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Screening and Behavioral Counseling Interventions to Reduce Unhealthy Alcohol Use in Adolescents and Adults: An Updated Systematic Review for the U.S. Preventive Services Task Force

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Structured Abstract

Importance: Unhealthy alcohol use is common and increasing in adults and is the most common cause of premature mortality in the United States.

Objective: To systematically review the benefits and harms of screening and nonpharmacologic interventions to reduce unhealthy alcohol use to inform the U.S. Preventive Services Task Force.

Data Sources: MEDLINE, PubMED, PsycINFO, and Cochrane Central Register of Controlled Trials through October 12, 2017; references of relevant publications; government Web sites; and ongoing surveillance through August 1, 2018.

Study Selection: English-language trials of benefits and harms of screening in health care settings or other comparable populations and nonpharmacologic interventions to reduce unhealthy alcohol use in screen-detected persons who report unhealthy alcohol use, and test accuracy studies of selected screening tools to detect unhealthy alcohol use.

Data Extraction and Synthesis: Two investigators independently reviewed abstracts and full-text articles, then extracted data from fair- and good-quality trials, based on predetermined criteria. Random-effects meta-analysis was used to estimate benefits of the interventions.

Main Outcomes and Measures: The primary drinking outcomes were drinks per week, exceeding recommended alcohol use limits, heavy use episodes, and, for pregnant women, abstinence. Other outcomes included mortality; quality of life and consequences of alcohol use; injuries, accidents, and acute health care utilization; family, social, and academic functioning; and legal outcomes.

Results: We included 113 studies (n=314,466) across all Key Questions. We did not find any studies that examined the benefits or harms of screening programs to reduce unhealthy alcohol use. For adolescents, data supported the use of the National Institute on Alcohol Abuse and Alcoholism Youth Screen and other similar one- or two-item screeners to detect alcohol use disorder. For adults, brief (1- to 3-item) screeners commonly reported sensitivity and specificity between 0.70 and 0.85, typically having better sensitivity than the full Alcohol Use Disorders Identification Test (AUDIT) for identifying the full spectrum of unhealthy use. However, the AUDIT tended to have higher specificity, particularly at the standard cutoff of 8 or higher. Evidence on the effects of interventions to reduce unhealthy alcohol use in adolescents was limited to two trials; both found mixed results for reduced alcohol use and did not report health or related outcomes. In adults, interventions reduced the number of drinks per week (weighted mean difference, -1.82 [95% confidence interval {CI}, -2.42 to -1.22]), the proportion exceeding recommended drinking limits (odds ratio [OR], 0.60 [95% CI, 0.53 to 0.67]), and the proportion reporting a heavy use episode (OR, 0.62 [95% CI, 0.55 to 0.71]), and increased the proportion of pregnant women reporting abstinence (OR, 1.92 [95% CI, 1.19 to 3.09]) after 6 to 12 months. Analyses limited to trials conducted in primary care settings and the United States suggested that effects in these most applicable trials were comparable or larger than the overall effect (e.g., for trials in primary care settings, the weighted mean difference was -2.82 [95% CI, -3.87 to -1.76]). Benefits remained through 24 months or beyond in four of seven trials with longer-term

outcomes. Heterogeneity was high and effect size was associated with a number of study characteristics such as setting, target age of the population, publication year, study size, and average baseline-use levels, but not clearly associated with any intervention characteristics. Data on effectiveness in important subgroups were very limited, but analyses by sex, the most commonly reported subgroup analysis, did not indicate differences in effectiveness of the interventions. Health outcomes were sparsely reported and, with some exceptions, generally did not demonstrate group differences in effect. We found no evidence that these interventions could be harmful.

Conclusion: Among adults, screening instruments are available that can effectively identify persons with unhealthy alcohol use and that are feasible for use in primary care settings, and 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. More evidence is needed to determine whether screening for unhealthy alcohol use is beneficial for adolescents.

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Chapter 1. Introduction

Condition Definition

Unhealthy alcohol use encompasses a wide range of behaviors, from drinking above the recommended limits (i.e., risky drinking) to severe alcohol use disorder (AUD). Types of unhealthy alcohol use and related terms are listed in **Table 1** and are not mutually exclusive; for example, persons with AUD also meet criteria for harmful use. The National Institute on Alcohol Abuse and Alcoholism (NIAAA) recommends that men ages 21 to 65 years consume no more than 4 drinks per day (56 g/day, according to the U.S. standard of 14 g/drink) and no more than 14 drinks per week (196 g/day), based on the standard drink amount of a 12-oz beer (5% alcohol), 5 oz of wine (12% alcohol), or 1.5 oz of distilled spirits (40% alcohol).[1] For women of any age and men age 65 years and older, the recommendation is to consume no more than three drinks per day and seven drinks per week (42 g/day or 98 g/week). Multiple organizations recommend no use of alcohol during pregnancy.[2-5] The NIAAA guide for youth age 18 years and younger suggests criteria that vary by age: for example, for 12- to 15-year-olds, any drinking in the past year is considered moderate risk and drinking on 6 or more days in the past year is considered high risk; for 18-year-olds, 12 to 51 drinking days is considered moderate risk and 52 or more days is considered high risk.[6] A person meets *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*) criteria for AUD if they experience at least two of the 11 criteria listed in **Appendix A Table 1**; severity of the disorder is specified (mild, moderate, severe) and based on the number of criteria met. This is a change from previous versions of the *DSM*, which had separate diagnoses for alcohol abuse and alcohol dependence (**Appendix A Table 1**). *DSM-5* severity modifiers of moderate or severe correspond to alcohol dependence in earlier versions of the *DSM* and the International Statistical Classification of Diseases and Related Health Problems system.

Defining unhealthy levels of drinking is complex and challenging. The primary evidence informing the established cut-points comes from epidemiological evidence and studies of adults providing dose-response curves, which involve nuanced interpretation.[7, 8] The primary challenge in setting these limits is determining the threshold that divides "low risk" and "high risk" drinking. These interpretations rely on decisions regarding what level of harm has substantial enough magnitude to warrant caution, as well as what types of harms should be considered. As a result, there is no firm consensus worldwide regarding the definition of risky drinking, and the definition of a standard drink varies between nations.[7]

Prevalence

Unhealthy alcohol use is relatively common and is increasing in adults.[9] Based on the 2016 Behavioral Risk Factor Surveillance System (BRFSS) Survey, 6.5% of adults reported drinking above recommended levels (≥14/7 drinks per week for men/women).[10] In addition, according to data from the 2016 National Survey on Drug Use and Health (NSDUH), an estimated 14.6 million adults met the criteria for having AUD, representing 7.8 percent of men and 4.2 percent of women.[11] Prevalence figures by age are shown in **Table 2**. Among adults age 18 years and

older, 26.2 percent 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 percent reported engaging in heavy drinking (≥5 drinks on the same occasion on ≥5 days) in the previous month.[11] Additionally, 9.2 percent of adolescents, ages 12 to 17 years, reported being current alcohol users and 4.9 percent reported heavy use episodes in the previous month. Furthermore, an estimated 488,000 (2.0%) adolescents were reported to have AUD, representing 2.4 percent of females and 1.5 percent of males.[11] Among college students (regardless of age), 57.2 percent reported any past-month alcohol use, 38.0 percent reported past-month heavy use episodes, and 10.5 percent reported past-month heavy alcohol use.[11] Rates of AUD are lower for older adults (1.6%), as are rates of having heavy use episodes in the past month (9.7%) and past-month heavy alcohol use (2.3%).

According to the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), high-risk drinking increased by 29.9 percent between 2001–2002 and 2012−2013 among adults in the United States.[9] Increases were particularly pronounced among women (57.9% increase), nonwhites (40.3% to 62.4% increases), and older adults (65.2% increase).[9] Similarly, the prevalence of AUD increased from 8.5 to 12.7 percent, a 35.7 percent increase. The largest increases were seen in women (59.8% increase), blacks (55.8% increase), and adults age 45 years and older (61.9% to 75.0% increases).[9] It is unclear why the NESARC identified substantially higher AUD prevalence than the NSDUH cited above, but the NESARC methods were almost identical across survey years, so the trend over time is likely reliable. Further, its finding of increased prevalence of unhealthy use over time is supported by similar trends seen in other large-scale national surveys, for both general and older adult populations.[12-14] Interestingly, however, the NSDUH data show a *declining* trend in the proportion of adolescents reporting alcohol use in the previous month, and slight reductions between 2015 and 2016 on unhealthy use in adults, so it is unclear whether the rising trend has continued beyond 2012–2013.[15] Reviewers have noted that declining sex differences in prevalence of alcohol use likely reflect changes in sociocultural environments, and that countries with rising alcohol use rates are showing smaller sex differences in rates of alcohol use, earlier onset of alcohol use, and earlier development of AUD symptoms in younger cohorts compared with older cohorts.[16]

Disparities exist among racial/ethnic minorities and underserved populations in terms of the prevalence of AUD and overall drinking patterns, as well as adverse health effects and consequences related to heavy alcohol use. The recent publication analyzing NESARC data from 2012 to 2013 referenced above found that the odds of developing an AUD of any severity in the previous 12 months was significantly higher among men (adjusted odds ratio [adjOR], 1.9 [95% confidence interval {CI}, 1.72 to 2.01]) versus women, and individuals living in urban cities (adjOR, 1.4 [95% CI, 1.20 to 1.55]) versus rural environments.[17]A greater percentage of Native Americans (19.2%) reported AUD of any severity in the previous 12 months followed by blacks (14.4%) and whites (14.0%), but the difference in prevalence between races/ethnicities was not found to be significant. That same trend was seen among persons with family incomes less than $20,000 per year (16.2%) versus those of higher socioeconomic status (12.7% to 14.0%).[17] Drinking patterns have also been found to vary by race/ethnicity, with Hispanics (17.2%) being shown to have the highest prevalence of binge drinking, followed by blacks (15.6%) and whites (14.8%).[18] Additionally, Hispanic men are reported to have a higher drink maximum in a day (7.4) compared with white (7.0) and black (4.9) men.[19] Although Native Americans have been shown to have higher rates of heavy and binge drinking compared with other races/ethnicities,

recent evidence has been mixed.[20]

Burden

Excessive alcohol use is one of the leading causes of premature mortality and is responsible for 1 in 10 deaths among working-age adults ages 20 to 64 years in the United States.[21] From 2006 through 2010, the number of average annual alcohol-attributable deaths in the United States were 87,798 (27.9/100,000 population), with an estimated 2.5 million years of potential life lost.[21] Overall, 44 percent of these deaths were due to chronic conditions (e.g., alcoholic liver disease) and 56 percent were due to acute conditions (e.g., motor vehicle traffic crashes). In 2013, there were 29,001 deaths directly related to alcohol use, which does not include mortality from unintentional injuries, homicides, and other causes indirectly related to alcohol use.[22] In the United States, 3.2 to 3.7 percent of cancer deaths (182,000 to 213,000 deaths) are attributed to alcohol use, including cancers of the breast, oral cavity and neck, and gastrointestinal sites.[23] Men are more likely to die from alcohol-related causes than women—the age-adjusted death rate was 2.9 times higher in men than in women in 2013.[22] Additionally, 5.1 percent of the global burden of disease and injury in disability-adjusted life years was related to alcohol.[24]

Consuming alcohol while pregnant can result in fetal alcohol spectrum disorders, as well as additional adverse birth outcomes, making alcohol use throughout pregnancy a major preventable cause of birth defects and developmental disabilities.[25] Prenatal exposure to alcohol can affect the developing brain, heart, kidney, liver, gastrointestinal tract, and endocrine systems.[26] Data from the 2011 to 2013 BRFSS survey showed that 1 in 10 pregnant women ages 18 to 44 years reported consuming alcohol in the previous month and 3.1 percent participated in binge drinking.[25] Beyond the harmful effect of alcohol use during pregnancy, evidence shows that women who engage in unhealthy alcohol use are more susceptible to the deleterious health effects, including liver and cognitive effects, than men who engage in unhealthy alcohol use. These effects may be mediated by the effects of alcohol on sex hormones and in alcohol pharmacokinetics' effect on the brain.[16]

College students' health also suffers with unhealthy alcohol use. For example, an estimated 1,825 college students ages 18 to 24 years have died annually from alcohol-related, unintentional injuries, including motor vehicle crashes.[27, 28] Approximately 696,000 students ages 18 to 24 years were assaulted by another student who had been drinking, and 97,000 students ages 18 to 24 years report experiencing alcohol-related sexual assault or date rape.[27, 29] About 1 in 4 college students report academic consequences from drinking, including missing class, falling behind in class, doing poorly on examinations or papers, and receiving lower grades overall.[27, 30]

In 2010, excessive alcohol use was estimated to cost the United States $249 billion, with State and Federal governments paying $100.7 billion, or just over 40 percent of these costs.[31] The majority of the cost of excessive alcohol use was due to binge drinking (76.7%), while underage drinking accounted for 9.7 percent, and drinking while pregnant was 2.2 percent ($5.5 billion) of the total cost. The majority of the economic cost of excessive alcohol use is due to losses in workplace productivity (72%), followed by health care expenses (11%), law enforcement and criminal justice expenses (10%), and losses from motor vehicle crashes (5%).[31] These estimates

are thought to be underestimates, however, due to the fact that information on alcohol is typically underreported or unavailable. Additional costs, including pain and suffering due to alcohol-related injuries and alcohol-related morbidities, are not included.

U.S. national drinking guidelines[6, 32] are consistent with the evidence on risk levels reported in meta-analyses of observational literature. One meta-analysis found that the average daily volume at which an increased risk of all-cause mortality occurs is approximately 38 g of ethanol (2.7 drinks, according to the U.S. standard),[33] and appears to be lower for women than for men. In addition, the risk of liver disease and a number of cancers (primarily of the gastrointestinal tract, liver, and breast) are increased at an average daily volume of approximately 25 g (1.8 drinks per day).[8, 34] A more detailed discussion of the epidemiology of the health effects of alcohol use is in **Appendix B**.

In addition to disparities in the prevalence of AUD and drinking patterns, disparities are also found in alcohol-related social and health problems. Data from the NSDUH show that whites and Native Americans report the highest rates of driving under the influence in the previous year, with 15.6 percent of whites and 13.3 percent of Native Americans reporting this activity.[35] Research has also shown that the rates of alcohol-attributed violence and intimate partner violence (IPV) vary by race/ethnicity. A study by Schafer and colleagues found that the reporting of unhealthy alcohol use increased the risk of IPV in black couples compared with white and Hispanic couples.[36] Alcohol use has also been found to contribute to victimization among Native Americans, with numerous studies reporting that Native Americans are at greater risk of alcohol-related trauma (IPV, rape, and assault) compared with other racial/ethnic groups in the United States.[37, 38] Alcohol-related morbidity and mortality are also found to vary across racial/ethnic groups. Hispanics and blacks have been shown to have a greater risk of developing liver disease compared with whites, and Hispanic men are reported to have the highest incidence of liver cirrhosis mortality compared with other races/ethnicities.[39, 40] Further, the incidence of alcohol-related esophageal cancer and pancreatic disease are higher for black men than white men, and fetal alcohol syndrome and fetal alcohol spectrum disorders are more prevalent in blacks and Native Americans.[41-43] A review of peer-reviewed and national surveillance reports found that Native Americans experience the highest rates of alcohol-attributable motor vehicle crash mortality, suicide, and falls compared with other racial/ethnic groups.[44]

Risk Factors and Etiology for AUD

Excessive use of alcohol can affect neurobiological functioning in the basal ganglia, extended amygdala, and prefrontal cortex, leading to the development of alcohol tolerance (needing larger amounts to feel "high"), diminution of pleasure from everyday human activities such as food and social interaction, increased release of neurotransmitters associated with stress when alcohol is absent from the body, and ultimately addiction.[45] Not surprisingly, initiation of drinking at younger ages, when the brain is rapidly developing and changing, is associated with an increased risk of unhealthy alcohol use. For example, an analysis of the 2010 NSDUH data found that younger age at first use of alcohol was associated with increased likelihood of reporting a heavy use episode in the past month.[46] Similarly, NESARC found that the odds of developing alcohol dependence are 2.3 times higher when initiation of alcohol use occurs prior to age 15 years,

compared with initiation after age 18 years (adjOR, 2.33 [95% CI, 1.74 to 3.13]), with similar results for alcohol abuse.[47] Additionally, childhood maltreatment, specifically sexual abuse and/or physical abuse, increases the risk of developing AUD.[48-51] For example, a 2016 study of young adults (n=300) found that childhood physical abuse (age ≤18 years) more than doubled the odds of AUD in young adulthood (adjOR, 2.41 [95% CI, 1.31 to 4.45]; p<0.01).[48]

AUD commonly co-occurs with personality and mood disorders,[52, 53] although the causal relationship between them is unclear and likely variable. Parental history of an AUD increases the risk of AUD in their children. The Copenhagen Perinatal Cohort study (n=9,125) found that offspring of parents with an AUD have approximately twice the odds of developing an AUD, compared with offspring of parents without an AUD.[54] Another population-based cohort study (n=398,881) found that the risk for offspring developing an AUD increased when one or both parents had the disorder (adjusted hazard ratio, 1.44 [95% CI, 1.29 to 1.61] and 2.29 [95% CI, 1.64 to 3.20] for persons with one and both parents with an AUD, respectively).[55]

A study of twins suggests that risk factors for AUD may differ between men and women.[56] The study found that, for women, family history of AUD, early-onset anxiety disorder, and nicotine dependence were strong risk factors for AUD. In men, important risk factors included novelty seeking, conduct disorder, childhood sexual abuse, parental loss, neuroticism, low self-esteem, and low marital satisfaction.

