summary Intervention Characteristics for Key Questions 4 and 5 (All Intervention Conditions)

Population	No. Studies	Participants	Intervention Groups	No. (% of Intervention Groups) Single Session	Multiple Sessions	Other	Estimated Total Contact, Median (Range), min	Web- or Computer-Based Only	Personalized Normative Feedback	Motivational Interviewing or Motivational Enhancement	Primary Care Team Involved	PCP Delivered Most/All of Intervention
All populations	68	36 528	94	51 (54)	40 (43)	3 (3)	30 (1-600)	30 (32)	58 (62)	36 (38)	29 (31)	16 (17)
Adolescents	2	588	2	1 (50)	1 (50)		20[a]	0	2 (100)	1 (50)	0	0
Adults (nonpregnant/postpartum)	55	33 662	80	44 (55)	33 (41)	3 (4)	30 (1-600)	27 (34)	53 (66)	29 (36)	29 (36)	16 (20)
Young adults	22	14 214	38	30 (79)	7 (18)	1 (mail only)	35 (1-600)	23 (61)	34 (89)	10 (26)	2 (5)	2 (5)
Adults	29	16 944	38	14 (37)	22 (58)	2 (not prescribed)	30 (3-555)	4 (11)	18 (47)	17 (45)	24 (63)	13 (34)
Older adults	4	2504	4	0	4 (100)		80 (30-140)	0	1 (25)	2 (50)	3 (75)	1 (25)
Pregnant/postpartum	11	2278	12	6 (50)	6 (50)		22 (10-80)	3 (25)	3 (25)	6 (50)	0	0
Pregnant	9	1920	10	5 (50)	5 (50)		22 (10-80)	2 (20)	2 (20)	4 (40)	0	0
Postpartum	2	358	2	1 (50)	1 (50)		30 (20-40)	1 (50)	1 (50)	2 (100)	0	0

Abbreviation: PCP, primary care physician.

[a] Able to estimate total minutes for only 1 trial in adolescents.

Harms of Screening

Key Question 3. What are the harms of screening for unhealthy alcohol use in adolescents and adults, including pregnant women?

No eligible studies were identified.

Benefits of Interventions

Key Question 4a. Do counseling interventions to reduce unhealthy alcohol use, with or without referral, reduce unhealthy alcohol use or improve other risky behaviors in screen-detected persons?

Sixty-eight trials[70-137] (n = 36528) were included (reported in 100 publications[70-169]) that addressed the effect of a counseling intervention on alcohol use. Two of the trials targeted adolescents,[92,109] 22 targeted college-aged or young adults,[71,75,79,83,87,96,98-101,103-105,107,108,111-113,125,129,133] 29 addressed general adult populations,[70,72-74,76,80-82,84,85,88,91,93-95,97,106,114,120,122,124,126-128,131,134,137] 4 focused on older adults,[86,90,110,136] and 11 targeted pregnant[77,78,115,116,118,119,123,130,132] or postpartum[89,117] women. Details of the included trials are reported in eTable 3 in the Supplement. Most trials were conducted in the United States (41/68 [60%]) and in primary care settings (42/68 [62%]). Trials were typically limited to participants who reported a prespecified level of alcohol use (most commonly either more than 7 [female participants] or 14 [male participants] drinks per week on average, or 4 [female participants] or 5 [male participants] or more drinks on a single occasion) or scored above a predetermined cutoff on a screening instrument such as the AUDIT. Ten trials were rated as good quality[71,86,88,91,92,100,123,129,133,136] and the remaining were fair quality. Nineteen trials (28%) were included in the previous review.

Most interventions involved 1 to 2 sessions (90% involved 4 or fewer sessions), with a median of 30 minutes of contact time (88% involved 2 hours of contact or less) (**Table 2**). Almost all interventions involved at least basic education; general feedback, such as how the participant's drinking compared with recommended limits; and suggestions about how to reduce alcohol use. Many, particularly those in primary care settings, used a SBIRT (screening, brief intervention, and referral to treatment) approach, consistent with approaches recommended by several health organizations. The most commonly reported intervention element was the use of personalized normative feedback sessions, in which participants were shown how their alcohol use compared with that of others; this technique was used in 62% of the included interventions and 89% of the interventions in younger adults. Motivational techniques were also common, particularly in combination with personalized normative feedback.

Most trials in adolescents and young adults involved 1 or 2 in-person or web-based personalized normative feedback sessions in school or university settings. Counseling interventions targeting adults other than college students (including pregnant and postpartum women) were more likely to take place in primary care settings, have multiple sessions, and involve the primary care team in some way; 33% of the interventions were delivered by the primary care clinician in trials of general and older adult populations.