Rationale for Screening

While persons with severe AUD are likely to be identified through the health and social effects of their alcohol use, those with lower levels of unhealthy alcohol use may not be easily identifiable without direct questioning. Yet unhealthy alcohol use affects a wide range of medical conditions that are commonly encountered in the primary care setting, including (but not limited to) gastrointestinal, cardiopulmonary, dermatological, reproductive, and neurological conditions.[57] Further, alcohol interacts dangerously with many commonly used prescription and over-the-counter medications.[58] Because of these factors, patients' alcohol use can have a substantial effect on their treatment for and recovery from many (if not most) conditions that are addressed in primary care, and efforts to reduce unhealthy alcohol use have substantial potential to improve the health of primary care patients. If screening and counseling can reduce alcohol use to within recommended limits, such health effects could possibly be avoided. Further, screening and intervention for lower levels of unhealthy alcohol use in adolescents and younger adults, before their neurochemistry has been affected by chronic or heavy use, offer an important opportunity to avoid progression to more serious and likely difficult-to-treat levels of use.

The 2016 U.S. Surgeon General report has identified screening in health care settings as an important vehicle for identifying persons with unhealthy alcohol and substance use,[45] and primary care–based alcohol screening and counseling were among the highest-rated preventive services in terms of clinically preventable burden in a study exploring health impact and cost-effectiveness of preventive clinical services.[59] To further support screening and interventions in primary care settings, patients have expressed a preference for treatment in primary and collaborative care settings, rather than specialty settings.[60]

Screening Strategies

Primary care practitioners have limited time to interact with their patients; therefore, brief or self-administered screening tests that identify the full spectrum of alcohol use are preferable to elaborate tools that occupy more clinician time.[61] Numerous brief instruments have been developed (**Appendix C**); however, only a few have gained widespread use in clinical or research settings. For patients screening positive on a brief screener, followup questions are needed to confirm the presence of unhealthy use, assess the extent of unhealthy alcohol use, and help the patient and clinician determine appropriate next steps. Several clinician guides (**Table 3**) have been developed that lay out next steps after the initial assessment, which may include brief counseling, followup visits with the primary care clinician, a thorough assessment by an addiction medicine or mental health specialist, referral to community and specialty services, and medication.

The previous systematic review to support the 2013 U.S. Preventive Services Task Force (USPSTF) recommendation identified one- or two-item screeners such as the NIAAA-recommended Single Item Alcohol Screening Questionnaire (SASQ), the Alcohol Use Disorders Identification Test (AUDIT), and the AUDIT-Concise (AUDIT-C) as having the best accuracy to screen for any level of unhealthy alcohol use among adults. The SASQ asks, "How many times in the past year have you had 5 [for men]/4 [for women] or more drinks in a day?", where one or more occasions in the previous year constitutes a positive screen. The AUDIT-C includes three items covering frequency of alcohol use, typical amount, and occasions of heavy use. The full AUDIT includes these three items, plus seven questions regarding signs of alcohol dependence and common problems associated with alcohol use (e.g., being unable to stop once you start drinking, needing a drink first thing in the morning). The U.S. Department of Veterans Affairs (VA) specifically recommends annual screening with the AUDIT-C and SASQ. The Cut down, Annoyed, Guilty, Eye-opener (CAGE) screener is another one developed to detect alcohol dependence rather than the full spectrum of unhealthy alcohol use,[61] and was used for screening in multiple treatment trials included in the previous review.

Screening instruments have also been developed for special populations, including adolescents, older adults, and pregnant women. For adolescents, the NIAAA recommends two items, asking about the patient's alcohol use and their friends' use. The NIAAA also developed the related Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD) to use this approach to assess alcohol, tobacco, and drug use. Both the NIAAA and American Academy of Pediatrics name the Car, Relax, Alone, Forget, Family, Friends, Trouble (CRAFFT) screener as a useful screening tool for identifying risky substance use in adolescents, which assesses riding in or driving a car while intoxicated, use of alcohol or drugs to relax, use when alone, forgetting what you've done while intoxicated, having friends or family suggest you cut down, and getting into trouble while using alcohol or drugs.

The Comorbidity Alcohol Risk Evaluation Tool (CARET) was developed for older adults. The CARET is a briefer version of two relatively lengthy instruments (the Alcohol-Related Problems Survey [ARPS] and the Short-ARPS [shARPS]) included in the previous review and was found to have acceptable accuracy but low feasibility for routine screening in primary care. The CARET includes items about common medications and medical conditions that could interact

with alcohol to further characterize the risky nature of alcohol use in older adults.

Four instruments have been specifically developed to screen for problematic alcohol use during pregnancy: Tolerance, Worried, Eye-openers, Amnesia, Cut down (TWEAK); Tolerance-Annoyed, Cut down, Eye opener (T-ACE); Past use, Pregnancy, use by Parents and Partners (4P's Plus); and Normal drinker, Eye opener, Tolerance (NET). Of these, a previous review concluded that the TWEAK and T-ACE performed best for pregnant women, along with the AUDIT-C. The T-ACE is specifically mentioned in the American College of Gynecologists and Obstetricians' recommendation on alcohol screening.

Finally, the World Health Organization (WHO) developed the Alcohol, Smoking and Substance Involvement Screening Test (ASSIST) to screen for substance use more broadly, covering unhealthy use of drugs and smoking as well as alcohol.[62] It has been validated in adults (age ≥18 years) and shows good cross-cultural neutrality.

Interventions for Unhealthy Alcohol Use

For persons with unhealthy drinking behavior who do not have an AUD, a brief intervention to increase the awareness of alcohol use and increase motivation to make behavioral changes in primary care may be sufficient, while those with AUD may need referral to more extensive treatment,[63] possibly including medication-assisted treatment. Medications approved by the U.S. Food and Drug Administration for the treatment of unhealthy alcohol use are intended for persons diagnosed with an AUD and are generally used after they have achieved abstinence.[64] These medications include acamprosate, disulfiram, and naltrexone, which aim to reduce symptoms of abstinence, create a physical reaction if alcohol is consumed, or block the rewarding effects of drinking.[64]

A number of health organizations have developed clinician guides for primary care–based interventions to reduce unhealthy alcohol use, some of which also provide implementation advice and planning documents (**Table 3**). Their approaches fall under the Screening, Brief Intervention, Referral, and Treatment (SBIRT) framework, and typically use the Ask, Advise, Assess, Assist, Arrange (5 A's) mnemonic, either explicitly or implicitly. Organizations generally recommend a very brief one- to three-item screener, followed by more in-depth risk assessment among persons who screen positive. Once unhealthy alcohol use is identified, guides typically suggest providing feedback to patients on their alcohol use; advising patients to reduce their alcohol use; having a discussion with patients to understand their readiness to change and develop goals and an action plan, if they are willing; and arranging for followup. Guides typically incorporate motivational interviewing tools to help patients increase their readiness to change, such as open-ended questions, affirmation, reflective listening, and summaries, along with standard motivational techniques such as expressing empathy, supporting self-efficacy, pointing out previous successes, rolling with resistance, and helping patients see the discrepancy between where they are and where they want to be. One review provides important perspective and recommendations on potential adaptations to SBIRT interventions for culturally diverse populations.[65] Beyond these clinician guides, counseling interventions have been developed that include a wide range of approaches (e.g., motivational enhancement therapy, cognitive

behavioral therapy, 12-step), specific strategies (e.g., action plans, drinking diaries), delivery methods (e.g., face-to-face, Web-based, individual, group-based), length of contact (e.g., brief, extended), and number of contacts (single, multiple).[66] NIAAA has developed an online resource to help individuals understand treatment options, find practitioners, and recognize signs of higher-quality care for AUD. This is a comprehensive and easy-to-use tool to help patients and their families navigate the often complicated process of finding and choosing a treatment option.[67]

Current Clinical Practice in the United States

Despite current clinical recommendations for physicians to screen patients for unhealthy alcohol use and provide brief counseling to those engaging in unhealthy drinking behaviors, not all physicians report following these recommendations in their practices. A 2016 cross-sectional survey of New York primary care physicians and nonphysician providers (n=213) found that approximately half (57%) reported screening patients for substance use (drugs as well as alcohol).[68] Further, 46 percent of respondents reported providing a brief intervention to patients who were found to meet criteria for unhealthy use and 47 percent gave a referral to treatment. In a survey of primary care residents, 60 percent reported that they "usually" or "always" screened patients for unhealthy alcohol use; however, only 19 percent used screening instruments capable of detecting heavy use episodes.[69] When compared with physicians, nonphysician providers (i.e., nurse practitioners and physician assistants) felt less comfortable talking with their patients about alcohol and drug use (p=0.004), and were less likely to perform a brief intervention (52% vs. 32%; p <0.0005) or refer a patient to treatment (50% vs. 70%; p=0.001).[68] Data from the patient perspective confirm that screening for unhealthy alcohol use is widely employed; 78 percent of patients reported that in the previous 2 years they were asked by a health care professional about their alcohol use, and 68 percent were asked how much alcohol they use, according to the BRFSS survey.[70] However, only 15.7 percent of adult respondents reported having a discussion about their use of alcohol with their providers; counseling was more common among binge drinkers but still fairly low (25.4% had ever discussed it, 13.4% discussed it in the previous year).[71] Even lower screening and counseling rates have been reported among young adults[72] and women's reproductive health clinicians.[73]

Physicians report a number of common barriers to achieving higher rates of screening patients for unhealthy alcohol use. These include not having enough time to conduct a further assessment and counseling in the event of a positive screen, lack of adequate training about how to properly screen patients, not feeling confident about being able to assist patients meeting the criteria for unhealthy use, not feeling comfortable discussing alcohol use with patients, not trusting that their patients would be honest about their alcohol use, and not feeling that available treatments were effective.[68, 69, 74] Clinic staff have also reported concerns that screening would interfere with the clinic flow.[75]

Recommendations of Others

Recommendations and statements from other organizations about screening and treatment for

unhealthy alcohol use are summarized in **Appendix D**. The VA, Surgeon General, NIAAA, the Centers for Disease Control and Prevention, and the American Society of Addiction Medicine all agree with the 2013 USPSTF recommendation that adult patients should be routinely screened for at-risk drinking and brief counseling should be provided to patients who are found to have unhealthy alcohol use behaviors.[76-80] Additionally, the NIAAA recommends medical management for adults with alcohol dependence. The American Academy of Pediatrics recommends that pediatricians increase their capacity in substance use detection, assessment, and intervention and that they be familiar with SBIRT practices.[81] Both the American College of Gynecologists and Obstetricians and WHO recommend that all women should be screened both before pregnancy and in their first trimester of pregnancy via validated tools (e.g., TACE) and that providers should offer a brief intervention to all pregnant women using alcohol.[24, 82]

Previous USPSTF Recommendation

In 2013, the USPSTF recommended that clinicians screen adults age 18 years or older for alcohol misuse and provide brief behavioral counseling interventions to reduce alcohol misuse to those engaged in risky or hazardous drinking behaviors (B recommendation).[66] The USPSTF concluded, however, that the evidence was insufficient to assess the balance of benefits and harms of screening and behavioral counseling interventions to reduce alcohol misuse in adolescents (I statement).

Chapter 2. Methods

Scope and Purpose

This systematic review examined the evidence for the benefits and harms of screening for unhealthy alcohol use and interventions to reduce unhealthy alcohol use in nondependent alcohol users in primary care–relevant settings (primary care, other outpatient health care settings) or in other general populations judged to be comparable to primary care populations. It will be used by the USPSTF to update its 2013 recommendation on screening for alcohol misuse in primary care. The current review uses the terminology of "unhealthy" use rather than "misuse" in accordance with the American Society of Addiction Medicine, which defined "unhealthy" use as any use that increases the risk or likelihood of health consequences (hazardous use), or that has already led to health consequences (harmful use), including a diagnosis of AUD.

Key Questions and Analytic Framework

In consultation with members of the USPSTF, we developed key questions (KQs) and an analytic framework (**Appendix A Figure 1**) to guide our review.

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?

Data Sources and Searches

We developed a search strategy designed to capture relevant literature published from 6 months prior to the search date in the previous USPSTF review to identify newly published studies of screening and counseling interventions (**Appendix A**).[83] We then searched the following databases for relevant English-language literature published between January 1, 2011 (for KQs 1, 3, 4, and 5) or January 1, 1998 (for KQ2), and October 12, 2017: MEDLINE, PubMED (for publisher-supplied records only), PsycINFO, and the Cochrane Central Register of Controlled

Trials. A research librarian developed and executed the search, which was peer-reviewed by a second research librarian.

In addition, we evaluated all relevant studies included in the previous reviews for inclusion in the current review, as well as selected studies from the "excluded studies" appendix. We also examined the reference lists of other previously published reviews, meta-analyses, and primary studies to identify additional potential studies for inclusion. We supplemented our searches with suggestions from experts and articles identified through news and table-of-contents alerts. We also searched ClinicalTrials.gov for ongoing trials. We imported the literature from these sources directly into EndNote® X7 (Thomson Reuters, New York, NY).

Since October 12, 2017, we have continued to conduct ongoing surveillance through article alerts and targeted searches of high-impact journals to identify major studies published in the interim that may affect conclusions. The last surveillance was conducted on August 1, 2018 and identified no primary research that would be included in our review. However, one recently published test accuracy study was identified that meets our inclusion criteria, but it did not change our conclusions and is therefore listed in the Discussion section only.

Study Selection

We developed specific inclusion criteria to guide our study selection (**Appendix A Table 2**). For KQs addressing benefits and harms of screening (KQs 1 and 3) and treatment (KQs 4 and 5), we included randomized, controlled trials (RCTs), including cluster randomized trials, and non-RCTs that included a usual care, no intervention, minimal control, or attention control comparison group. For KQ2 we included studies of test accuracy reporting sensitivity and specificity compared with a structured or semistructured clinical interview. We excluded prospective and retrospective cohort studies, case control studies**,** time series studies, before-after studies with no comparison group, cross-sectional studies, case studies, case series, and editorials/commentaries.

We included studies conducted among adolescents or adults age 12 years or older. For KQs 1 to 3, study participants were required to *not* be selected on the basis of alcohol use or a related behavior. For KQs 4 and 5, studies had to have at least half of their enrolled sample recruited via population-based screening, operationalized as individual outreach to members of a defined population (or a random or consecutive sample) who had been identified as potentially eligible to complete a standardized brief instrument. Additionally, studies of participants with alcohol dependence or severe AUD (or >50% of the enrolled sample having alcohol dependence/severe AUD) were excluded. Other population exclusions included studies limited to treatment-seeking individuals, those with concomitant psychotic disorders, those presenting in an emergency setting, and others not generalizable to primary care (e.g., inpatients, those court-mandated to treatment, those who are incarcerated).

We required that studies screen for alcohol use using a brief standardized instrument or set of questions. For KQ2, we limited the evidence to the most widely used screening instruments and those most feasible for application in primary care. This included those identified in the previous review as having the best evidence to support their use (AUDIT, AUDIT-C, SASQ) and those

named in national-level recommendations related to screening for unhealthy alcohol use (AUDIT-C, SASQ). We also included variations of the AUDIT and AUDIT-C, such as the USAUDIT/USAUDIT-C and those translated to other languages. Additionally, we selected instruments that target important subpopulations (adolescents [NIAAA two-item screener, BSTAD], pregnant women [TWEAK, T-ACE], or older adults [CARET]), or that cover both drug and alcohol use (ASSIST). We did not, however, examine the CAGE questionnaire, despite its fairly widespread use in clinical trials of alcohol treatment, since it is not sensitive to lower-level hazardous use and has not performed well with adolescents and young adults.[83, 84] We did not limit evidence related to benefits or harms of unhealthy alcohol screening or treatment (KQs 1 and 3–5) on the basis of the screening instruments used in those studies; any screening instrument was accepted for these KQs.

To be included in this review, test performance (KQ2) studies were required to evaluate their screening tests against a reference standard, rather than another screening instrument. For reference standards, we accepted structured or semistructured interviews assessing AUD and/or detailed quantity and frequency assessment, or computer-based versions of structured assessments of either AUD or detailed alcohol quantity and frequency assessments. In addition, we excluded studies that assembled "clean" case and control groups, such as individuals being treated for AUD (cases) and a community sample with no history of alcohol treatment (controls).

Intervention studies (KQs 1, 3, 4, 5) were required to report alcohol use as an outcome, such as frequency and/or quantity of use, abstinence, score on an instrument measuring severity of unhealthy use, or meeting criteria for AUD. We required a minimum of 6 months of followup for all populations except pregnant women, who had no minimum followup requirement. We included interventions that were conducted in or recruited from primary care or a health care system or that we judged could feasibly be implemented in or referred from primary care. Eligible settings included primary care clinics; prenatal clinics; obstetrics/gynecology clinics; specialty medical treatment settings (e.g., diabetes management, dialysis clinics); and research clinics/offices, homes, or other community settings, including electronic or computer-based screening. For KQs 4 and 5, we required that screening to identify eligible participants must have taken place in settings comparable to primary care with a defined population (e.g., primary care clinic; Special Supplemental Nutrition Program for Women, Infants, and Children; college freshmen orientation). Screening that took place in behavioral/mental health clinics, substance abuse treatment centers, emergency department/trauma centers, worksites (including occupational screening), inpatient/residential facilities, or other institutions (e.g., correctional facility) were excluded. We focused on studies of counseling to reduce unhealthy alcohol use, with or without referral, and were open to a variety of approaches (e.g., brief advice, personalized normative feedback, motivational interviewing, cognitive behavioral therapy), strategies (e.g., action plans, diaries), delivery methods (e.g., face-to-face, electronic), length of contact (e.g., brief, extended), providers (e.g., medical, health educators, peers), and number of contacts (e.g., single, multiple). Interventions to prevent initiation of use among nonusers were not included. Since pharmacotherapy is primarily relevant to patients with severe AUD, studies of pharmacotherapy treatment were excluded.