Six trials (in 7 intervention groups) incorporated feedback on how an individual's alcohol consumption was affecting his or her health, such as elevated liver enzyme levels, symptoms or medical conditions that could be exacerbated by alcohol use,

and potentially dangerous alcohol use with prescribed medications.[73,86,93,110,132,134]

The most commonly reported alcohol use outcome was drinks per week, reported in 45 trials. On average, individuals in intervention groups reduced their drinking by 1.6 drinks per week more than those in control groups after 6 to 12 months (32 trials and 37 analysis groups [n = 15 974]; weighted mean difference [WMD] between groups in change from baseline, −1.6 [95% CI, −2.2 to −1.0]; I^2 = 63%) (**Figure 4**, **Table 3**). This analysis included only 1 trial in adolescents, with separate entries for moderate- and high-risk users, and so is primarily reflective of adult unhealthy alcohol users. Baseline use levels were highly variable, with trial baseline means ranging from 3.8 to 59.3 drinks per week across all populations, and larger effects were typically seen with larger baseline use levels. The intervention group means changed from 20.5 drinks per week at baseline to 15.6 drinks per week at follow-up; control group means changed from 20.1 at baseline to 17.4 at follow-up. Excluding trials in adolescents and young adults, whose drinking patterns were generally typified by heavy use episodes rather than daily heavy drinking, the mean drinks per week in adult populations changed from 26.0 at baseline to 19.1 at follow-up in the intervention groups and from 25.6 at baseline to 21.6 in the control groups.

Trials that could not be included in the meta-analysis generally showed effects of a similar or slightly smaller size, favoring the intervention group (eg, between-group differences in change ranging from 0.9 to 1.8 drinks/wk, or posttest differences of 2.3 drinks/wk, or 10% to 20% relative reductions in use). The associations remained statistically significant when limited to trials conducted in primary care settings (21 trials [n = 7803]; WMD, −2.4 [95% CI, −3.4 to −1.3]; I^2 = 70%), in the United States (18 trials [n = 8766]; WMD, −1.3 [95% CI, −1.9 to −0.6]; I^2 = 64%), and in US-based primary care settings (9 trials [n=4989]; WMD, −1.8 [95% CI, −2.9 to −0.6]; I^2 = 77%) (**Figure 5**). For trials with multiple follow-up assessments, effects were typically maintained between 6 and 12 months of follow-up; however, in several trials of young adults, group differences at 6 months' follow-up were no longer statistically significant at 12 months' follow-up.[75,87,99,125] Seven trials[70,88,90,95,102,107,114] reported follow-up at 24 months or beyond, and group differences were maintained in 4 of these through 24 months[90,107,112] to 48 months.[88]

A small-studies effect was identified for drinks per week (Egger test bias coefficient, −1.04; P = .03) (eFigure 6 in the Supplement), and earlier publication date, younger population age (young adults vs other adults), and higher baseline drinking levels were also associated with larger effect sizes (Figure 5). These factors were not independent of each other, however, and it could not be determined which had a causal association with effect size. Smaller trials were more likely to have been published before 2007 and to have been conducted among heavier drinkers. Older trials were also primarily conducted among general adult populations in primary care settings, whereas many of the newer trials were conducted among young adults in college settings, with baseline use levels that were considerably lower than those in trials targeting general adult populations. Associations between effect size and intervention elements or other populations or study characteristics were generally not found.

The intervention was associated with a reduction in the odds of exceeding recommended drinking limits at 6 to 12 months of follow-up (15 trials [16 effects; n = 9760]; odds ratio [OR], 0.60 [95% CI, 0.53 to 0.67]; I^2 = 24%) (Table 3; eFigure 7 in the Supplement), although this outcome was reported in only 24% (16/68) of the included studies. Between 15% and 76% of participants exceeded recommended drinking limits at follow-up in the intervention groups, compared with 29% to 82% in the control groups. Similarly, there was a reduction in the pooled odds of reporting an episode of heavy use (12 trials [14 effects; n = 8108]; OR, 0.67 [95% CI, 0.58 to 0.77]; I^2 = 24% (Table 3; eFigure 8 in the Supplement), which was also relatively sparsely reported. Between 10% and 76% of intervention participants reported heavy use episodes at follow-up, compared with 13% to 92% in control groups. Small-studies effects were not detected for either of these outcomes. The 9 trials in pregnant women were most likely to report the odds of abstinence rather than the aforementioned outcomes; abstinence was higher in the intervention groups compared with the control groups (5 trials [n = 796]; pooled OR, 2.26 [95% CI, 1.43 to 3.56]; I^2 = 0%) (Table 3; eFigure 9 in the Supplement). Among trials reporting abstinence before delivery, abstinence ranged from 72% to 90% among intervention participants and from 55% to 74% among control participants. Other alcohol use outcomes were very sparsely reported and generally showed no statistically significant differences between groups.

Few changes in other behavioral outcomes such as drug use, sex after alcohol use, and seeking help for unhealthy alcohol use were noted, and those outcomes were only rarely reported. One trial[82] in a general adult population found a reduction in self-reported drinking and driving, but 2 trials, in younger[125] and older[86] adults, did not. The latter trial in older adults also reported that participants reduced the likelihood of using alcohol in the face of symptoms or comorbidities that could be exacerbated by alcohol and with medication that could interact negatively with alcohol.[86]

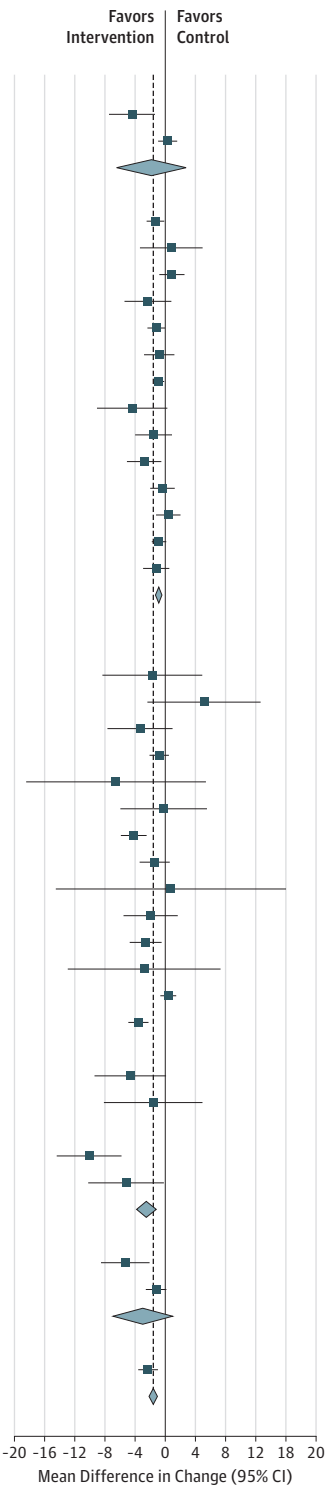
Key Question 4b. Do counseling interventions to reduce unhealthy alcohol use, with or without referral, reduce morbidity or mortality or improve other health, social, or legal outcomes in screen-detected persons?

The most commonly reported health outcome was alcohol-related problems or consequences, measured using a variety of instruments. A pooled analysis showed a statistically significant, but very small, standardized mean difference in change between groups of −0.04 (18 trials [n = 9894]; 95% CI, −0.09 to −0.01; I^2 = 3%). This effect size (Hedges g) can be interpreted as a Cohen d, where a small effect is typically considered to be 0.20 to 0.50.[170] Mortality was reported in 8 trials, primarily as part of the description of the participant retention. The pooled association was not statistically significant (9 trials [n = 4533]; OR, 0.64 [95% CI, 0.34 to 1.19]; I^2 = 0%) (eFigure 10 in the Supplement) and also may represent an overestimate of the true effect, since some trials that did not report deaths likely had no deaths, particularly trials among young adults. Trials were not powered for this outcome and many had very few events, resulting in imprecise results.

One trial, the Trial for Early Alcohol Treatment (TrEAT), described ascertainment methods.[88] The effect on mortality at 4 years, 0.8% (3/392) of intervention participants dying compared with 1.8% (7/382) of control participants, was not statistically significant. Differences in mortality between groups were statistically significant at 3 years of follow-up, when there had been only 1 death among intervention participants but 7 among

Figure 4. Drinks per Week (Key Question 4a), Mean Difference in Change Between Alcohol Counseling Interventions and Control Groups, by Population