Two reviewers independently reviewed titles and abstracts for potential inclusion, then two reviewers reviewed the full-text articles. Discrepancies were resolved via discussion and third-

party consultation as needed. Title, abstract, and full-text review were conducted in DistillerSR (Evidence Partners, Ottawa, Canada).

Quality Assessment and Data Abstraction

Two reviewers applied USPSTF design-specific criteria (**Appendix A Table 3**)[85] and supplemented it with criteria from the Quality Assessment of Diagnostic Accuracy Studies[86] to assess the methodological quality of all eligible studies. We assigned each study a quality rating of "good," "fair," or "poor." Discordant quality ratings were reviewed and discussed; a third reviewer adjudicated as needed. Studies rated as poor quality were excluded from the review.

For intervention trials, good-quality studies were those that met all or nearly all of the specified quality criteria (e.g., comparable groups were assembled initially and maintained throughout the study, and followup was ≥90%), whereas fair-quality studies did not meet all of these criteria but did not have serious threats to their internal validity related to the design, execution, or reporting of the study. Intervention studies rated as poor quality generally had several important limitations, including at least one of the following risks of bias: very high attrition (generally >40%), differential attrition between intervention arms (generally >20%); lack of baseline comparability between groups without adjustment; or issues in trial conduct, analysis, or reporting of results that put the validity of the findings in doubt (e.g., possible selective reporting, inappropriate exclusion of participants from analyses, and questionable validity of randomization and allocation concealment procedures). For studies of test performance, good-quality studies recruited patients consecutively or randomly; administered the index test blinded to, or at least prior to, the reference standard; used a reference standard that could accurately classify the target condition; interpreted the reference standard independently from the screening test; and administered the screening test and reference standard on the same day to all participants.

For all of the included studies, one reviewer extracted key elements into standardized abstraction forms in DistillerSR. A second reviewer checked the data for accuracy. For each study, we abstracted general characteristics of the study (e.g., author, year, study design), clinical and demographic characteristics of the sample and setting (e.g., age, race/ethnicity, baseline clinical characteristics, setting, country), analytic methods, and results.

For test accuracy studies (KQ2), we abstracted details of the reference standards and screening instruments. We abstracted the optimal cutoff for each screening test, either as defined by the author or selected by the reviewer as the best balance of sensitivity and specificity reported. We also abstracted the cutoff of 8 or higher for AUDIT; 3 or higher, 4, and 5 for AUDIT in U.S. primary care studies; 3 or higher for AUDIT-C in women; and 4 or higher for AUDIT-C in men. The outcomes of interest were sensitivity and specificity, which we calculated based on provided 2x2 tables if they were not directly reported.

For intervention characteristics of KQ 4 and 5 trials, we abstracted detailed information about specific components: setting, mode of delivery (i.e., in-person, telephone, electronic, or print); therapeutic or intervention approach (e.g., cognitive behavioral therapy, motivational

interviewing), duration, number, and length of sessions; providers and provider training; and adherence. We determined the intensity of the intervention based on the number and length of contacts and assigned one of the following designations: very brief (single contact, ≤5 minutes), brief (single contact, ≤15 minutes), extended (single contact, >15 minutes), brief multicontact (multiple contacts, ≤15 minutes each), or extended multicontact (multiple contacts, one or more of them >15 minutes).

Data Synthesis and Analysis

We created summary tables for all KQs showing study, population, and intervention characteristics (if applicable) and outcomes for qualitative evidence synthesis. Studies were grouped according to population: adolescents (ages ~12 to 18 years), young adults (ages ~18 to 25 years), general adult populations (age ≥18 years), older adults (age ~≥65 years), and pregnant and postpartum women. We used these tables along with forest plots of results to examine data for consistency, precision, and, for intervention trials, the relationship of effect size with key potential modifiers such as population, treatment contact time, control group alcohol use at baseline, and publication date. If available, we abstracted and examined results reported in the following subgroups: sex, age, race/ethnicity, socioeconomic status group, pregnant women, and those with specific concurrent substance use, specific severity of disorder, mental health condition, or at a particular level of readiness to change.

For studies on the accuracy of screening instruments (KQ2), we calculated confidence intervals (CIs)[87, 88] in Stata, version 13.1 (Stata Corp LP, College Station, TX), using data from contingency tables that included true positives, false positives, false negatives, and true negatives. If these data were not reported directly, we created contingency tables based on the total sample size, number of persons with the condition according to the reference standard, sensitivity, and specificity. No pooled analyses were performed due to the small number of studies that were available for each combination of study populations, screening tests, reported screening test cutoffs, and target conditions. We report a range of sensitivity and specificity across eligible studies to provide an overall description of findings. While many conditions were reported in our included studies, we focused our analysis on a) the full spectrum of unhealthy use (including use in pregnant women) and b) use disorder (*DSM-IV* abuse and dependence, or *DSM-5* use disorder). Our primary analyses focused on the full spectrum of unhealthy use (assessing for exceeding limits, abuse, or dependence), although we also report data on exceeding limits alone in the detailed results. Data for other conditions, including dependence only (*DSM-IV* dependence or *DSM-5* moderate/severe dependence), are in **Appendix G** and **Appendix I**.

For KQ4, we selected drinks per week as our primary outcome since it was by far the most commonly reported outcome. We converted all related outcomes to drinks per week, such as when provided with other time frames (e.g., drinks/month) or with grams of ethanol rather than drinks. We used the conversion factor of 14 g of ethanol for one standard drink, since this is the definition of a standard drink in the United States.

We had sufficient data with acceptable comparability between studies to conduct meta-analysis with 40 trials altogether, across the four main alcohol-use outcomes of drinks per week,

exceeding recommended limits, heavy use episodes, and abstinence (for pregnant women). Few health outcomes were reported in enough trials to consider pooling; however, we were able to conduct a meta-analysis of mortality and alcohol problems or consequences.

We ran random-effects models using the DerSimonian and Laird pooled estimate, which we felt was acceptable because most analyses either included more than 10 trials or had low statistical heterogeneity.[89] For analyses that showed statistically significant pooled effects but had fewer than 10 trials and I^2 greater than 50 percent, we also ran a sensitivity analysis, using a more conservative profile likelihood model to see if statistical significance was sustained. If the profile likelihood model did not converge, we ran a restricted maximum likelihood analysis with the Knapp-Hartung correction for small samples. When trials only reported results separately for subgroups (e.g., males and females), we included entries for both subgroups in the meta-analysis. For outcomes with 10 or more trials in the meta-analysis (drinks per week, exceeding recommended limits, and heavy use episodes), we generated funnel plots and ran Egger's test to examine funnel plot asymmetry to explore small study effects, which can be an related to publication bias.[90] Additionally, for drinks per week, which included 31 trials (and 36 separate entries) and had considerable statistical heterogeneity (I^2=64%), we conducted meta-regression and sensitivity analyses to explore factors that were associated with effect size. We used Stata version 13.1 for all analyses.

Grading the Strength of the Body of Evidence

We graded the strength of the overall body of evidence for each KQ. We adapted the Evidence-based Practice Center approach,[91] which is based on a system developed by the Grading of Recommendations Assessment, Development and Evaluation Working Group.[92] Our method explicitly addresses four of the five domains required by the Evidence-based Practice Center: consistency (similarity of effect direction and size), precision (degree of certainty around an estimate), reporting bias (potential for bias related to publication, selective outcome reporting, or selective analysis reporting), and study quality (i.e., study limitations). We did not address the fifth required domain—directness—as it is implied in the structure of the KQs (i.e., pertains to whether the evidence links the interventions directly to a health outcome).

Consistency was rated as reasonably consistent, inconsistent, or not applicable (e.g., single study). Precision was rated as reasonably precise, imprecise, or not applicable (e.g., no evidence). Reporting bias was rated as suspected, undetected, or not applicable (e.g., when there was insufficient evidence for a particular outcome). Study quality reflects the quality ratings of the individual trials and indicates the degree to which the included studies for a given outcome have a high likelihood of adequate protection against bias. The body of evidence limitations field highlights important restrictions in answering the overall KQ (e.g., lack of replication of interventions, nonreporting of outcomes important to patients).

We graded the overall strength of evidence as high, moderate, or low. "High" indicates high confidence that the evidence reflects the true effect and that further research is very unlikely to change our confidence in the estimate of effects. "Moderate" indicates moderate confidence that the evidence reflects the true effect and that further research may change our confidence in the

estimate of effect and may change the estimate. "Low" indicates low confidence that the evidence reflects the true effect and that further research is likely to change our confidence in the estimate of effect and is likely to change the estimate. A grade of "insufficient" indicates that evidence is either unavailable or does not permit estimate of an effect. Two independent reviewers rated each KQ according to consistency, precision, reporting bias, and overall strength of evidence grade. We resolved discrepancies through consensus discussion involving more reviewers.

Expert Review and Public Comment

The draft Research Plan was posted for public comment on the USPSTF Web site from August 25, 2016, to September 21, 2016. In response to public comments, the USPSTF narrowed the scope of the review to target nondependent, unhealthy alcohol use. Based on this change, the USPSTF also modified the inclusion criteria to exclude test performance studies of the CAGE questionnaire (since it is not used for identifying the full spectrum of at-risk alcohol use) and pharmacotherapy intervention studies (since these are typically reserved for persons with alcohol dependence). In addition, the USPSTF revised the inclusion criteria to include studies limited to persons with concomitant, nonpsychotic mental health disorders such as depression and anxiety disorders. The USPSTF made other minor modifications and clarifications as appropriate, such as expanding some outcomes ("school/educational outcomes" rather than "school performance"), including the International Statistical Classification of Diseases code system as a way to identify persons with the condition, and noting that interventions to prevent initiation of alcohol use in adolescents are excluded. A final research plan was posted on the USPSTF's Web site on October 20, 2016.

This full draft report was shared with invited expert reviewers and federal partners. We compiled the comments received from these invited experts and addressed them in the report when appropriate. Additionally, a draft of this report was posted for public comment on the USPSTF Web site from June 5 through July 5, 2018. A few comments were received during this public comment period; minor changes were made to the report based on these comments but no changes were made to the evidence or to our conclusions.

USPSTF Involvement

We worked with six USPSTF members at key points throughout this review, particularly when determining the scope and methods for this review and developing the Analytic Framework and KQs. After revisions reflecting the public comment period, the USPSTF members approved the final analytic framework, KQs, and inclusion and exclusion criteria. The Agency for Healthcare Research and Quality funded this review under a contract to support the work of the USPSTF. An agency Medical Officer provided project oversight, reviewed the draft report, and assisted in the external review of the report.

Chapter 3. Results

Literature Search

We reviewed 17,149 abstracts and 570 full-text articles for all KQs (**Appendix A Figure 2**), and included 113 studies, reported in 160 publications. The list of included studies and excluded studies (with reasons for exclusion) are available in **Appendix E** and **Appendix F**, respectively.

KQ1a. Does Primary Care Screening for Unhealthy Alcohol Use in Adolescents and Adults, Including Pregnant Women, Reduce Alcohol Use or Improve Other Risky Behaviors? KQ1b. 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?

We found no trials that examined the direct effect of screening for unhealthy alcohol use on alcohol use or on health, social, or legal outcomes.

KQ2. What Is the Accuracy of Commonly Used Instruments to Screen for Unhealthy Alcohol Use?

Included Studies

We identified 45 studies[84, 93-136] (reported in 56 publications[84, 93-147]) (**Table 4**) that addressed the accuracy of screening instruments (KQ2): 10 in adolescents,[101, 102, 105, 114, 116, 118, 119, 123, 130, 131] five in young adults,[84, 95, 109, 120, 127] 27 in general adult populations,[93, 96-99, 103, 104, 106-108, 110-113, 115, 117, 121, 122, 124-126, 128, 129, 132-134, 136] one in older adults,[94] and two in pregnant[100] or postpartum women.[135] One study in a general adult population provided subgroup analyses of pregnant women and older adults,[106, 139] and one study of participants ages 12 to 20 years provided subgroup analyses of young adults (ages 18 to 20 years).[102] The majority of studies were conducted in the United States (28/45 [62%]) and recruited patients from primary care (23/45 [51%]) (**Table 5**). The number of screened participants ranged from 95 to 166,165. A variety of one- or two-item screening tests were used in the included studies, as well as the AUDIT, AUDIT-C, and ASSIST. The one- or two-item screening tools addressed a variety of specific targets, such as typical or maximum drinks per drinking day (quantity), number of unhealthy drinking days over a specified time period (frequency), or typical total number of drinks over a specific time period (quantity x frequency). Response categories and cutoffs also varied. Studies sometimes assigned a certain number of drinks to be the cutoff (e.g., more than four drinks on one occasion at any time during the time window). Others used questions with Likert-type

response categories, such as Item 3 from the AUDIT-C (often referred to as the AUDIT-3), which asks, "How often do you have six or more drinks on one occasion?" and has response categories of 0 (never), 1 (less than monthly), 2 (monthly), 3 (weekly), and 4 (daily or almost daily); for a given study, a positive screening value may be 1, 2, or 3. We accepted minor variations of the named screening tools, such as modified response categories or wording.

Reference standards used in the included studies were most commonly structured diagnostic interviews (e.g., Composite International Diagnostic Interview, Alcohol Use Disorder and Associated Disabilities Interview Schedule, Mini International Neuropsychiatric Interview Plus), and sometimes the interview was used in combination with other instruments (e.g., with the ASSIST to identify the full spectrum of unhealthy use) or with the Timeline Followback (TLFB). Definitions of unhealthy use and exceeding limits were variable, as recommendations differ across countries. The majority of the studies were fair quality (28/45 [62%]). Among the studies that were rated as fair quality, the most common reasons for increased risk of bias included: not reporting enough information regarding the order and timing of the reference standard and screening test; not clearly reporting on whether the researchers had knowledge of the index test results during the administration and interpretation of the reference standard; not presenting a range of cutoff values or an a priori threshold; and/or not reporting whether participant recruitment was random or consecutive.

Summary of Results

Table 6 summarizes the test accuracy of the most commonly used screening instruments (one- or two-item questions, AUDIT-C, and AUDIT) for detecting full spectrum of unhealthy alcohol use (including exceeding daily or weekly limits, exceeding heavy use episode limits, and meeting criteria for AUD) and AUD (any level of severity, including both abuse and dependence). Forest plots show study-level results for detecting unhealthy use (**Figures 1-7**) and AUD (**Figures 8-13**). In addition, detailed information on the use of these instruments to detect alcohol dependence or severe AUD is available in **Appendix G**.

For adolescents, just one study (n=225) in a German high school reported on the test accuracy for detecting the full spectrum of unhealthy alcohol use (**Figure 4**), 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 (males and females combined). Multiple studies demonstrated good test accuracy of one- or two-item screeners and the AUDIT for detecting AUD. For example, the NIAAA-recommended single question ("In the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?") had sensitivity ranging from 0.87 to 1.00 (95% CI range, 0.76 to 1.0) and specificity ranging from 0.84 to 0.94 (95% CI range, 0.82 to 0.97; k=3; n=2,486) (**Figure 8**), and other one- or two-item screeners showed similar results. All five studies addressing one- or two-item screeners were conducted in primary care settings in the United States, and in several studies the samples were comprised primarily of black and Hispanic youth.

For adults, studies of the NIAAA-recommended single-item question ("How many times in the past year have you had 5/4 [males/females] 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 unhealthy alcohol use (k=4; n=44,461) (**Figure 1**). All of these studies were conducted in the United States, primarily in primary care settings. Other one- or two-item screeners generally showed sensitivities of 0.70 or greater, although the standard of six or more drinks per occasion tended to have lower sensitivity than the five/four or more drinks standard, often with nonoverlapping CIs. Other adult populations (young adults, older adults, pregnant women) had results in similar ranges. When used for detecting AUD instead of the full spectrum of unhealthy use, the ranges were largely overlapping but shifted slightly higher for sensitivity and lower for specificity.

For the AUDIT-C, sensitivity for detecting unhealthy alcohol use in adults was similar to the one- or two-item screeners, excluding one VA-based study in HIV-positive patients and matched controls[125] that had substantially lower sensitivity. In most studies, the range of sensitivity was 0.73 to 0.97 for females (95% CI range, 0.62 to 0.99; k=5; n=2,714) (**Figure 2**) and 0.82 to 1.0 for males (95% CI range, 0.75 to 1.0; k=4; n=1,038) (**Figure 3**) at the standard cutoffs of 3 or higher for females and 4 or higher for males, but the range of reported specificity was much wider (0.28 to 0.91 [95% CI range, 0.21 to 0.93] and 0.34 to 0.89 [95% CI range, 0.25 to 0.92], for females and males, respectively). A number of studies reported sensitivity of 0.80 or greater at optimal cutoffs on the AUDIT-C, with associated specificity generally in range of mid-0.70s to mid-0.80s (**Figure 4**). Results generally showed similar ranges when detecting AUD rather than the full spectrum of unhealthy alcohol use, except with some higher specificity values at the standard cutoffs. 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 cutoff of 8 or higher, studies reported a wide range of sensitivity for detecting unhealthy alcohol use in general adult populations (0.38 to 0.73 [95% CI range, 0.33 to 0.84]) but high specificity (0.89 to 0.97 [95% CI range, 0.84 to 0.98]; k=7; n=8,852) (**Figure 5**). Sensitivity was relatively high (0.82) in young adults at the standard cutoff of 8 or higher, but data were sparse in this population (k=2; n=660). In many studies, sensitivity improved at lower cutoffs. Studies conducted in U.S.-based primary care settings showed a more optimal balance of sensitivity and specificity at cutoffs of 3, 4, or 5 (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]; k=3; n=2,782) (**Figure 7**). Both sensitivity and specificity values tended to be wider ranging across studies for detecting AUD than for detecting unhealthy use when using the AUDIT.