Source	Time Point, mo	Intervention		Control		Mean Difference in Change (95% CI)
		No. of Participants	Mean Change From Baseline (SD)	No. of Participants	Mean Change From Baseline (SD)	
Adolescents						
Haug et al,[92] 2017						
High-risk drinking	6	80	-7.9 (10.5)	74	-3.5 (8.8)	-4.41 (-7.46 to -1.36)
Medium-risk drinking	6	181	-0.9 (6.6)	142	-1.3 (5.0)	0.32 (-0.95 to 1.59)
Subtotal: I^2 = 87.3%; P = .005						-1.83 (-6.45 to 2.78)
Young adults						
Bertholet et al,[71] 2015	6	338	-1.7 (7.8)	329	-0.4 (7.6)	-1.30 (-2.47 to -0.13)
Carey et al,[75] 2006	12	65	-3.6 (12.1)	59	-4.4 (11.6)	0.80 (-3.36 to 4.96)
Collins et al,[79] 2014	12	183	-1.8 (8.3)	173	-2.7 (7.8)	0.89 (-0.79 to 2.56)
Daeppen et al,[83] 2011	6	110	-1.5 (13.2)	125	0.8 (10.8)	-2.30 (-5.41 to 0.81)
Fleming et al,[87] 2010	12	493	-4.8 (9.5)	493	-3.6 (9.2)	-1.20 (-2.37 to -0.03)
LaBrie et al,[102] 2013	12	144	-2.2 (8.4)	143	-1.4 (9.0)	-0.80 (-2.82 to 1.22)
Larimer et al,[103] 2007	12	737	0.2 (7.2)	751	1 (6.3)	-0.83 (-1.52 to -0.14)
Leeman et al,[104] 2016	6	48	-1.7 (9.3)	42	2.7 (12.8)	-4.39 (-9.06 to 0.28)
Lewis et al,[105] 2014	6	119	-5.2 (10.1)	121	-3.7 (9.2)	-1.55 (-3.99 to 0.89)
Neighbors et al,[111] 2004	6	126	-3.6 (9.0)	126	-0.8 (9.5)	-2.80 (-5.08 to -0.52)
Neighbors et al,[113] 2016	6	177	-2.5 (8.7)	180	-2.1 (6.9)	-0.37 (-2.00 to 1.26)
Schaus et al,[125] 2009	12	181	-1.9 (7.4)	182	-2.3 (8.4)	0.40 (-1.23 to 2.03)
Turrisi et al,[129] 2009	10	278	3.6 (5.8)	305	4.4 (6.0)	-0.82 (-1.78 to 0.14)
Voogt et al,[133] 2014	6	456	0.7 (13.0)	451	1.9 (13.8)	-1.20 (-2.94 to 0.54)
Subtotal: I^2 = 10.9%; P = .33						-0.86 (-1.29 to -0.43)
Adults						
Aalto et al,[70] 2000						
Men	36	97	0.4 (19.1)	84	2.1 (25.4)	-1.71 (-8.34 to 4.91)
Women	36	37	4.8 (20.9)	39	-0.4 (10.6)	5.14 (-2.37 to 12.65)
Bischof et al,[72] 2008	12	131	-6.5 (18.6)	139	-3.2 (17.5)	-3.35 (-7.67 to 0.97)
Cunningham et al,[81] 2012	6	589	-0.5 (11.5)	589	0.3 (11.1)	-0.80 (-2.09 to 0.49)
Drummond et al,[84] 2009	6	39	-15.5 (30.4)	52	-9 (26.3)	-6.53 (-18.45 to 5.40)
Emmen et al,[85] 2005	6	61	5.7 (14.0)	62	5.9 (18.3)	-0.21 (-5.96 to 5.54)
Fleming et al,[88] 1997	12	392	-7.7 (11.8)	382	-3.5 (12.4)	-4.18 (-5.89 to -2.47)
Hansen et al,[91] 2012	12	476	NR	454	-5.5 (15.8)	-1.40 (-3.40 to 0.60)
Heather et al,[93] 1987	6	29	-8.4 (21.7)	32	-9.1 (37.7)	0.75 (-14.52 to 16.02)
Maisto et al,[106] 2001	12	73	-5.5 (11.3)	85	-3.6 (11.8)	-1.94 (-5.54 to 1.66)
Ockene et al,[114] 1999	12	235	-5.7 (11.3)	210	-3.2 (11.4)	-2.60 (-4.72 to -0.48)
Richmond et al,[120] 1995	12	66	-6.3 (26.2)	61	-3.5 (25.0)	-2.80 (-12.93 to 7.33)
Rose et al,[121] 2017	6	678	-0.5 (9.9)	685	-0.9 (10.0)	0.40 (-0.66 to 1.46)
Rubio et al,[123] 2010	12	371	-8.2 (9.3)	381	-4.7 (9.5)	-3.56 (-4.90 to -2.22)
Scott and Anderson,[127] 1991						
Men	12	80	-11.2 (13.9)	74	-6.6 (16)	-4.64 (-9.39 to 0.10)
Women	12	33	-11.6 (13.0)	39	-10 (15.3)	-1.60 (-8.14 to 4.94)
Wallace et al,[134] 1988						
Men	12	318	-18.2 (26.7)	322	-8.1 (28.7)	-10.10 (-14.40 to -5.80)
Women	12	130	-11.5 (18.2)	137	-6.3 (23.4)	-5.20 (-10.22 to -0.18)
Subtotal: I^2 = 69.7%; P < .001						-2.51 (-3.81 to -1.21)
Older adults						
Fleming et al,[90] 1999	12	87	-5.4 (7.3)	71	-0.1 (12.2)	-5.30 (-8.52 to -2.08)
Moore et al,[110] 2010	12	213	-5.7 (7.6)	294	-4.5 (7.9)	-1.21 (-2.58 to 0.16)
Subtotal: I^2 = 80.9%; P = .02						-2.98 (-6.96 to 0.99)
Postpartum women						
Fleming et al,[89] 2008	6	122	-3.6 (5.3)	113	-1.3 (5.0)	-2.28 (-3.59 to -0.96)
Overall: I^2 = 62.8%; P < .001						-1.59 (-2.15 to -1.03)



Weights are from random-effects analysis.