For all studies, subgroup analyses commonly identified different optimal cutoffs for different subgroups. In several instances, optimal cut-points were lower for females than for males, for blacks than for whites, and for the very young and older ages than for general adults. However, with little replication and sometimes conflicting results, evidence does not clearly support any specific alternate cut-points for the subgroups and instruments explored. One study[109] among young adults reported test accuracy for male and female subgroups to detect unhealthy alcohol use employing the AUDIT and AUDIT-C. The optimal cutoff for the AUDIT was 8 or higher for both sexes; for the AUDIT-C, females had a lower cutoff than males (≥5 vs. ≥7). Another study among young adults found lower optimal cutoffs for the AUDIT and AUDIT-C for females versus males.[127] For adults, four studies found lower optimal cut-points for females than males

on both the AUDIT and the AUDIT-C;[93, 115, 122, 134] however, one of these[134, 140] reported no difference in performance characteristics by sex at the standard cutoffs for the AUDIT. Three studies examining single-item screeners found no difference in test accuracy between males and females[106, 126, 133] but one study found lower optimal cutoffs for females.[106, 139]

Race/ethnicity differences were suggested in some, but not all, studies. One study among young adults reported the same cutoffs for the AUDIT for white and black males, but lower for black females versus white females.[127] The same study[127] reported lower cutoffs for the AUDIT-C for black versus white participants. For general adults, race/ethnicity differences in the optimal cutoffs were reported for single-item screeners in one study, with higher optimal cutoffs for American Indian, white, and Hispanic participants versus Asian and black participants,[106, 139] but no statistically significant difference was found for race/ethnicity in two other studies.[126, 133, 144] Volk and colleagues[134, 140] reported no difference by race/ethnicity for the AUDIT, and while the test accuracy in the same group of participants varied by race/ethnicity for the AUDIT-C, the authors did not recommend using different cutoffs for race/ethnicity in practice.

Socioeconomic status was examined in two studies of single-item screening tests, with no difference reported.[126, 133]

In general, older adults[94, 106] tended to have lower optimal cutoffs than the general adult population. Among adolescents, one study suggested lower cutoffs to detect alcohol dependence for single-item screeners,[101] but in another study, the optimal cutoffs remained the same for younger (ages 12 to 14 years) and older (ages 15 to 17 years) adolescents to detect AUD.[102] When comparing adolescents (ages 12 to 17 years) to young adults (ages 18 to 20 years) within the same study, the optimal cutoffs to detect AUD were higher for young adults.[102]

Detailed Results

Adolescents

Study and Population Characteristics

Five good-quality[101, 102, 105, 116, 119] and five fair-quality[114, 118, 123, 130, 131] studies recruited adolescent participants, usually ages 12 to 17 years. Seven studies were conducted in U.S. primary care patients,[102, 105, 114, 116, 118, 119, 123] one recruited a community-based sample in the United States,[101] and the two studies conducted outside the United States (Germany, Chile) recruited participants from schools.[130, 131] Studies ranged in size from 95[131] to 166,165[101] participants; all but one of the studies had fewer than 1,600 participants. The mean age was 15 or 16 years in six studies; four studies did not report mean age.[101, 114, 118, 123] The number of females ranged from 44[131] to 68[119] percent. Race/ethnicity was reported in the eight U.S.-based studies. Three studies had a majority of white participants (62% to 93%),[101, 102, 123] three studies had a majority of black participants (51% to 93%),[114, 118, 119] and two others had a majority of nonwhite participants (82% to 85%).[105, 116] One study[123] restricted eligibility to adolescents who had been diagnosed for a year or longer with type 1 diabetes, asthma, cystic fibrosis, inflammatory bowel disease, or juvenile idiopathic arthritis.

Only one study reported the prevalence of unhealthy alcohol use (24.9%).[130] In seven studies,[102, 105, 114, 116, 118, 119, 123] the prevalence of AUD ranged from 2.9 to 7.6 percent (dependence ranged from 2.2%[119] to 2.5%[101] in two studies). One study,[130] recruiting students from a comprehensive school in Germany, had a much higher prevalence of AUD at 20.0 percent (dependence, 3.1%).

One study evaluated the test accuracy for identifying unhealthy use,[130] eight studies for identifying AUD,[102, 105, 114, 116, 118, 119, 123, 130] and four studies for identifying dependence.[101, 102, 119, 131] Four studies assessed the test accuracy of the AUDIT, one studied the AUDIT-C, one studied the ASSIST, and six studies examined various one- or two-item screeners. For all conditions, all studies used a structured clinical interview (e.g., Composite International Diagnostic Interview, Adolescent Drinking Index, Diagnostic Interview Schedule for Children, Version Four) as the reference standard.

Full Spectrum of Unhealthy Alcohol Use

One- or Two-Item

No studies among adolescents reported on test accuracy for using a one- or two-item test to screen for the full spectrum of unhealthy alcohol use. One study,[105] using a one- or two-item test to screen for persons exceeding recommended limits, reported a sensitivity of 0.56 (95% CI, 0.51 to 0.61) and specificity of 0.92 (95% CI, 0.90 to 0.93) (**Appendix H Figure 5, Appendix I Table 4**).

AUDIT-C

One study[130] (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) for the optimal cutoff of 5 or higher for males and females combined (**Figure 4, Appendix I Table 1**) in a sample with high levels of AUD. One study reported sensitivity of 0.85 (95% CI, 0.69 to 0.93) and specificity of 0.77 (95% CI, 0.71, 0.82) at the optimal cutoff of 5 or higher to detect persons exceeding recommended limits[130] (**Appendix H Figure 6, Appendix I Table 4**).

AUDIT

The same study[130] (n=225) reported a sensitivity of 0.66 (95% CI, 0.53 to 0.77) and specificity of 0.86 (95% CI, 0.80 to 0.90) when using the standard cutoff of 8 or higher (**Figure 5, Appendix I Table 1**). The optimal cutoff reported in this study was 6 or higher, with a sensitivity of 0.79 (95% CI, 0.66 to 0.87) and specificity of 0.79 (95% CI, 0.73 to 0.85) (**Figure 6, Appendix I Table 1**). Two studies[130, 131] reported sensitivity ranging from 0.85 to 0.96 (95% CI range, 0.69 to 1.0) and specificity ranging from 0.63 to 0.73 (95% CI range, 0.48 to 0.79) to detect persons exceeding recommended limits using the AUDIT at the optimal cutoffs of 3 and 6 (**Appendix H Figure 7, Appendix I Table 4**).

ASSIST

No studies in adolescents reported on test accuracy for using the ASSIST to screen for the full

spectrum of unhealthy alcohol use.

AUD

One- or Two-Item

Five studies[102, 105, 116, 118, 123] (n=3,564) reported test accuracy for four variations of a one- or two-item screening test[102, 105, 116, 118, 123] (**Figure 8, Appendix I Table 2**), with sensitivity ranging from 0.87 to 1.0 (95% CI range, 0.68 to 1.00) and specificity ranging from 0.84 to 0.95 (95% CI range, 0.82 to 0.97). Three studies[105, 118, 123] (n=2,486) followed a screening approach recommended by the NIAAA that asks about friends' and personal use of alcohol; sensitivity ranged from 0.87 to 1.00 (95% CI range, 0.76 to 1.0) and specificity ranged from 0.84 to 0.94 (95% CI range, 0.82 to 0.97).

AUDIT-C

One study[130] (n=225) reported a sensitivity of 0.76 (95% CI, 0.61 to 0.86) with a corresponding specificity of 0.78 (95% CI, 0.71 to 0.83) at the optimal cutoff of 5 or higher for males and females combined (**Figure 11, Appendix I Table 2**).

AUDIT

Three studies examined the test accuracy of the AUDIT at a cutoff of 8 or higher (**Figure 12, Appendix I Table 2**).[105, 119, 130] Sensitivity was similar among two studies at 0.70 (95% CI, 0.57 to 0.81)[105] and 0.71 (95% CI, 0.57 to 0.82),[130] with a widely ranging proportion with AUD (3.9% and 20%); the third study reported a sensitivity of 0.54 (95% CI, 0.38 to 0.69).[119] Specificity ranged from 0.84 to 0.97 (95% CI range, 0.78 to 0.98). A lower optimal cutoff was reported for two studies, at 3 or higher[119] and 6 or higher.[130] Sensitivity increased (0.84 and 0.88 [95% CI range, 0.71 to 0.97]), but specificity decreased (0.77 [95% CI range, 0.71 to 0.83]) for these lower cutoffs (**Figure 13**). One study[119] conducted in a U.S. primary care sample also reported the test accuracy of the AUDIT at a cutoff of 5 or higher, with sensitivity of 0.73 (95% CI, 0.58 to 0.87) and specificity of 0.88 (95% CI, 0.85 to 0.91) (**Figure 7, Appendix I Table 2**).

ASSIST

One study[114] used the ASSIST with a cutoff of 2 or higher to screen for *DSM-5*-defined AUD; sensitivity was 1.00 (95% CI, 0.86 to 1.00) and specificity was 0.79 (95% CI, 0.75 to 0.82) (**Appendix I Table 2**).

Young Adults

Study and Population Characteristics

Four good-quality studies[84, 102, 109, 120] and two fair-quality studies[95, 127] recruited young adults. One of the good-quality studies included adolescents ages 12 to 20 years and reported results for a young adult subgroup (ages 18 to 20 years).[102] Five studies were conducted in the United

States, three from college/university settings,[109, 120, 127] one from primary care,[102] and one from a sexually transmitted infection clinic.[84] The sixth study was conducted at a university in Belgium.[95] Mean age ranged from 18 to 21 years, and the proportion of female participants ranged from 45 to 68 percent. Three studies[109, 120, 127] had a majority of white participants (64% to 90%) and one study[84] had 46 percent white and 49 percent black participants. Race/ethnicity was not reported in the Belgian study or for the subgroup of young adults. Sample size ranged from 251 to 3,564 participants. Socioeconomic status was not reported in any of the six included studies.

Two studies evaluated the test accuracy for identifying unhealthy use (prevalence ranged from 28.1% to 52%),[109, 120] four studies for identifying AUD (prevalence ranged from 10.0% to 43.4%),[84, 95, 102, 120] and two for identifying dependence (**Appendix G**).[95, 127] Five studies assessed test accuracy of the AUDIT, two evaluated the AUDIT-C,[109, 127] and one examined a variety of one- or two-item screening questions.[102] For unhealthy use, one study used a structured clinical interview and one used the TLFB as reference standards. For use disorder and dependence, all studies used a structured clinical interview for the reference standard.

Full Spectrum of Unhealthy Alcohol Use

One- or Two-Item

No included studies that focused on young adults reported on test accuracy for using one- or two-item tests to screen for the full spectrum of unhealthy alcohol use.

AUDIT-C

One study[109] reported sensitivity of 0.98 (95% CI, 0.93 to 0.99) and specificity of 0.47 (95% CI, 0.38 to 0.56) for females at a cutoff of 3 or higher (**Figure 2, Appendix I Table 6**). The optimal cutoff in this study was 5 or higher for females (sensitivity, 0.82 [95% CI, 0.73 to 0.88]; specificity, 0.82 [95% CI, 0.74 to 0.88]) (**Figure 4**). For males at a cutoff of 4 or higher, sensitivity was 0.97 (95% CI, 0.92 to 0.99) and specificity was 0.40 (95% CI, 0.30 to 0.50) (**Figure 3**). The optimal cutoff was 7 or higher for males (sensitivity, 0.80 [95% CI, 0.71 to 0.86]; specificity, 0.88 [95% CI, 0.79 to 0.93]) (**Figure 4**).

AUDIT

Two studies[109, 120] assessed the test accuracy of the AUDIT to screen for unhealthy alcohol use (**Appendix I Table 6**). At a cutoff of 8 or higher, also the optimal cutoff for one study,[109] sensitivity was 0.82 in both studies (95% CI range, 0.72 to 0.88) and specificity was 0.79 and 0.78 (95% CI range, 0.72 to 0.84) (**Figure 5**). The optimal cutoff was 7 or higher for one study (sensitivity, 0.88 [95% CI, 0.79 to 0.93]; specificity, 0.70 [95% CI, 0.64 to 0.76]) (**Figure 6**).[120]

ASSIST

No studies in young adults reported on test accuracy for using the ASSIST to screen for the full spectrum of unhealthy alcohol use.

AUD

One- or Two-Item

One study[102] (n=251) assessed the test accuracy of three variations of a one- or two-item screening question to screen for AUD, assessing frequency (drinking days in the previous year), quantity (drinks per drinking day), and the combination (total drinks consumed in the previous year) (**Figure 8, Appendix I Table 7**). Sensitivity ranged from 0.81 to 0.92 (95% CI range, 0.61 to 0.98) and specificity ranged from 0.75 to 0.80 (95% CI range, 0.69 to 0.85). Total drinks in the previous year had the highest sensitivity but lowest specificity.

AUDIT-C

No included studies that focused on young adults reported on test accuracy for using the AUDIT-C to screen for AUD.

AUDIT

Two studies reported a cutoff of 8 or higher,[84, 120] with sensitivity of 0.68 (95% CI, 0.60 to 0.75) and 0.82 (95% CI, 0.74 to 0.89) and specificity of 0.75 (95% CI, 0.68 to 0.81) and 0.72 (95% CI, 0.65 to 0.77), respectively (**Figure 12, Appendix I Table 7**). The optimal cutoff ranged from 6 or higher to 8 or higher in three studies reporting test accuracy for any cutoffs (sensitivity, 0.73 to 0.82 [95% CI range, 0.65 to 0.89]; specificity, 0.67 to 0.78 [95% CI range, 0.60 to 0.79]) (**Figure 13**).[84, 95, 120]

ASSIST

No studies in young adults reported on test accuracy for using the ASSIST to screen for AUD.

General Adults

Study and Population Characteristics

Eight good-quality[96, 98, 106, 110, 111, 121, 126, 133] and 19 fair-quality studies[93, 97, 99, 103, 104, 107, 108, 112, 113, 115, 117, 122, 124, 125, 128, 129, 132, 134, 136] recruiting adults were included. Fifteen studies were conducted in the United States; the other 12 were conducted in Europe (one each in Switzerland/France, the Netherlands, United Kingdom, and Germany; two each in Finland and Italy; three in Spain) or Australia (k=1). Nine studies recruited from U.S. primary care. Mean age ranged from 26 to 52 years. One study recruited exclusively females[98] and one study recruited exclusively males;[125] otherwise, the proportion of female participants ranged from 20.3 to 74.8 percent. Three studies recruited participants from the VA.[98, 104, 125] Six studies limited their recruitment or analysis to participants who the study categorized as current drinkers.[96, 99, 111, 125, 129, 132] Three studies recruited participants with diagnoses or symptoms of anxiety or depression,[96, 97, 122] one recruited patients seeking evaluation for attention deficit hyperactivity disorder,[124] and one recruited HIV-positive participants;[125] two of these studies also recruited control participants who did not have the disease.[97, 125] Sample size ranged from 124 to 43,093 participants. Race/ethnicity was

reported in 12 studies; 11 of the 12 studies were based in the United States. Six studies had a majority of white participants;[98, 103, 104, 110, 124, 132] six studies had higher proportions of other race/ethnic groups than whites, primarily black and Hispanic.[121, 125, 126, 133, 134, 136] While socioeconomic status was not widely reported, six U.S.-based studies recruited participants of lower socioeconomic status, as indicated by recruitment setting, income, employment, education, or combinations thereof.[99, 117, 121, 126, 134, 136]

Eleven studies[93, 108, 115, 122, 125, 126, 128, 129, 132-134] reported prevalence of unhealthy alcohol use, ranging from 7.9 to 53.2 percent; all but three of the 11 studies reported a prevalence of less than 33 percent.[108, 122, 132] Across 16 studies,[96, 99, 104, 106-108, 110, 111, 117, 121, 124, 126, 132-134, 136] prevalence of AUD ranged from 7.7 to 43.8 percent; five of the 16 studies reported AUD prevalence greater than 20 percent.[99, 108, 110, 117, 132] Twelve studies evaluated the test accuracy for identifying unhealthy alcohol use, 16 studies for identifying AUD, and 10 for identifying alcohol dependence. Nineteen studies assessed test accuracy of the AUDIT, 15 evaluated the AUDIT-C, 12 evaluated one- or two-item screeners, and one evaluated the ASSIST.[121]

The reference standard varied depending on the condition, but nearly all studies used a structured diagnostic interview, at times with TLFB, Short Inventory of Problems for alcohol, or the ASSIST. For AUD and alcohol dependence, all studies used a structured diagnostic interview, most frequently based on *DSM-IV* criteria. For unhealthy alcohol use, structured interview was often used in combination with the TLFB. In two studies,[93, 122] the target condition was exceeding recommended limits (ignoring AUD), and the reference standard was based on the TLFB only.

Full Spectrum of Unhealthy Alcohol Use

One- or Two-Item

Seven studies that recruited adults assessed the test accuracy of various one- or two-item screeners to screen for unhealthy alcohol use (**Figure 1, Appendix I Table 10**).[93, 106, 122, 125, 126, 132, 133] Across these studies, sensitivity ranged from 0.65 to 0.90 (95% CI range, 0.58 to 0.91) and specificity ranged from 0.68 to 1.0 (95% CI range, 0.64 to 1.0) (n=48,211). Four studies[106, 126, 132, 133] with a total of 44,461 participants assessed the test accuracy of a question on heavy episodic drinking recommended by the NIAAA (5/4+ drinks) and reported sensitivity ranging from 0.73 to 0.88 (95% CI range, 0.65 to 0.90) and specificity ranging from 0.74 to 1.0 (95% CI range, 0.69 to 1.0) at the optimal cutoff. In general, the instruments defining a positive screen as drinking six or more drinks on one occasion had lower sensitivity and higher specificity than those using the standard of five/four or more drinks (for males/females). Five studies[93, 112, 126, 132, 133] used a one- or two-item test to screen for persons exceeding recommended limits and reported sensitivity ranging from 0.75 to 0.93 (95% CI range, 0.61 to 0.96) and specificity ranging from 0.72 to 0.91 (95% CI range, 0.68 to 0.93) at the optimal cutoff. An additional study[125] recruiting male HIV-positive patients and matched controls from the VA reported a sensitivity of 0.48 (95% CI, 0.39 to 0.57) and specificity of 0.94 (95% CI, 0.92 to 0.95) (**Appendix H Figure 5, Appendix I Table 13**).

AUDIT-C

Eight studies assessed the test accuracy of the AUDIT-C to screen for unhealthy alcohol use (**Appendix I Table 10**).[93, 115, 122, 125, 129, 132-134] In five studies reporting a cutoff of 3 or higher for females, sensitivity ranged from 0.73 to 0.97 (95% CI range, 0.62 to 0.99) and specificity ranged from 0.28 to 0.91 (95% CI range, 0.21 to 0.93) (**Figure 2**).[93, 115, 122, 129, 132-134] In four of the five studies reporting a cutoff of 4 or higher for males, sensitivity ranged from 0.82 to 1.0 (95% CI range, 0.75 to 1.0) and specificity ranged from 0.34 to 0.89 (95% CI range, 0.25 to 0.92) (**Figure 3**).[93, 115, 122, 129, 132, 134] The remaining study recruited male patients from the VA and had much lower sensitivity at a cutoff of 4 or higher (0.63 [95% CI, 0.55 to 0.69], with corresponding specificity of 0.90 [95% CI, 0.87 to 0.92]).[125] Optimal cutoffs ranged from 2 or higher to 6 or higher across eight studies; at times the optimal cutoffs differed by subgroup, with the optimal cutoff for females lower than the optimal cutoff for males (**Appendix I Table 10**). The most frequently reported optimal cutoffs were 4 or higher and 5 or higher. Across eight studies, sensitivity at the optimal cutoffs ranged from 0.74 to 0.92 (95% CI range, 0.62 to 0.98) and specificity ranged from 0.66 to 0.89 (95% CI range, 0.59 to 0.92) (**Figure 4**). One study that recruited male HIV-positive patients and matched controls from the VA reported a lower sensitivity for the optimal cutoff, at 0.63 (95% CI, 0.55 to 0.69), with corresponding specificity of 0.90 (95% CI, 0.87 to 0.92). Seven studies[106, 112, 113, 125, 129, 132, 133] used the AUDIT-C to screen for persons exceeding recommended limits, with sensitivity ranging from 0.74 to 1.00 (95% CI range, 0.64 to 1.0) and specificity ranging from 0.77 to 0.92 (95% CI range, 0.73 to 0.92) at optimal cutoffs ranging from 3 to 5 (**Appendix H Figure 6, Appendix I Table 13**).

AUDIT

Nine studies reported the test accuracy of the AUDIT to screen for unhealthy alcohol use (**Appendix I Table 10**).[93, 108, 115, 122, 125, 128, 129, 132, 134] At a cutoff of 8 or higher, seven studies reported sensitivity ranging from 0.38 to 0.73 (95% CI range, 0.33 to 0.84) and specificity ranging from 0.89 to 0.97 (95% CI, 0.83 to 0.98) (**Figure 5**).[93, 115, 122, 125, 129, 132, 134] A cutoff of 8 or higher was optimal for only one subgroup in one study (males with mild depression).[122] The optimal cutoffs ranged from 3 or higher to 11 or higher, with sensitivity ranging from 0.68 to 0.90 (95% CI range, 0.43 to 0.96) and specificity ranging from 0.75 to 0.96 (95% CI range, 0.63 to 0.98) (**Figure 6**). Eight studies had an optimal cutoff of 3 or higher to 5 for all participants or certain subgroups. For five studies,[93, 108, 115, 122, 134] the optimal cutoff differed between males and females, with a lower optimal cutoff for females than for males. Six studies[93, 110, 112, 125, 129, 132] used the AUDIT to screen for persons exceeding recommended limits, with sensitivity ranging from 0.64 to 0.89 (95% CI range, 0.52 to 0.93) and specificity ranging from 0.67 to 0.95 (95% CI range, 0.59 to 0.97) at the optimal cutoff (ranging from 4 to 9) (**Appendix H Figure 7, Appendix I Table 13**).

Three studies recruiting U.S.-based primary care patients reported data on lower AUDIT cutoffs (≥3 to 5) for unhealthy use (**Figure 7**).[125, 132, 134] At a cutoff of 3 or higher, two of the studies reported sensitivity of 0.86 (95% CI range, 0.77 to 0.91), with specificity ranging from 0.74 to 0.83 (95% CI range, 0.68 to 0.85). At a cutoff of 4 or higher, sensitivity ranged from 0.71 to 0.84 (95% CI range, 0.64 to 0.88) and specificity ranged from 0.77 to 0.90 (95% CI range, 0.73 to 0.91) across the three studies. At a cutoff of 5 or higher, sensitivity ranged from 0.64 to 0.71

(95% CI range, 0.57 to 0.77) and specificity ranged from 0.87 to 0.94 (95% CI range, 0.83 to 0.95).

ASSIST

No studies in general adults reported on test accuracy for using the ASSIST to screen for the full spectrum of unhealthy alcohol use.

AUD

One- or Two-Item

Four one- or two-item screening tests were used in seven studies to screen for AUD, with sensitivity ranging from 0.71 to 0.94 and specificity ranging from 0.60 to 0.91 (**Figure 8, Appendix I Table 11**). The question recommended by the NIAAA on heavy episodic drinking (5/4+ drinks) was used in six studies[96, 106, 126, 132, 133, 136] (n=44,244), with sensitivity at the optimal cutoffs ranging from 0.71 to 0.92 (95% CI range, 0.65 to 0.98) and specificity ranging from 0.60 to 0.91 (95% CI range, 0.55 to 0.95).

AUDIT-C

Six studies reported the test accuracy of the AUDIT-C to screen for AUD (**Appendix I Table 11**).[104, 106, 107, 132-134] In three[104, 106, 134] studies reporting accuracy for a cutoff of 3 or higher for females, sensitivity ranged from 0.78 to 0.87 (95% CI range, 0.74 to 0.92) and specificity ranged from 0.69 to 0.85 (95% CI range, 0.65 to 0.75) (**Figure 9**). In three studies reporting test accuracy for a cutoff of 4 or higher for males, sensitivity ranged from 0.87 to 0.88 (95% CI range, 0.78 to 0.94) and specificity ranged from 0.63 to 0.75 (95% CI range, 0.62 to 0.80) (**Figure 10**).[106, 107, 132, 134] The optimal cutoff for six studies was 3 or higher or 4 or higher; one study had an optimal cutoff of 5 or higher for males.[104] At the optimal cutoff, sensitivity ranged from 0.70 to 0.88 (95% CI range, 0.65 to 0.95) and specificity ranged from 0.70 to 0.85 (95% CI range, 0.66 to 0.87) (**Figure 11**).

AUDIT

Eight studies assessed test accuracy of the AUDIT to screen for AUD (**Appendix I Table 11**).[104, 108, 110, 111, 117, 124, 132, 134] At a cutoff of 8 or higher, six studies[104, 111, 117, 124, 132, 134] reported sensitivity ranging from 0.43 to 0.96 (95% CI range, 0.35 to 1.0) and specificity from 0.82 to 0.96 (95% CI range, 0.74 to 0.99) (**Figure 12**). Only one study had 8 or higher as the optimal cutoff.[117] The optimal cutoffs ranged from 5 or higher to 10 or higher (seven studies reported optimal cutoffs of ≥5 to 7), with sensitivity from 0.48 to 0.96 (95% CI range, 0.35 to 1.0) and specificity from 0.34 to 0.96 (95% CI range, 0.28 to 0.99) (**Figure 13**).

Two studies recruiting participants from U.S. primary care reported test accuracy at lower cutoffs (≥4 and ≥5) (**Figure 7, Appendix I Table 11**).[132, 134] At a cutoff of 4 or higher, sensitivity was 0.83 (95% CI, 0.76 to 0.88), with corresponding specificity of 0.67 (95% CI, 0.63 to 0.71).[132] At a cutoff of 5 or higher, sensitivity was 0.72 (95% CI, 0.65 to 0.79) and 0.80 (95% CI,

0.73 to 0.86), with corresponding specificity of 0.79 (95% CI, 0.75 to 0.82) and 0.88 (95% CI, 0.86 to 0.90).[132, 134] In contrast, sensitivity was much lower in these studies using the cutoff of 8 or higher (0.43 [95% CI, 0.35 to 0.51][132] and 0.55 [95% CI, 0.47 to 0.63][134]).

ASSIST

One study[121] reported the test accuracy of the ASSIST to screen for AUD (**Appendix I Table 11**). The optimal cutoff for females was 7 or higher, with sensitivity of 0.86 (95% CI, 0.42 to 0.97) and specificity of 0.83 (95% CI, 0.77 to 0.88). The optimal cutoff for males was 13 or higher, with sensitivity of 0.80 (95% CI, 0.64 to 0.91) and specificity of 0.95 (95% CI, 0.90 to 0.98).

Older Adults

Study and Population Characteristics

Three good-quality studies recruited older adults from the community, one in Finland (n=517)[94] and one in the United States (n=8,666).[106, 139] The U.S.-based study recruited all adults and presented test accuracy results for an older adult subgroup.[106, 139] In the Finnish study, the mean age was 69 years, half of the participants were female, and race/ethnicity and socioeconomic status were not reported. Subgroup-specific population characteristics were not reported for the U.S.-based study.[106, 139] These studies assessed the accuracy of the AUDIT, AUDIT-C, and several one- or two-item screeners to screen for unhealthy alcohol use,[94, 106, 139] AUD,[106, 139] and alcohol dependence.[94] The TLFB was the reference standard for the Finnish study, classifying 23 percent of participants with unhealthy alcohol use; the U.S.-based study[106, 139] used a structured clinical interview. An additional study, conducted in Spain, assessed only the test accuracy of the AUDIT and AUDIT-C to screen older adults for exceeding recommended levels of alcohol intake.[113]

Full Spectrum of Unhealthy Alcohol Use

One- or Two-Item

Two studies[94, 106] reported test accuracy for a variety of one- or two-item screening questions, with sensitivity ranging from 0.64 to 0.97 (95% CI range, 0.61 to 0.99) and specificity ranging from 0.70 to 1.0 (95% CI range, 0.65 to 1.0) (**Figure 1, Appendix I Table 15**). The U.S.-based study reported test accuracy for the NIAAA-recommended question (5/4+ drinks) to assess heavy episodic drinking, with sensitivity of 0.64 (95% CI, 0.61 to 0.67) and specificity of 1.0 (95% CI, 1.0 to 1.0).[106, 139]

AUDIT-C

At the optimal cutoff of 4 or higher in the Finnish study, sensitivity was 0.94 (95% CI, 0.88 to 0.97) and specificity was 0.80 (95% CI, 0.76 to 0.84) (**Figure 4, Appendix I Table 15**).[94] Two studies[106, 113] reported test accuracy to detect persons exceeding recommended limits, with sensitivity ranging from 0.93 to 10.0 (95% CI range, 0.91 to 1.0) and specificity ranging from

0.81 to 0.85 (95% CI range, 0.80 to 0.86) at optimal cutoffs of 3 or higher and 4 or higher (**Appendix H Figure 6, Appendix I Table 13**).

AUDIT

The sensitivity and specificity at the cutoff of 8 or higher was 0.48 (95% CI, 0.39 to 0.57) and 0.97 (95% CI, 0.95 to 0.98), respectively, in the Finnish study (**Figure 5, Appendix I Table 14**). The optimal cutoff was 5 or higher, with sensitivity of 0.86 (95% CI, 0.78 to 0.91) and specificity of 0.87 (95% CI, 0.83 to 0.90) (**Figure 6**). At the optimal cutoff of 8 or higher, one study[113] reported a sensitivity of 0.67 (95% CI, 0.64 to 0.70) and specificity of 0.95 (95% CI, 0.95 to 0.96) to detect persons exceeding recommended limits (**Appendix H Figure 7, Appendix I Table 13**).

ASSIST

No studies in older adults reported on test accuracy for using the ASSIST to screen for the full spectrum of unhealthy alcohol use.

CARET

No studies in older adults reported on test accuracy for using the CARET to screen for the full spectrum of unhealthy alcohol use.

AUD

One- or Two-Item

No studies in older adults reported on test accuracy for using a one- or two-item screening test to screen for AUD.

AUDIT-C

The U.S.-based study reported the test accuracy of the AUDIT-C to screen for AUD in adults age 65 years or older who had drunk alcohol in the previous year. At the optimal cutoff of 4 or higher, sensitivity was 0.76 (95% CI, 0.67 to 0.83) and specificity was 0.74 (95% CI, 0.72 to 0.75) (**Figure 11, Appendix I Table 16**).

AUDIT

No studies in older adults reported on test accuracy for using the AUDIT to screen for AUD.

ASSIST

No studies in older adults reported on test accuracy for using the ASSIST to screen for AUD.

CARET

No studies in older adults reported on test accuracy for using the CARET to screen for AUD.

Pregnant Women

Two fair-quality studies[100, 135] and one good-quality study[106] recruited pregnant women. Two studies were set in the United States, with one recruiting American Indian women (or women carrying American Indian babies) at a mean of 15 weeks' gestation attending prenatal appointments[100] and the other recruiting pregnant past-year drinkers from the community through a large epidemiologic survey.[106] The third study was set in Argentina and recruited postpartum women within 48 hours of delivery.[135] Mean age was 24[135] and 26[100] years in two studies; the third study did not report maternal age.[106] In one study, based on a structured interview and medical records, 53 percent of women used alcohol during their pregnancy.[100] The other study used a structured interview to identify the target conditions, reporting 5.5 percent with AUD and 3.5 percent with alcohol dependence.[106] The study in Argentina did not report prevalence.[135]

Alcohol Use

One- or Two-Item

The study in American Indian women reported the test accuracy of a quantity-frequency question to screen for any alcohol use during pregnancy (**Appendix I Table 18**). At the optimal cutoff, sensitivity was 0.77 (95% CI, 0.68 to 0.83) and specificity was 0.93 (95% CI, 0.86 to 0.96).[100]

Other Tools

No studies in pregnant women reported on test accuracy for using the AUDIT-C, AUDIT, ASSIST, TWEAK, or T-ACE to screen for alcohol use.

Full Spectrum of Unhealthy Alcohol Use

No studies in pregnant women reported on test accuracy for using any screening test to screen for unhealthy alcohol use.

AUD

One- or Two-Item

No studies in pregnant women reported on test accuracy for using a one- or two-item screening test to screen for AUD.

AUDIT-C

Two studies reported the test accuracy of the AUDIT-C to screen for AUD.[106, 135] At a cutoff of 3

or higher, also the optimal cutoff in both studies, sensitivity ranged from 0.90 to 0.96 (95% CI range, 0.69 to 0.99) and specificity ranged from 0.71 to 0.79 (95% CI range, 0.65 to 0.82) (**Appendix I Table 19**).

AUDIT

In one study at the optimal cutoff of 4 or higher, sensitivity was 0.87 (95% CI, 0.74 to 0.94) and specificity was 0.86 (95% CI, 0.83 to 0.89).[135]

T-ACE

In one study at the optimal cutoff of 2 or higher, sensitivity was 0.96 (95% CI, 0.86 to 0.99) and specificity was 0.76 (95% CI, 0.72 to 0.79).[135]

TWEAK

In one study at the optimal cutoff of 2 or higher, sensitivity was 0.96 (95% CI, 0.86 to 0.99) and specificity was 0.77 (95% CI, 0.73 to 0.80).[135]

ASSIST

No studies in pregnant women reported on test accuracy for using the ASSIST to screen for AUD.

KQ3. What Are the Harms of Screening for Unhealthy Alcohol Use in Adolescents and Adults, Including Pregnant Women?

Hypothesized possible harms included stigma, labeling, discrimination, privacy concerns, and interference with the patient-provider relationship. In addition, there may be legal concerns for pregnant women in some states. We found no trials that examined the harms of screening for unhealthy alcohol use.

KQ4a. 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?
KQ4b. 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?
KQ5. What Are the Harms of Interventions to Reduce Unhealthy Alcohol Use in Screen-Detected Persons?