Table 3. Summary of Meta-analysis Results, Primary Drinking Outcomes for Key Question 4a

Outcome (Effect Measure)	No. of Studies (No. of Effects Analyzed)	No. Participants Analyzed	Pooled Effect (95% CI)	I^2, %	T^2
Drinks/wk, Between-Group Difference in Change From Baseline (Weighted Mean Difference)					
All populations	32 (37)	15 974	−1.59 (−2.15 to −1.03)	63	1.40
Adolescents	1 (2)	477	−1.83 (−6.45 to 2.78)	87	9.77
Young adults	14 (14)	6935	−0.86 (−1.29 to −0.43)	11	0.07
Adults	15 (18)	7662	−2.51 (−3.81 to −1.21)	70	3.73
Older adults	2 (2)	665	−2.98 (−6.96 to 0.99)	81	6.77
Pregnant women	0	0	NR		
Postpartum women	1 (1)	235	−2.28 (−3.59 to −0.96)	NA	NA
% Exceeding Recommended Drinking Limits (OR)					
All populations	15 (16)	9760	0.60 (0.53 to 0.67)	24	0.01
Adolescents	0	0	NR		
Young adults	2 (2)	3068	0.71 (0.60 to 0.86)	0	0.0
Adults	10 (11)	4964	0.56 (0.49 to 0.65)	14	0.01
Older adults	3 (3)	1728	0.58 (0.41 to 0.80)	24	0.02
Pregnant women	0	0	NR		
Postpartum women	0	0	NR		
% With Heavy Use episodes (OR)					
All populations	12 (14)	8108	0.67 (0.58 to 0.77)	24	0.01
Adolescents	1 (2)	477	0.55 (0.22 to 1.34)	52	0.24
Young adults	2 (2)	2247	0.81 (0.63 to 1.05)	0	0.0
Adults	6 (7)	3683	0.65 (0.53 to 0.81)	44	0.03
Older adults	3	1701	0.59 (0.44 to 0.80)	0	0.0
Pregnant women	0	0	NR		
Postpartum women	0	0	NR		
% Abstinent From Alcohol (OR)					
Pregnant women	5	796	2.26 (1.43 to 3.56)	0	0.0

Abbreviations: NA, not applicable; NR, not reported; OR, odds ratio.

controls. This trial also reported statistically significant reductions in days of hospitalization (420 in the intervention group vs 664 in the control group) and controlled substance or liquor violations (2 in the intervention group vs 11 in the control group) at 4 years of follow-up. Other trials reported a wide variety of health outcomes, generally at 6 to 12 months of follow-up, with few findings of benefit for intervention over control groups.

Harms of Interventions

Key Question 5. What are the harms of interventions to reduce unhealthy alcohol use in screen-detected persons?

Only 6 of the included trials (n = 3650) of counseling interventions to reduce unhealthy alcohol use reported on harms.[72,103,105,113,116,136] In all cases, authors reported no harms in both groups. Further, no pattern of unexpected paradoxical increases in alcohol use was noted with these interventions.

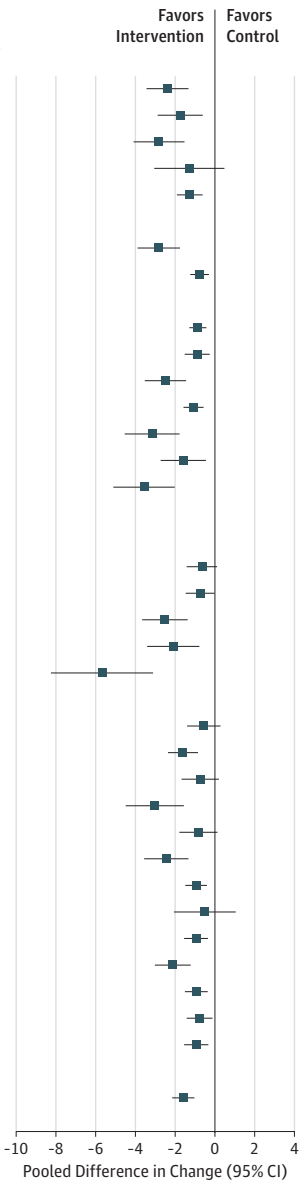
Discussion

The evidence in this review is summarized in **Table 4**. No evidence was found for screening programs to reduce unhealthy alcohol use or improve health, compared with usual care without screening. Multiple screening instruments are available that can detect unhealthy alcohol use with reasonable accuracy and that require 1 or 2 minutes to administer. For example, studies of adults found that the NIAAA-recommended single question had sensitivity ranging from 0.73 to 0.88 and specificity from 0.74 to 1.0 for detecting unhealthy alcohol use. For the AUDIT-C, sensitivity was similar, but the range of reported specificity was wider. For the full AUDIT, range of sensitivity was wide (0.38-0.73) using the recommended score cutoff of 8 or higher, but range of specificity was high (0.89-0.97). This pattern supports the use of a brief screener to identify excess use, followed by assessment with a more detailed instrument with greater specificity (eg, the AUDIT), as is currently done in some health care systems.[171-173] If used as an initial screening test, data for the AUDIT from US primary care settings suggests that lower cutoffs (eg, 3, 4, or 5) may be preferable to provide a more optimal balance of sensitivity and specificity for detecting the full spectrum of unhealthy alcohol use. Given the relatively brief time required for follow-up questions after a positive screen to confirm the presence of unhealthy alcohol use and determine its extent (if present), clinicians may prioritize sensitivity over specificity for the initial screening and may consider calibrating the optimal cutoff for their setting.