Included Trials

We included 68 trials (in 102 publications)[148-249] (n=36,528) that addressed the effect of a counseling intervention on alcohol use or health, social, or legal outcomes in a screen-detected population (**Table 7, Appendix I Table 21**). Two of the trials targeted adolescents,[210, 215] 22 targeted college-aged or young adults,[160-162, 170, 189, 192, 194-201, 205, 211, 220, 223, 225, 226, 239] 29 addressed general adult populations,[149, 152, 153, 163, 165, 169, 171, 172, 174, 175, 184-186, 188, 190, 193, 206, 208, 209, 218, 224, 228, 231, 233, 234, 240, 242] four focused on older adults,[157, 176, 183, 230] and 11 targeted pregnant[168, 181, 191, 202, 203, 217, 221, 222, 235] or postpartum[158, 212] women. **Tables 8** and **9** summarize study and population characteristics for these trials. Most trials were conducted in the United States (41/68 [60%]) and in primary care settings (42/68 [62%]). We rated 10 of the trials as good quality[153, 161, 168, 183, 205, 210, 220, 226, 230, 234] and the remaining were fair quality; 28 trials were excluded due to poor quality. Nineteen of the trials (28%) were included in the previous review.

All trials conducted outreach to potential participants with a request to complete a screening instrument, although some studies also allowed participants to self-identify or accepted referrals from medical providers or service agencies. Most trials were limited to participants who reported a prespecified level of alcohol use (most commonly, either more than 7 (female) or 14 (male) drinks per week on average, or drinking 4 (female) or 5 (male) or more drinks on a single occasion), or scored above a predetermined cutoff on a screening instrument such as the AUDIT. Two trials did not restrict participants based on alcohol use, but reported subgroup analyses among unhealthy users.[192, 210] Four trials in young adults included everyone screened regardless of screening results, rather than limiting their sample to unhealthy users,[196, 197, 199, 205] and did not report subgroup analyses among those who met criteria for unhealthy alcohol use. We included these studies because the average consumption was in the high-risk use range, indicating an alcohol use reduction intervention was appropriate for at least half the sample. For example, two of the trials targeting incoming freshmen (average age, 18 years) reported baseline weekly alcohol use of 3.5[196] and 7[205] drinks per week, along with an average of one heavy use episode every 2 weeks[196] or an average of 2.2 alcohol-related problems.[205] All four of these trials' interventions were very consistent with other trials' interventions in this age group.

Interventions

Information about the interventions can be found in **Table 10** and **Appendix I Tables 22** and **23**. Most interventions involved one to two sessions (90% involved ≤4 sessions), with a median of 30 minutes of contact time (88% involved ≤2 hours of contact). Almost all interventions involved at least general feedback, such as how the participant's drinking fit with recommended limits and how to reduce alcohol use. Many interventions, particularly those in primary care settings, used an SBIRT approach, consistent with those recommended by several health organizations (**Table 3**). The most commonly reported intervention element was the use of personalized normative feedback sessions, in which participants were shown how their alcohol use compares to others; this technique was used in more than half of the included trials and almost all trials in younger adults. Motivational techniques were also common, particularly in combination with personalized normative feedback. The use of drinking diaries and action plans or alcohol use "prescriptions" was also common, particularly in trials of general and older adults. A few interventions also incorporated more extensive cognitive behavioral counseling[170, 175, 194, 196] in conjunction with personalized normative feedback. Most trials in adolescents and young adults involved one or two in-person or Web-based personalized normative feedback sessions in school or university settings. Interventions targeting adults other than college students (including pregnant and postpartum women) were more likely to have taken place in primary care settings, had multiple sessions, and involved the primary care team in some way; approximately one-third of the interventions were delivered by the primary care clinician in trials of general and older adult populations. Three trials (with four intervention arms) involved group-based interventions,[188, 194, 196] and four used a stepped-care approach,[149, 208, 230] where participants who did not reduce alcohol use after a brief intervention were graduated to more intensive interventions. Six trials (in seven intervention arms) incorporated feedback on how an individual's alcohol consumption was affecting his/her health, such as elevated liver enzymes, symptoms or medical conditions that could be exacerbated by alcohol use, and potentially dangerous alcohol use with prescribed medications.[174, 176, 183, 188, 209, 222]

Summary of Results

Alcohol Use and Other Risky Behaviors (KQ4a)

The most commonly reported alcohol use outcome was number of drinks per week, which was reported in 45 of the included trials. On average, intervention groups reduced their drinking by 1.6 drinks per week more than control groups after 6 to 12 months, among 32 trials (in 37 analysis groups) that could be included in the meta-analysis (WMD between groups in change from baseline, -1.59 [95% CI, -2.15 to -1.03]; k=37; n=15,974; I^2=63%) (**Figure 14, Table 11**). This included only one trial in adolescents, with separate entries for moderate- and high-risk users, 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 mean drinking rate in the intervention groups changed from 20.5 drinks per week at baseline to 15.6 drinks per week at followup. In the control groups, the mean drinking rate was 20.1 drinks at

baseline and 17.4 drinks at followup. Excluding trials in adolescents and young adults, whose drinking pattern was generally typified by heavy use episodes rather than daily heavy drinking, the mean number of drinks per week in adult populations changed from 26.0 drinks at baseline to 19.1 drinks at followup in the intervention groups and 25.6 drinks at baseline to 21.6 drinks in the control groups. Based on mean baseline drinking levels and mean change in drinks per week, there was a median reduction of 24 percent from baseline drinking levels after 6 to 12 months (interquartile range, 13% to 32%) in intervention participants, compared with a 16 percent reduction in the control group (interquartile range, 3% to 21%). Within-study variability in change was very large, with some participants showing large changes and others none, or even increasing their alcohol use, based on study-reported standard deviations.

A small-study effect was identified for drinks per week (Egger's test bias coefficient, -1.04; p=0.031) (**Figure 19**), meaning that publication bias is a risk in this body of evidence, and is discussed more below, under "Heterogeneity in Effect Size." Trials that could not be included in the meta-analysis generally showed effects of a similar size or slightly smaller, favoring the intervention group (e.g., between-group differences in change ranging from 0.9 to 1.8, or posttest differences of 2.3 drinks/week, or 10% to 20% relative reductions in use). The effects remained statistically significant when limited to trials conducted in primary care settings (WMD, -2.38 [95% CI, -3.44 to -1.33]; k=21; I^2=70%), in the United States (WMD, -1.27 [95% CI, -1.91 to -0.62]; k=18; I^2=64%), and in U.S.-based primary care settings (WMD, -1.75 [95% CI, -2.88 to -0.61; k=9; I^2=77%) (**Figure 15**). Results remained statistically significant when the more conservative restricted maximum likelihood model was used for pooling (data not shown). Among trials conducted in primary care settings, pooled effects were very similar between interventions that did and did not involve the primary care team (**Figure 15**).

For trials with multiple followup assessments, effects were typically maintained between 6 and 12 months of followup; however, in several trials of young adults, the statistical significance disappeared between 6 and 12 months. Across all populations, four trials found that treatment benefits were maintained through 24[157, 198, 201] to 48[153] months, but the effect disappeared between 12 and 48 months in another.[165] Two other trials reported no group differences at 24[233]and 36[206] months of followup, but interim assessments were either not conducted or had unacceptably high attrition and were not abstracted, so it is unknown whether these interventions were effective in the short term.

We also found a pooled 40 percent reduction in the odds of participants exceeding recommended drinking limits at followup (OR, 0.60 [95% CI, 0.53 to 0.67]; k=16; n=9,760; I^2=24%) (**Figure 16, Table 11**), although this outcome was reported in only 24 percent (16/68) of the included studies. Between 15 and 76 percent of participants exceeded recommended drinking limits at followup in the intervention groups, compared with 29 to 82 percent in the control groups. Similarly, there was a 33 percent reduction in the pooled odds of reporting an episode of heavy use (OR, 0.67 [95% CI, 0.58 to 0.77]; k=14; n=8,108; I^2=24%) (**Figure 17, Table 11**), which was also relatively sparsely reported. Small-study effects were not detected for either of these outcomes. The nine trials in pregnant women were most likely to report the odds of abstinence, rather than the aforementioned outcomes, which was doubled in the intervention groups, compared with control groups (pooled OR, 2.26 [95% CI, 1.43 to 3.56]; k=5; n=796; I^2=0%) (**Figure 18, Table 11**). Other alcohol use outcomes were very sparsely reported and generally

showed very small statistically nonsignificant group differences.

Few changes in other behavioral outcomes were noted, such as in drug use, sex after alcohol use, and seeking help for unhealthy alcohol use, and were only rarely reported. One trial[152] in a general adult population found a reduction in self-reported drinking and driving, but two in younger[170] and older[183] adults did not. The trial in older adults 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.[183]

Among trials reporting drinks per week, several reported effects separately for males and females[153, 168, 171, 174, 175, 193, 206, 234] or were entirely limited to males[192, 208, 220] or females.[158, 196, 218] Meta-analyses limited to men only and women only showed very similar between-group effects (WMD, -2.79 [95% CI, -4.10 to -1.49]; k=11; I^2=45 and -2.81 [95% CI, -4.45 to -1.17]; k=9; I^2=56 for men and women, respectively, data not shown). Among these trials, however, one found a substantially larger effect for men[206] and two others showed smaller statistically nonsignificant differences favoring men,[171, 174] but none of these trials reported the statistical significance of treatment-by-sex interactions. Four other trials reported testing the interaction between treatment effect and sex for an alcohol use outcome, with mixed results; three trials found larger relative treatment effects in women,[149, 165, 197] and one reported no interaction effect.[205] Further, results of trials with interventions tailored to women were very limited, aside from those that targeted pregnant and postpartum women, and, with one exception,[201] did not demonstrate superior effects.[190, 196, 218, 227]

Across a variety of alcohol use outcomes, a few studies explored differential effects by subgroups other than sex, including baseline drinking severity,[149, 170, 193, 199, 202, 210] readiness to change,[170, 193, 205] drinking pattern,[165] race/ethnicity,[191, 203] socioeconomic characteristics,[206] and the presence of mental health comorbidities.[149] Several trials found larger effects in patients with heavier baseline use on at least one outcome[149, 193, 199, 210] or trends in that direction,[170] although most did not report interaction tests. Few trials found differences in other subgroups, and none of the differences that were found were replicated. Since subgroup effects were reported only rarely, there is a risk that statistically significant results were preferentially published, so reported results may exaggerate subgroup differences in intervention benefit.

Heterogeneity in Effect Size

The effect size for our primary outcome, drinks per week, was larger in the subset of trials that had been included in the previous review (WMD, -2.83 [95% CI, -3.89 to -1.76]; k=15; I^2=68%) than those that were newly included (WMD, -0.77 [95% CI, -1.24 to -0.30]; k=22; I^2=28). Exploratory analyses indicated that several factors were associated with effect size and likely explained the difference between the effects in studies in the current and previous reviews, including population (young adults vs. adults of other ages), setting (primary care vs. other), study sample size, baseline alcohol use, and year of publication. However, these factors were not independent of each other, and we were unable to determine which of these had a causal association with effect size.

Across all studies included in the meta-analysis for drinks per week (30 trials in adults of varying

ages, including one in postpartum women and one in adolescents), a statistically significant small-study bias was detected (p=0.031) (**Figure 19**). Smaller trials were more likely to have been published more than 10 years ago and to have been among heavier drinkers. The median sample size in studies published in 2007 or later was roughly twice as large (median n analyzed, 360 [range, 90 to 1488]) as those published before 2007 (median n analyzed, 158 [range, 61 to 774]). Similarly, baseline drinks per week in trials published since 2007 (median, 10 [range, 4 to 54]) were less than half of those in older trials (median, 22 [range, 11 to 64]). **Figure 20** provides a visual display of the association between effect size and baseline alcohol use, showing the distribution of studies by baseline drinks per week in the control group by publication year. The size of the marker is weighted by the mean difference between groups in change from baseline, so trials with larger between-group differences have larger markers. The scatter plot shows that larger effects generally appear on the upper half of the figure (higher baseline drinks per week) and on the left (earlier publication year).

Older trials were also primarily conducted in general adult populations in primary care settings, while many of the newer trials were conducted in young adults in college settings, with baseline use levels that were considerably lower than in trials targeting general adult populations. Followup analyses found that the pooled effects were smaller, but still statistically significant, when limited to trials published in 2007 or later, with an average reduction of 1.1 drinks per week (**Figure 15**) and a 35 percent reduction in the odds of exceeding recommended drinking limits (OR, 0.65 [95% CI, 0.56 to 0.76]; k=8; n=6,569; I^2=23%; data not shown). This effect is not entirely due to the greater proportion of trials in young adults in the recent literature; when comparing effects between older and newer studies and *excluding* the trials in young adults, effects were still larger in the older literature, but differences were less pronounced (e.g., -1.59 drinks per week in more recent literature vs. -3.6 drinks per week in older literature) (**Figure 15**).

We did not find any treatment elements that were clearly associated with effect size (e.g., multisession vs. single-session contact, direct personal contact vs. computer or mail-only contact, estimated contact minutes, use of personalized normative feedback [vs. not], use of motivational techniques [vs. not], whether the primary care provider delivered the counseling [vs. not] among trials conducted in primary care). The lack of association with treatment elements held up even within baseline alcohol use strata (≤14 drinks/week, >14 to 28 drinks/week, >28 drinks/week). However, among the trials of general and older adults there was a near statistically significant effect, showing larger effects with multiple- versus single-contact interventions (p=0.07), but this was not the case for trials limited to young adults (p=0.61). Effect size was not influenced by study quality (fair vs. good), loss to followup, whether the trials targeted economically disadvantaged persons, or whether the trial included more than 50 percent racial/ethnic minority persons.

Health, Social, and Legal Outcomes (KQ4b)

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 (95% CI, -0.09 to -0.01; k=18; I^2=3%). This effect size (Hedge's g) can be interpreted as a Cohen's d, where a small effect is typically considered to be 0.20 to 0.50.[250] Mortality was reported in eight trials,

primarily as part of the description of the participant retention. The pooled effect was not statistically significant (OR, 0.64 [95% CI, 0.34 to 1.19]; k=9; n=4,533; I^2=0%) (**Figure 21**), and also likely represents an overestimate of the true effect, since many trials that did not report deaths likely had no deaths, particularly those in young adults. Trials were not powered for this outcome and many had very few events, resulting in imprecise results. Only one trial, the Trial for Early Alcohol Treatment (TrEAT), described ascertainment methods.[153] This trial conducted a careful assessment of health outcomes through 4 years, based on self-report as well as electronic medical records, and databases from the government Crime Information Bureau, Department of Transportation, and Vital Statistics records. This trial found a statistically nonsignificant reduction in mortality at 4 years, with 0.8 percent (3/392) of intervention participants dying compared with 1.8 percent (7/382) of control participants. The difference in mortality between groups was statistically significant at 3 years of followup, when there had been only one death among intervention participants but seven among control participants. The trial did not report whether any of these were related to alcohol use; however, two deaths in the control group were due to car accidents. Other causes of death were coronary artery disease and respiratory failure (in the control group), and suicide and myocardial infarction (in the intervention group).

The TrEAT trial also reported statistically significant reductions in days of hospitalization (420 in the intervention vs. 664 in the control group) and controlled substance or liquor violations (two in the intervention vs. 11 in the control group) at 4 years of followup. In addition, it reported statistically nonsignificantly fewer emergency department visits (302 in intervention vs. 376 in the control group) and motor vehicle crashes with nonfatal injuries (20 in intervention vs. 31 in the control group) after 4 years. Other trials reported a wide variety of health outcomes, generally at 6 to 12 months of followup, with few findings of benefit for intervention over control groups.

Harms (KQ5)

Few studies reported on harms, and none identified any increased risk of harms with the included interventions. Further, no pattern of unexpected paradoxical increases in alcohol use was noted with these interventions.

Detailed Results, by Subpopulation

Adolescents

Study, Population, and Intervention Characteristics

Two trials targeted adolescents (n=1,160), one fair-quality[215] and one good-quality,[210] both published since the previous review. Both trials only reported results by subgroup, one by sex[215] and the other by baseline severity.[210] Retention was high in both trials, with 98 percent[215] and 93 percent[210] retention at 6 months of followup.

The first trial (n=119) involved a 20-minute counseling session for 14- to 18-year-olds attending

primary care visits at either a large, urban, academic medical center or a public health clinic in the southeastern United States.[215] This intervention used a motivational enhancement approach that also included personalized normative feedback and discussion of alcohol use in their peer network. Youth in this study were age 16.4 years on average; 71 percent were female and 84 percent were black. Youth were eligible if they scored 2 or 3 on the CRAFFT with respect to alcohol or marijuana use, indicating they were at risk for a substance use disorder.

The other trial (n=469, among relevant subgroup) involved a single Web-based personalized normative feedback session among Swiss high school students (ages 16 to 19 years) followed by text messages tailored to the students' baseline risk level.[210] Average age in this trial was 16.8 years, 53 percent were female, and race/ethnicity was not reported. The trial included all students, regardless of alcohol use level, but reported results separately for those with and without unhealthy use. We limited our inclusion to the subgroup with unhealthy alcohol use, which was defined as one or more episodes of heavy use in the previous 30 days or more than 14 (males) or seven (females) drinks consumed in a typical week. This group was further divided into two subgroups, with results only reported separately: those with more than two heavy use episodes in the previous 30 days ("high risk") and those with one or two heavy use episodes ("moderate risk").

Alcohol Use and Other Risky Behaviors (KQ4a)

Both trials found beneficial effects in one of two subgroups reported, and neither reported overall effects for the subgroups combined.