One limitation of the evidence on the accuracy of screening instruments is that studies sometimes used variations of the standard instruments and cutpoints, and the gold standard was also heterogeneous across studies (eg, the definition of "exceeding recommended limits" varied across countries). This likely increased the variability in results but also supports the robustness of these tools, even with modifications. Use of the USAUDIT and USAUDIT-C, designed to use the United States' standard drink size and to return

Figure 5. Subgroup and Sensitivity Analysis Results for Drinks per Week (Key Question 4a), Mean Difference in Change Between Alcohol Counseling Interventions and Control Groups, by Indicated Subgroup of Trials

Analysis	No. of Studies	I^2, %	Pooled Difference in Change (95% CI)
High applicability			
Primary care setting	21	70	-2.38 (-3.44 to -1.33)
Primary care in the United States	9	77	-1.75 (-2.88 to -0.61)
Primary care team involved, PC setting	16	68	-2.81 (-4.09 to -1.53)
Primary care team not involved, PC setting	5	65	-1.28 (-3.05 to 0.48)
United States	18	64	-1.27 (-1.91 to -0.62)
Comparison with previous review			
In previous review	15	68	-2.83 (-3.89 to -1.76)
Not in previous review	22	28	-0.77 (-1.24 to -0.30)
Heterogeneity: population, publication date			
Young adults	14	11	-0.86 (-1.29 to -0.43)
Young adults, excluding all-comers trials	12	24	-0.89 (-1.52 to -0.26)
Adults, excluding young adults	21	68	-2.49 (-3.53 to -1.45)
Published in 2007 or later	22	56	-1.07 (-1.58 to -0.57)
Published prior to 2007	15	43	-3.16 (-4.54 to -1.78)
Published in 2007 or later, non-young adults	8	72	-1.59 (-2.73 to -0.45)
Published prior to 2007, non-young adults	13	40	-3.56 (-5.11 to -2.02)
Heterogeneity: baseline severity			
Baseline drinks/wk			
0-7	4	41	-0.65 (-1.42 to 0.11)
>7-14	12	52	-0.75 (-1.47 to -0.02)
>14-21	9	56	-2.52 (-3.66 to -1.37)
>21-28	5	36	-2.10 (-3.41 to -0.78)
>28	7	11	-5.68 (-8.25 to -3.11)
Heterogeneity: intervention characteristics			
Single, very brief session	7	45	-0.56 (-1.40 to 0.28)
Single, brief session	8	0	-1.61 (-2.36 to -0.85)
Single, extended session	2	0	-0.74 (-1.68 to 0.20)
Multiple brief sessions	12	78	-3.02 (-4.49 to -1.56)
Multiple extended sessions	7	0	-0.83 (-1.79 to 0.13)
Multiple sessions	19	71	-2.44 (-3.56 to -1.33)
Single session	17	30	-0.95 (-1.49 to -0.40)
Multiple sessions, young adults only	2	59	-0.50 (-2.06 to 1.05)
Single session, young adults only	11	16	-0.95 (-1.55 to -0.35)
Direct contact (telephone, in-person)	24	68	-2.12 (-3.02 to -1.22)
No direct contact	13	38	-0.94 (-1.51 to -0.36)
Direct contact, young adult only	5	0	-0.77 (-1.42 to -0.12)
No direct contact, young adult only	9	24	-0.94 (-1.55 to -0.33)
Overall			
All included data	37	63	-1.59 (-2.15 to -1.03)



Weights are from random-effects analysis.

results consistent with NIAAA recommendations, is likely to improve on the performance of the standard AUDIT and AUDIT-C.[174] No studies on the USAUDIT or USAUDIT-C were published during the search window; however, a newly published study conducted among college students confirms that the performance characteristics of these instruments are improved over those of the standard AUDIT and AUDIT-C for determining whether someone exceeds the NIAAA-recommended drinking limits.[175]

Among adults identified through screening, counseling interventions to reduce unhealthy alcohol use were associated with reductions in alcohol use (by a mean of 1.6 drinks/wk) and in the odds of exceeding recommended drinking limits (by 40%) and heavy use episodes (by 33%) at 6 to 12 months of follow-up. Based on these findings, among adult unhealthy alcohol users, and assuming 33% of control group participants were drinking within recommended limits at follow-up (the median of the included trials), such interventions would result in an absolute increase of 14 percentage points in the likelihood of drinking within recommended limits, meaning 7 adults would need to be treated to achieve 1 drinking within recommended limits (number needed to treat [NNT], 7.2 [95% CI, 6.2 to 11.5]). Among pregnant women, counseling interventions were associated with an odds ratio of 2.26 for remaining abstinent from alcohol during pregnancy, for an NNT of 6.0 (95% CI, 4.3 to 12.5), assuming a baseline rate of 62% of women being abstinent from alcohol. Very limited data suggested that benefits from alcohol use counseling interventions can be maintained over 2 to 4 years.

Although many trials reported health, social, legal, and related outcomes, no specific outcomes were widely reported. Very limited information on harms of the included intervention was found, but the fact that most results favored the intervention groups across

Table 4. Summary of Evidence

No. Studies (Design), No. of Participants	Summary of Findings	Consistency and Precision	Limitations (Includes Reporting Bias)	Strength of Evidence	Applicability
KQ1: Benefits of Screening					
0	NA	NA	NA	Insufficient	NA
KQ2: Screening Accuracy					
45 (diagnostic accuracy) n = 277 881	For adolescents, data supported the use of the NIAAA Youth Screen and other 1- or 2-item screeners to detect AUD; however, data were insufficient to determine whether brief (1-3 items) screeners or the AUDIT can detect unhealthy use Preliminary evidence suggests lower cutoffs than the standard ≥8 would be preferred for the AUDIT if used	Reasonably consistent, reasonably precise (to detect AUD) Consistency and precision NA (to predict unhealthy use)	Information around the administration of the screening test and reference standard (order of tests, blinding of interviewer to the results of the index test while administering the reference standard) often not well reported No reporting bias suspected	Moderate (adolescents, to detect AUD) Insufficient (adolescents, to detect full spectrum of unhealthy alcohol use) High (adults)	Many in US primary care, including studies covering both general populations and targeted subgroup with comorbidities and in different types of settings (eg, including the VA and Indian Health Service) US-based studies outside of primary care included epidemiologic surveys with sampling to be representative of the US population, with oversampling of racial/ethnic minorities in some cases Young adult studies primarily in college settings
	For adults, brief (1-3 items) screeners commonly reported sensitivity and specificity between 0.70 and 0.85, typically having better sensitivity than the full AUDIT for identifying the full spectrum of unhealthy use; however, the AUDIT tended to have higher specificity, particularly at the standard cutoff of ≥8 Evidence supports the use of brief instruments as initial screeners, where high sensitivity and lower specificity would be desirable, followed by use of a longer instrument, such as the AUDIT, with greater specificity	Reasonably consistent, reasonably precise			
KQ3: Harms of Screening					
0	NA	NA	NA	Insufficient	NA
KQ4a: Benefits of Interventions—Alcohol Use and Other Risky Behaviors					
68 (RCTs) n = 36 528	Interventions reduced drinks/wk (WMD, −1.59 [95% CI −2.15 to −1.03]), the proportion exceeding recommended drinking limits (OR, 0.60 [95% CI, 0.53 to 0.67]), and the proportion reporting a heavy use episode (OR, 0.67 [95% CI, 0.58 to 0.77]), and increased the proportion of pregnant women reporting abstinence (OR, 2.26 [95% CI, 1.43 to 3.56]) Outcomes were generally reported at 6- to 12-mo follow-up or during the late pregnancy or early postpartum period for abstinence during pregnancy Benefits remained through 24 mo or beyond in 4 of 7 trials with longer-term outcomes Heterogeneity was high and effect size was associated with a number of study (but not intervention) characteristics Reduction in self-reported drinking after driving in 2 of 3 trials Only 2 trials included adolescents	Inconsistent and imprecise (adolescents) Reasonably consistent, reasonably precise (adults)	Inconsistency of outcomes reported and some important outcomes sparsely reported, such as proportion meeting or exceeding recommended drinking limits; risk of social desirability bias Reporting bias suspected, owing to detected small-studies bias	Low for benefit (adolescents) Moderate for benefit (adults)	Majority of trials conducted in the United States, in primary care, and in the past 10 y, with representation from a wide range of important subpopulations (eg, young adults, older adults, pregnant and postpartum women, low income, with comorbidities, racial/ethnic minorities)

(continued)

Table 4. Summary of Evidence (continued)

No. Studies (Design), No. of Participants	Summary of Findings	Consistency and Precision	Limitations (Includes Reporting Bias)	Strength of Evidence	Applicability
KQ4b: Benefits of Interventions—Health, Social, and Legal Outcomes					
41 (RCTs) n = 20 324	No evidence in adolescents In adults, studies reported a statistically nonsignificant reduction in all-cause mortality (OR, 0.64 [0.34 to 1.19]) but were underpowered, usually had unclear ascertainment methods, and likely overestimated effect, since many trials not reporting all-cause mortality likely had no deaths Reductions in emergency department visits or controlled substance or liquor violations at 4-y follow-up in 1 good-quality study Small reduction in alcohol-related consequences in trials of young adults (SMD, −0.06 [95% CI, −0.11 to 0.01]) Other health outcomes sparsely reported, usually not statistically significant, and did not consistently favor the intervention group 1 trial in pregnant women found higher birth weight among those in the intervention group, but other pregnancy and birth outcomes showed no between-group differences	Mortality, alcohol-related consequences: reasonably consistent, imprecise Other outcomes: inconsistent, imprecise	Wide range of outcomes reported with little replication and few studies reporting any particular outcome; mortality underpowered with ascertainment usually not described Possible reporting bias for mortality, since all studies reporting had at least 1 death	Insufficient (adolescents) Low for benefit (adults)	Majority of trials conducted in the United States, in primary care, and in the past 10 y, with representation from a wide range of important subpopulations (eg, young adults, older adults, pregnant and postpartum women, low income, individuals with comorbidities, racial/ethnic minorities)
KQ5: Harms of Interventions					
6 (RCTs) n = 3650	All trials reporting on adverse effects had 0 adverse effects in both groups Across all included studies, no pattern of paradoxical effects suggesting risk of harm	Reasonably consistent, imprecise	Sparsely reported No reporting bias detected	Low for no harms	Majority of trials conducted in the United States, in primary care, and in the past 10 y