The U.S.-based study targeting alcohol and drug use found a statistically significant treatment-by-sex interaction and only reported results by sex, with beneficial effects seen only for males. Alcohol use during the previous 30 days decreased among males in the intervention group (from 0.52 to 0.25 on a scale of 0–7) and increased among males in the control group (0.50 to 0.81) over 6 months (Cohen's d=0.50; $p<0.05$). For females, alcohol use was slightly higher at baseline in the intervention group (1.19 vs. 0.69 in the control group), but both groups averaged around 0.8 at 6 months of followup (Cohen's d not reported; $p>0.05$). The scale used for this study was: 0=0 days, 1=1–2 days, 2=was not reported, 3=3–5 days, 4=6–9 days, 5=10–19 days, 6=20–29 days, and 7=all 30 days.

The Swiss study of high school students found beneficial results only for the high-risk students; that is, those reporting more than two episodes of heavy use in the previous month. Among these students, the number of drinks per week and heavy use episodes in the previous 30 days had declined by 7.95 drinks and 1.48 episodes at 6 months of followup, respectively, in the intervention group, compared with reductions in the control group of 3.54 drinks and 0.86 episodes. The reduction in heavy use episodes was statistically significant; drinks per week was not statistically significant in the adjusted model, although the unadjusted result shown in the forest plot was statistically significant (**Figure 14**). Reductions were smaller and between-group differences were not statistically significant for the moderate-risk group; in the intervention and control groups, drinks per week declined by 0.94 and 1.26, respectively, and heavy use episodes declined by 0.05 and 0.06.

Health, Social, and Legal Outcomes (KQ4b)

Neither study reported on health, social, or legal outcomes.

Harms (KQ5)

Neither study reported on harms related to the intervention.

Young Adults

Study, Population, and Intervention Characteristics

We identified 22 trials that targeted young adults (n=14,214). Most (20/22) of the trials in younger adults were conducted in university settings, including the four primary care–based trials,[160-162, 170] which were conducted in university health clinics. Two-thirds (15/22) were conducted in the United States, and the remaining were in Europe, Canada, Australia, and New Zealand. Four trials were rated as good quality,[161, 205, 220, 226] and median retention across all trials was 84 percent (range, 65% to 90%) at 6 to 12 months of followup. The average participant age was 19.8 years, 51.5 percent of participants were female, and most participants were white or Asian. Most trials of young adults selected participants based on the presence of heavy use episodes, typically defined as four or more drinks on one occasion for females and five or more drinks on one occasion for males. Almost 90 percent (34/36) of the interventions in these trials involved personalized normative feedback, usually delivered in one or two brief sessions, with more than half delivered via computer or the Web and no or minimal direct interaction with study staff. One study (with two treatment arms) involved parents via mailed materials.[205] Four of these trials were included in the previous review.[160, 161, 170, 178]

Alcohol Use and Other Risky Behaviors (KQ4a)

Young adults reduced their alcohol use by an average of 0.87 drinks per week (WMD, -0.86 [95% CI, -1.29 to -0.43]; k=14; n=6,935; I^2=11%) (**Figure 14**). Results were similar when we dropped the trials that had no alcohol use restrictions, and therefore included some participants who were not unhealthy alcohol users (WMD, -0.89 [95% CI, -1.52 to -0.26]; k=12; n=4,864; I^2=24%). The five trials that could not be included in the meta-analysis showed similarly modest effects,[161, 162, 195, 196, 201] with between-group differences in change ranging from -0.9 to -1.8, and three trials reporting 10 and 20 percent reductions in risk-negative binomial models. Interestingly, one additional primary care–based trial targeting a general adult population, published in 1997, reported subgroup analyses for younger adults (ages 18 to 30 years), and found substantially larger effects; intervention participants reported a reduction of 4.1 drinks per week (95% CI, -7.1 to -1.1) more than control group participants at 12 months of followup.[153] Baseline use in the young adult subgroup of this study was 18 drinks per week, which is an average of seven more drinks per week than in trials limited to young adults.

Of the six trials reporting results at both 6 and 12 months, four found that benefits at 6 months were no longer statistically significant at 12 months for at least one intervention group.[162, 170, 189, 223] Only two trials reported outcomes beyond 12 months,[198, 201] and both found that benefits were

maintained through 24 months, although only for the most intensive and specifically tailored intervention group in one of these trials.[201] A number of trials included multiple intervention groups,[162, 189, 199, 201, 205, 211, 223, 225] and we used the group we judged to be most intensive or comprehensive; other intervention groups showed comparable or smaller effects on drinks per week and other alcohol use outcomes. One trial in a general adult population found that 12-month benefits for drinks per week were maintained through 24 months in a subgroup analysis of younger adults ages 18 to 30 years, but were smaller and no longer statistically significant at 36 months of followup.[153]

Most trials in young adults recruited participants with episodes of heavy use; however, this outcome did not show a benefit of treatment in this population, either as number of heavy use episodes per week (WMD, -0.06 [95% CI, -0.16 to 0.05]; k=7; n=2,968; I^2=33%; data not shown) or as the proportion with heavy use episodes in the previous month (OR, 0.81 in each of two trials; neither statistically significant) (**Figure 17**). However, the trial targeting a general adult population that reported subgroup analyses for younger adults did find larger effects for heavy use episodes, as well as for drinks per week; intervention participants reported a reduction of 2.0 more heavy use episodes per month (95% CI, -3.1 to -0.9) than control group participants after 1 year.[153] Among trials limited to young adults, both trials that reported the proportion exceeding recommended limits showed improvements over control; reductions in the odds of exceeding limits were 35 percent (95% CI, 46% to 92%)[195] and 26 percent (95% CI, 60% to 91%).[197] Pooled effects were not statistically significant for drinks per drinking day (WMD, -0.40 [95% CI, -0.90 to 0.10]; k=4; n=1,026; I^2=56%; data not shown).

Four trials in young adults were conducted in primary care settings,[160-162, 170] and three of these had positive results across multiple drinking outcomes after 6 months, but group differences were not maintained at 12 months.[160, 162, 170] The fourth trial showed statistically nonsignificant 10 to 20 percent reductions in risk across three alcohol use outcomes, assessed only at 6 months of followup.[161]

One trial each reported no between-group differences in self-reported drinking and driving[170] or in marijuana-related consequences.[201]

Health, Social, and Legal Outcomes (KQ4b)

Thirteen trials reported results for alcohol-related problems or consequences, and the pooled estimate showed a small but statistically significant standardized difference in favor of the intervention groups (standardized mean difference [Hedge's g], -0.06 [95% CI, -0.11 to -0.01]; I^2=0%) (**Figure 22**). This is a very small effect, with even the upper CI falling well below what would usually be considered a small effect size. The most commonly used instrument was the Rutgers Alcohol Problems Index (RAPI), a 23-item instrument asking how many times respondents had experienced the list of problems due to alcohol use, such as not being able to do homework or study for a test, getting into fights, neglecting responsibilities, and finding yourself in a place you could not remember getting to. It also includes some items specifically about alcohol use ("feel that you had a problem with alcohol," "want to stop drinking but can't"). Included trials used different versions, with response category values of 0–1, 0–3, and 0–4. Three trials also reported scales measuring academic effects, with one reporting greater improvements

in the intervention groups (negative binomial rate ratio [RR], 0.8; p<0.05 at 6 and 12 months of followup);[162] the other two did not find statistically significant group differences (negative binomial RR, 0.9; p=0.87[195] and median Academic Role Expectations and Alcohol Scale score, 4 [out of 35] in the control group vs. 2 in the intervention group; p=0.06,[161] both at 6 months of followup). Two other trials found no between-group differences in risk-taking behavior[170] or a composite health care utilization outcome that included inpatient, emergency department, urgent care, and detox services.[160]

Harms (KQ5)

Three trials reported no adverse effects in both groups.[197, 201, 225] Two trials had point estimates that favored the control group by less than one drink per week; however, these effects appeared consistent with true, underlying effect being scattered around a small beneficial effect on average, and individual study results falling a small distance on either side of the average effect.[189, 223] Thus, no pattern of paradoxical effects was identified that would indicate that these interventions could be harmful in young adults.

General Adult Populations

Study, Population, and Intervention Characteristics

We identified 29 trials (n=16,944) that targeted adults of all ages. Most trials in general adult populations were conducted in primary care settings (24/29 [83%]). Ten trials altogether were conducted in the United States; the remaining studies were conducted in Canada, Australia, and Europe. Three trials were rated as good quality,[153, 168, 234] and across all trials the median retention was 77 percent (range, 59% to 96%) at 6 to 24 months of followup. The average age was 44.7 years; 42 percent of participants were female. Among trials conducted in the United States, where race/ethnicity was most consistently reported, 76 percent of participants were white, 19 percent were black, and 17 percent were Hispanic; four included majority nonwhite samples.[169, 188, 218, 246] Five of the trials had a substantial proportion of participants who were socioeconomically disadvantaged (i.e., >50% of participants were uninsured or on Medicaid, on public assistance, unemployed, or had an annual income of <$15,000).[168, 169, 188, 218, 224] Almost half (18/38) of the interventions in these studies included personalized normative feedback, and three trials (with four intervention arms) also included personalized feedback about health effects related to their alcohol use.[174, 188, 209] Most of these interventions took place in person, and 63 percent (24/36) involved the participant's primary care team; the primary care clinician delivered most or all of the intervention in 34 percent (13/36) of the interventions. Eleven of these trials were included in the previous review.[149, 152, 153, 163, 165, 168, 169, 171, 172, 174, 175]

Alcohol Use and Other Risky Behaviors (KQ4a)

Drinks per week totals were reduced in general adult populations by an average of three drinks per week (WMD, -2.51 [95% CI, -3.81 to -1.21]; k=18; n=7,662; I^2=70%) (**Figure 14**). Five of the six trials that reported this outcome but could not be included in the meta-analysis did not show statistically significant differences,[152, 172, 185, 188, 218, 228] with effects across all six studies ranging from -1.3[152] to -3.1[172] greater reduction in drinks per week in the intervention group, to

2.3[185] fewer drinks per week at followup in the intervention group. Effects were generally consistent with respect to statistical significance across multiple intervention groups or attenuated with less intensive approaches,[149, 175, 186, 188, 209, 228, 234] although one trial did find larger effects at 12 months (but not 6 months) of followup with a single 10- to 15-minute advice session than with the more intensive arm that offered a 30- to 40-minute motivational enhancement intervention followed by two brief booster sessions.[163] Two trials reported outcomes for drinks per week beyond 12 months; one found that benefits dropped off at 24 months,[165] but the other study maintained a difference of 0.3 greater reduction in drinks per week in the intervention group than the control group through 48 months (from -0.4 drinks/week difference at 12 months of followup).[153]

The odds of exceeding recommended limits were reduced by 44 percent (OR, 0.56 [95% CI, 0.49 to 0.65]; k=11; n=4,964; I^2=14%) (**Figure 16**). Heavy use episodes were reduced by 35 percent (OR, 0.65 [95% CI, 0.53 to 0.81]; k=7; n=3,683; I^2=44%) (**Figure 17**). Three trials reported other behavioral outcomes: one reported lower self-reported drinking and driving (20% in the intervention group vs. 35% in the control group reported that in the previous month they had driven after more than two drinks) (OR, 0.46 [95% CI, 0.27 to 0.76]),[152] one found no between-group differences for having sex after drinking among patients attending a sexual health clinic (OR, 0.79 [95% CI, 0.33 to 1.75]),[185] and the third found no differences in the number of days participants had used drugs (mean difference in change, -4.5 [95% CI, -24 to 15]).[218]

A few trials in general adult populations reported effects of subgroup analyses. One trial reported no interactions with age, education, marital status, or employment status,[206] but only examined these interactions in males. Another trial reported a treatment benefit only in persons drinking above recommended limits but without an AUD or heavy use episodes in the previous month, while no clear benefit was found in those with AUD or heavy use episodes at baseline.[149]A third trial found no differences in treatment effect in older adults versus younger and middle-aged adults.[163]

Health, Social, and Legal Outcomes (KQ4b)

Five trials reported mortality outcomes, usually as part of a description of the participant flow, and none found an effect on mortality. This included the TrEAT trial, with 4 years of followup and well-reported ascertainment methods, which found that 0.8 and 1.8 percent of intervention and control participants had died, respectively.[153] As covered in the overall summary of results above, at 4 years of followup, this trial found reductions in days hospitalized (420 in the intervention vs. 664 in the control group) and controlled substance or liquor violations (two in the intervention vs. 11 in the control group), as well as statistically nonsignificant differences in emergency department visits (302 in intervention vs. 376 in control group) and motor vehicle crashes with nonfatal injuries (20 in intervention vs. 31 in control group). Aside from the TrEAT trial, six[188, 206, 208, 209, 218, 246] other trials reported various self-rating medical or physical health items or scales, and between-group differences favoring the intervention group were found in only one study, on the Medical subscale of the Addictions Severity Index (detailed data not reported).[188] The others reported small effects that did not consistently favor the intervention groups for these outcomes. Similarly, one trial reported quality-adjusted life-years,[219] five reported various mental health–related scale scores, and none found group differences at 6 to 12

months of followup.[188, 206, 208, 218, 246] Other outcomes that were reported (excluding the TrEAT trial) almost always showed no clinically or statistically important differences between groups, and included general consequences scales;[208, 218, 230, 240] legal,[188] employment,[188] and family/social scales;[171, 188] liver enzymes;[171, 188, 193, 206] blood pressure;[224] hospitalizations;[172] and accidents.[171]

Harms (KQ5)

One trial reported no adverse events in any arms of the trial.[149] Although no pattern of paradoxical effects was identified that would indicate that these interventions could be harmful in general adult populations, one trial did report that control group participants were more likely than intervention participants to be below the AUDIT cutoff of 8, indicating nonproblematic levels of alcohol use.[233] However, in this trial, the point estimates favored the intervention group for the related outcomes of exceeding recommended limits and heavy use episodes, suggesting no actual harm.

Older Adults

Study, Population, and Intervention Characteristics

Four trials focused on older adults (n=2,504), with minimum ages ranging from 55 to 65 years (average age, 68.5 years), all in primary care settings; three were conducted in the United States[157, 176, 183] and one in Great Britain.[230] Two trials were rated as good quality,[183, 230] and retention across all four trials ranged from 83 to 92 percent. Thirty percent of the participants were female, and there was minimal representation of racial/ethnic minority or low socioeconomic status patients. All of these interventions included multiple contacts, combining in-person and phone contacts. One used a stepped-care approach and had repeat visits only if participants hadn't changed their alcohol use at a 4-week followup call.[230] Two of these trials were included in the previous review.[157, 176]

Alcohol Use and Other Risky Behaviors (KQ4a)

Three of the trials in older adults[157, 176, 183] reported number of drinks per week at 12 months of followup, all showing greater reductions in the intervention groups (**Figure 13**). Differences in change between groups ranged from -2.2 (95% CI not reported; $p<0.01$)[183] (not included in the meta-analysis) to -5.3 (95% CI, -8.5 to -2.1),[157] from baseline use levels of 14 to 17 drinks per week. Beneficial effects were maintained through 24 months in one trial, at which point intervention group participants had reduced their drinking by an average of three more drinks per week than control group participants ($p<0.001$).[157] The same three trials also reported reductions in the proportion exceeding recommended drinking limits after 12 months, with ORs ranging from 0.33 (95% CI, 0.15 to 0.73)[157] to 0.75 (95% CI, 0.42 to 1.36) (**Figure 16**).[176] One trial also reported a greater reduction in the number of heavy use episodes per month at 12 months (mean difference in change, -3.1 [95% CI, -5.6 to -0.6]; $p<0.001$), but the effect deteriorated and was not maintained at 24 months.[157] Between-group differences in change were not seen for the AUDIT-C[230] or the CARET.[176] One trial reported that participants reduced the likelihood of using alcohol in the face of symptoms (OR, 0.60 [95% CI, 0.46 to 0.80]) or comorbidities (OR,

0.72 [95% CI, 0.53 to 0.96]) that could be exacerbated by alcohol, and with medication that could interact negatively with alcohol (OR, 0.66 [95% CI, 0.51 to 0.85]).[183] This trial did not find group differences in driving within 2 hours of having three or more drinks, which was reported by 11 and 16 percent (p=0.27) at 6 months in the intervention and control groups, respectively, and 14 and 17 percent at 12 months of followup (p=0.06).

Health, Social, and Legal Outcomes (KQ4b)

One trial reported a reduction in emergency department visits (OR, 0.56 [95% CI, 0.33 to 0.96]) and in depressive symptoms (mean difference at posttest, 0.14 on a 5-point scale; p<0.05).[183] Two trials found no statistically significant group differences in change on the SF-36 mental and physical component scores.[183, 230] Across both scales and two different time points for each study, between-group differences in change ranged from 0.4 (95% CI, -0.4 to 1.2), favoring the control group, to -1.2 (95% CI, -3.1 to 0.6), favoring the intervention group, with baseline scores ranging from 44 to 51 on a 100-point scale.

Harms (KQ5)

One trial reported no adverse events in either arm of the trial.[230] No pattern of paradoxical effects was identified that would indicate that these interventions could be harmful in general adult populations.