Abbreviations: AUD, alcohol use disorder; AUDIT, Alcohol Use Disorders Identification Test; KQ, key question; NA, not applicable; NIAAA, National Institute on Alcohol Abuse and Alcoholism; OR, odds ratio; RCT, randomized clinical trial; SMD, standardized mean difference; VA, US Department of Veterans Affairs; WMD, weighted mean difference.

a wide range of outcomes, even though differences were not always statistically significant, suggests very low risk of harm. Several studies reported on the acceptability of their interventions to participants and generally reported positive to very positive ratings.[79,97,116,117,130]

Findings in the current review were generally consistent with the findings of the previous USPSTF review.[176] For test accuracy, the previous reviewers concluded that a single-question screener, the AUDIT-C, and the AUDIT appeared to be the best overall instruments for screening adults for the full spectrum of unhealthy alcohol use in primary care, with ranges of sensitivities and specificities solidly in the range of the sensitivities and specificities seen in this review among studies of adults. In the current review, original studies were examined rather than existing systematic reviews, and at least 60% of the studies included in this review were newly published since the previous review. Among the newly included evidence are 10 studies in adolescents, who were not previously represented.

For counseling interventions, overall, the pooled effect size for drinks per week was larger in the previous review,[176] although results were quite similar for general and older adult populations and for other drinking outcomes. One of the main differences between the 2 reviews is the inclusion of studies conducted outside of primary care settings in the current review, which resulted in the inclusion of a substantial number of studies in college settings. Consistent with the previous review was the finding of a fairly large but statistically nonsignificant association between interventions and reduced all-cause mortality (OR, 0.64 [95% CI, 0.34 to 1.19] in the current review; relative risk, 0.52 [95% CI, 0.22 to 1.22] in the previous review).

Areas for future research include direct comparisons of screening programs with usual care (without universal screening); further evaluations of the versions of the AUDIT and AUDIT-C recently developed for the United States (USAUDIT and USAUDIT-C); interventions to reduce unhealthy alcohol use in populations of adolescents, young adults, and older adults in health care settings; and exploration of more intensive intervention approaches with young adults. One important limitation of evidence on the benefits and harms of alcohol counseling interventions is the lack of a consistently reported group of outcomes. It would be beneficial for trials to routinely report outcomes with the greatest clinical meaning, such as the proportion of participants drinking within recommended limits, and to report health (including alcohol-related medical conditions), social, and legal outcomes. It would also be useful for trials to commit a priori to reporting subgroup effects in important subpopulations, such as by age group, sex, race/ethnicity, and baseline severity.

Limitations

This evidence review has several limitations. First, comparative effectiveness trials—which have the potential to identify important features or mechanisms of change—were not included; however, other reviews that have included comparative effectiveness reviews have had very limited success in identifying mechanisms of change. Second, evidence regarding use of medication in treatment of AUD was not included. While this is primarily relevant to individuals being treated for more severe disorders rather than to most people with unhealthy alcohol use in screen-detected samples, medication would likely be appropriate for some patients identified through screening. A previous review found that multiple medications were associated with reductions in drinking and maintenance of abstinence for people with moderate to severe AUD, with NNTs from 12 to 20.[177] Third, among adolescents, trials addressing prevention of unhealthy alcohol use were not included. This was outside the scope of the review but may be an important body of literature to consider when developing recommendations for adolescents.

Conclusions

Among adults, screening instruments feasible for use in primary care are available that can effectively identify people with unhealthy alcohol use, and counseling interventions in those who screen positive are associated with reductions in unhealthy alcohol use. There was no evidence that these interventions have unintended harmful effects.

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Concept and design: O'Connor, Perdue, Patnode, Jonas.
Acquisition, analysis, or interpretation of data: O'Connor, Perdue, Senger, Rushkin, Bean, Jonas.
Drafting of the manuscript: O'Connor, Rushkin, Bean, Jonas.
Critical revision of the manuscript for important intellectual content: O'Connor, Perdue, Senger, Patnode, Jonas.
Statistical analysis: O'Connor, Perdue, Jonas.
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and 9 federal partner reviewers from the National Institute of Alcohol Abuse and Alcoholism, National Institute of Mental Health, Office of Research on Women's Health, National Center of Birth Defects and Developmental Disabilities, and the National Institute of Dental and Craniofacial Research. Comments from reviewers were presented to the USPSTF during its deliberation of the evidence and were considered in preparing the final evidence review. Peer reviewers and those commenting on behalf of partner organizations did not receive financial compensation for their contributions.

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