Pregnant and Postpartum Women

Study, Population, and Intervention Characteristics

We identified 11 fair-quality trials (n=2,278) that evaluated the effectiveness of interventions to reduce alcohol use among pregnant[181, 184, 191, 202, 203, 217, 221, 222, 235] and postpartum[158, 212] women. One trial was conducted in the Netherlands[222] and the other 10 were conducted in the United States. The trials targeting pregnant women took place in outpatient obstetric settings, usually at prenatal visits during the first[184, 203, 222] or second[181, 191, 202, 217, 221, 235] trimester. The trials in postpartum women recruited in the hospital postdelivery[212] and at a 6-week postnatal visit.[158] Median retention was 81 percent (range, 63% to 100%) after 1 to 12 months; most of the trials followed the women for 6 months or less. Among the studies in the United States, approximately half of participants were white, 31 percent were black, and 15 percent were Hispanic. Seven of these trials included a substantial number of socioeconomically disadvantaged women.[184, 202, 203, 212, 217, 221, 235] The interventions in these populations involved one to four sessions, which were generally described as "brief" or 10 to 20 minutes in length, for a total contact time ranging from an estimated 10[203] to 80[184] minutes. Six interventions[158, 184, 212, 217, 221, 235] used motivation techniques and another used the transtheoretical model framework, suggesting use of different motivational techniques for participants in different stages of change with regard to alcohol use.[222] Three interventions described the use of cognitive behavioral techniques.[158, 202, 203] Three of the interventions were delivered via computer or the Web, with minimal contact with study staff.[212, 222, 235] Two of these trials were included in the previous review.[158, 181]

Alcohol Use and Other Risky Behaviors (KQ4a)

The most commonly reported outcome in trials targeting pregnant women was abstinence from alcohol. The pooled odds of abstaining from using alcohol during pregnancy was nearly doubled in the intervention groups, compared with control groups (OR,1.92 [95% CI, 1.19 to 3.09]; k=5; n=796; I^2=9%) (**Figure 18**); however, the recall range was highly variable, ranging from 1 to 3 months. The percent of reported abstinence in the control groups ranged from 11 to 89 percent, while intervention groups ranged from 18 to 90 percent. However, the between-group difference in abstinence was statistically significant in only two of the five trials.[202, 203] Four trials[181, 184, 191, 221] reported number of drinks per drinking day, but none found differences, and in many cases the mean change values in the two groups were within 0.2 of each other, with some results favoring the control groups. Similarly, no statistically significant (or potentially clinically important) differences were detected on other drinking outcomes, such as drinks per week, drinking days per week, percent of days used alcohol, and AUDIT score.[191, 221, 235] In postpartum women, one trial (n=235) reported greater reduction in drinks per month (dropping from 34 to 20 drinks/month in the intervention group, compared with a change from 32 to 27 drinks/month in the control group) and heavy use episodes per month (dropping from 10 to 7 in the intervention group vs. 10 to 9 in the control group).[158] In the other trial in postpartum women (n=123), although mean scores consistently favored the intervention group, posttest scores did not differ statistically on number of drinking days in the previous 3 months (15 and 22 in the intervention group and control group, respectively), drinks per week (6.4 and 8.7), or heavy use episodes per week (0.56 and 0.75).[212]

Two trials of pregnant and postpartum women reported on subgroup effects. One trial in low-income pregnant women reported that treatment effects were larger in those who drank fewer than eight drinks per month (vs. ≥8 drinks/month), were African American, and were teenagers,[203] although they did not report whether they tested interaction terms. Another trial reported a greater treatment effect on birth length among those with higher (vs. lower) baseline alcohol consumption, but no such effect for birth weight and drinks per drinking day.[202]

Health, Social, and Legal Outcomes (KQ4b)

Two trials reported birth weight, finding the average to be 224 g larger in the intervention group of one trial[235] ($p<0.03$) but no between-group difference in the other trial.[181] Trials also reported no differences in gestational age (detailed results not reported),[235] head circumference (detailed results not reported),[235] fetal mortality (OR, 0.29 [95% CI, 0.03 to 2.62]),[202] or live birth weight of larger than 2,500 g and no admission to neonatal intensive care (OR, 3.30 [95% CI, 0.80 to 13.8]).[217] One trial[221] found no differences between groups on "basic psychological need satisfaction." Neither of the trials in postpartum women reported health, social, or legal outcomes.

Harms (KQ5)

One trial in pregnant women reported no adverse events in either arm of the trial.[217] No pattern of paradoxical effects was identified that would indicate these interventions could be harmful in pregnant or postpartum women.

Chapter 4. Discussion

Unhealthy alcohol use has substantial and wide-ranging negative effects at the individual, family, and societal level. A summary of our findings is presented in **Table 12**, including our assessment of the overall strength of evidence for each KQ.

Summary of Evidence

We found no direct evidence that screening programs 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 ("How many times in the past year have you had 5/4 [males/females] or more drinks in a day?") 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 to 0.73) using the recommended cutoff of 8 or higher, but specificity was high (0.89 to 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 (e.g., the AUDIT), as is currently done in some health care systems,[251-253] such as the Veterans Health Administration. If used as an initial screening test, data for the AUDIT from U.S.-based primary care settings suggest that lower cutoffs may be preferable (e.g., 3, 4, or 5) to provide a more optimal balance of sensitivity and specificity for detecting the full spectrum of unhealthy alcohol use. Given the low cost of followup 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, and may consider calibrating the optimal cutoff for their setting. Use of the USAUDIT and USAUDIT-C, designed to use the U.S. standard drink size and to return results consistent with NIAAA recommendations, may improve upon the performance of the standard AUDIT and AUDIT-C.[254] No studies on the USAUDIT or USAUDIT-C were published during our search window; however, a newly published study in college students confirms that the performance characteristics are at least comparable to the AUDIT and AUDIT-C for determining whether a person exceeds the NIAAA recommended drinking limits.[255]

For adolescents, limited data were available on accuracy of any screening instrument for detecting the full spectrum of unhealthy alcohol use (one study with 225 participants), but multiple studies demonstrated good accuracy of one- or two-item questions and the AUDIT for detecting AUD. Despite the adequate test accuracy, the low prevalence of unhealthy alcohol use among adolescents, older adults, and pregnant women will result in low positive predictive values, less than 50 percent for all scenarios we modeled in these populations (**Table 13**). Among nonpregnant adults, the prevalence of unhealthy alcohol use is higher, resulting in fewer false positives. For example, the positive predictive value in general adult populations is estimated at 74 percent for identifying persons with heavy use episodes, at a sensitivity of 0.80 and specificity of 0.90.

Our results indicated that among adults who were identified through screening, counseling interventions to reduce unhealthy alcohol use led to reductions in alcohol use (by an average of 1.6 drinks/week), and reduced both the odds of exceeding recommended drinking limits (by 40%) and heavy use episodes (by 33%) at 6 to 12 months of followup (**Table 12**). Based on these findings, among adults engaged in unhealthy alcohol use, and assuming a control rate of 33 percent drinking within recommended limits at followup (the median of our included trials), such interventions would result in an absolute increase of 14 percent more participants drinking within recommended limits, meaning seven adults would need to be treated to get one drinking within recommended limits (number needed to treat [NNT], 7.2 [95% CI, 6.2 to 11.5]). For context, NNT with high-intensity counseling interventions to prevent one case of a biologically-confirmed sexually transmitted infection ranges from 16 to 69, across three levels of baseline risk. In pregnant women, interventions doubled the odds that women remain abstinent from alcohol during pregnancy (NNT, 6.0 [95% CI, 4.3 to 12.5], assuming a baseline rate of 62% of women being abstinent from alcohol). Intervention effects are likely similar for men and women, and there was no evidence to suggest that different race/ethnicity or socioeconomic subpopulations had lower likelihood of benefit. Evidence in adolescents was limited to two trials, with mixed results.

Very limited data suggested that benefits from alcohol use interventions can be maintained over 2 to 4 years, including both in number of drinks per week and some health outcomes. However, several trials in younger adults found that beneficial effects appeared at 6 months, but were attenuated and no longer statistically significant at 12 months, suggesting that beneficial effects may deteriorate more quickly in younger adults.

While many trials reported health, social, legal, and related outcomes, no specific outcomes were widely reported. Eight trials reported mortality, finding that the interventions were associated with a 36 percent reduction in the odds of death (OR, 0.64 [95% CI, 0.34 to 1.19]), but results were not statistically significant. We found very limited information on harms of the included intervention, but the fact that most results favored the intervention groups across 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 the interventions to the participants, and generally reported positive to very positive ratings.[186, 212, 217, 223, 235]

Comparison With the 2012 USPSTF Review

The previous USPSTF review examined existing systematic reviews to address the question of screening test performance. 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 single-question screeners having reported sensitivity of 0.82 to 0.87 and specificity of 0.61 to 0.79. They further concluded that lower cut-points on the AUDIT than the standard 8 or higher may provide a more optimal balance of sensitivity and specificity in U.S.-based primary care. We examined original studies rather than existing systematic reviews, so our evidence base is more directly applicable to U.S. primary care, and at least 60 percent of the studies included in our review were published after the search windows of the previous review's evidence, so most of the included studies are new

since the previous review. The ranges of sensitivity and specificity estimated by the previous review for adults are solidly in the range of the sensitivity and specificity seen in our review in studies of adults. Among the newly included evidence is 10 studies in adolescents, who were not previously represented.

Among intervention trials included in our review, the pooled effect size was more than two drinks per week larger for trials that were included in the previous review[83] than for trials that were not included in the previous review (**Figure 15**). **Table 14** shows intervention trial results from the previous and current reviews side-by-side. While reductions in drinks per week were larger in the previous review, other drinking outcomes showed very similar results. One of the main differences between the two 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. Differences in the results for drinks per week between the two reviews were likely due to this and other factors, including differences in the distribution of population age and severity, and possibly also to small-study effects or secular trends in treatment response over time. Differences between reviews in drinks per week were less pronounced within the general and older adult trials. For example, the average relative reduction in drinks per week in general adult populations was 3.6 in the previous review and 2.5 in the current review. Our estimated absolute increase of 14 percent more participants drinking within recommended limits based on the assumption described in the previous paragraph (and NNT of 7.2) is also consistent with the 11 percent increase (NNT, 9) reported in the previous review. Also consistent with the previous review was our finding of a fairly large but statistically nonsignificant association between interventions and reduced all-cause mortality, with a 36 percent reduction in the odds of death in the current review (OR, 0.64 [95% CI, 0.34 to 1.19]), compared with a 48 percent reduction in the risk of death in the previous review (RR, 0.52 [95% CI, 0.22 to 1.22]).

Comparison With Other Reviews

We found only one systematic review of test performance of a relevant screening tool that was published after the previous review, which confirmed the efficiency of the English-language AUDIT, AUDIT-C, and other abbreviated versions of the AUDIT, as well as other language-adapted versions.[256] Other systematic reviews of interventions to reduce unhealthy alcohol use are largely consistent with our findings. For example, a series of systematic reviews of experimental and quasiexperimental studies in adolescents and young adults[257-259] found relatively small but statistically significant effects in young adults (e.g., an estimated 0.8 fewer drinking days per month) that weakened with longer-term followup. A separate review in young adults reported a similar standardized effect size, which translated to reducing drinks per week from 13.7 at baseline to 12.5 at followup (standardized mean difference between groups, -0.14 [95% CI, -0.21 to -0.07]).[260] Systematic reviews of electronic screening and brief interventions among trials targeting all ages also found effect sizes consistent with ours,[261, 262] such as a greater pooled reduction of 15 g of ethanol per week (WMD, -14.91 [95% CI, -25.56 to -4.26]) in intervention versus control groups after 6 to 11 months, and 7.5 g per week at 12 months (WMD, -7.46 [95% CI, -25.34 to 10.43]).[261] Using a conversion factor of 14 g of ethanol for one drink, this is similar to the effect found in young adults in our studies of just under one drink per week,

measured at 6 to 12 months. While this review included studies from a wide range of countries and settings, five of the eight trials in the meta-analysis of 6- to 11-month outcomes were trials in young adults that were included in our review. Approximately half of the trials in young adults in our review were electronically-based interventions. The other review of electronic interventions found a similar effect size of roughly one drink per week.[262] We did not find other recent systematic reviews of the benefits or harms of interventions in general adult populations.

Other Evidence Related to Benefits and Harms of Screening

Although no trials met our inclusion criteria for the KQs related to the benefits and harms of screening compared with no screening, we identified two trials that explored the population-level effect of alcohol screening programs. Control group participants were screened in both trials, so they did not meet the criterion for KQ1 of having an unscreened control group. These trials provided weak evidence for alcohol-use screening programs and suggest this could be a promising area for future research. Both trials screened for a number of risk factors for an outcome of interest (cancer[263] and alcohol-exposed pregnancy[264]), including unhealthy alcohol use. After screening, patients in the intervention groups were provided with counseling targeted to risk factors identified by the screening. In both trials, results were reported for the full study sample, not only those who screened positive for unhealthy alcohol use. A trial of American Indian/Alaska Native women found a statistically nonsignificant reduction in the proportion at high risk for an alcohol-exposed pregnancy at followup (reduced from 36.4% at baseline to 18.9% in the intervention group, and 33.6% to 22.1% in the control group; p=0.72; n=263).[264] The other trial, in Spanish primary care patients, found that after 18 months, the proportion meeting criteria for risky drinking fell from 10.1 to 4.9 percent in the intervention group, versus 10.0 to 8.3 percent in the control group (OR, 0.50 [95% CI, 0.35 to 0.72]; p<0.001; n=3,031). Neither study reported on harms. Another study of a screening and motivational interview intervention was excluded due to high attrition (46% lost to followup).[265] This study in young women (mean age, 18.2 years) presenting at youth health centers did not show group differences in alcohol use outcomes at 12-month followup, among those with high-risk alcohol use at baseline.

Contextual Information to Bound Intervention Effect Sizes Found in the Current Review

Based primarily on data in nonpregnant adults, we identified several factors that were associated with reduction in number of drinks per week, such as sample size, publication year, baseline alcohol use, target age of the population, setting, and possibly contact time among trials of general and older adults. We were unable to determine which factors were most likely to have causal associations with drinks per week since they tended to cluster together; older studies tended to have smaller sample sizes, target heavier drinkers, have been conducted in primary care, target general adult populations, and have larger effects. Given the relatively larger effects in primary care settings, even if the overall reduction of 1.8 drinks per week is an overestimate due to small-study effects or secular changes in treatment responsiveness, it is likely a reasonably conservative lower-bound estimate of the true, current effect in primary settings,

targeting the full spectrum of unhealthy alcohol use. Further, our results could also *underestimate* the true effect, since the assessment and minimal interventions may have contributed to reduced drinking in control groups. A systematic review concluded that answering questions about drinking in brief intervention trials seems to alter subsequent self-reported behavior, potentially generating bias (toward the null) by exposing nonintervention control groups to an integral component of the intervention.[266] Indeed, many included trials showed drinks per week declining over time in the control group as well as the intervention group, particularly between baseline and the first followup.

Our results for mortality (OR, 0.64 [95% CI, 0.34 to 1.19]) were consistent with the effect of reduced alcohol use on persons with AUD in a systematic review of 16 studies among individuals with AUD at baseline.[267] This review found that participants who reduced their drinking but did not attain abstinence had a 39 percent reduction in the odds of death compared with those who continued heavy drinking (OR, 0.61 [95% CI, 0.39 to 0.94]).[267] This supports the potential clinical importance of our mortality results, although caveats regarding potential reporting bias, lack of information about ascertainment, and imprecision in our evidence remain important.

The most commonly reported health outcome was alcohol-related problems or consequences. This outcome was frequently reported in young adults, typically using the RAPI. This may be an important outcome for young persons, as there is some evidence linking RAPI scores at age 18 years to diagnosis of AUD 7 years later.[268] This study of twins, who were concordant and discordant for both RAPI score at age 18 years and AUD at age 25 years, found a 10-fold increase in the odds of having a diagnosis per unit increase in the RAPI score at age 18 years. Several of our included studies reported between-group differences in change in the range of 0.4 to 1.5 units on the RAPI,[160, 198, 200, 205, 211] favoring the intervention group; however, the units varied across studies, hampering interpretation (i.e., some used the RAPI as a 23-point scale, others as a 69-point scale, and other variations). Also, two trials reported similar absolute changes, but favoring the control group.[170, 189]

A few of our trials reported on emergency and inpatient health care utilization,[153, 160, 172, 183] with mixed results and generally limited power. Among studies that were not included in our review, one uncontrolled implementation study suggests the potential for benefit with large-scale implementation.[269] This study of Medicaid patients at 33 clinics in Wisconsin found that screening and brief interventions for unhealthy alcohol use in these real-world settings reduced hospital days by 0.036 days per member per month (PMPM), although the effect on inpatient admissions (-0.001 admissions PMPM) and emergency department days (-0.004 days PMPM) were not statistically significant.[269]

Importance of Specific Intervention Components

Aside from a nearly statistically significant effect of single versus multiple contacts among general and older adults, we did not find intervention characteristics that were clearly associated with drinks per week, in-person versus Web-only contact, or use of motivational techniques, personalized normative feedback, or cognitive behavioral approaches, and other outcomes were

too sparely reported to support these exploratory analyses. We did not include comparative effectiveness studies, which may have helped illuminate the importance of components. However, other reviews and pooled analyses that have included comparative effectiveness studies found no association between effect size and a number of specific components or therapist behaviors, with the possible exception of self-monitoring.[270, 271] An integrative data analysis of individual-level data from 31 brief motivational interventions found that the largest effects were seen for interventions with the highest degree of personalization and breadth of coverage (operationalized as the number of different components addressed). Interestingly, however, when the interventions were minimally personalized, effects were larger when fewer components were addressed than when many components were covered, suggesting a simpler message had more effect when the intervention was not personalized.[272] Another study found that a stronger therapeutic alliance was associated with greater declines in drinking across multiple therapeutic approaches, which is likely more reflective of interventionist skill than specific change-promoting techniques.[273] One review of interventions in adolescents and young adults found that motivational interviewing and the use of decisional balance and goal-setting exercises were associated with larger effects in trials of interventions to reduce alcohol use, but this review included both universal and indicated prevention interventions, a wider range of settings, and did not require recruitment through screening, so applicability is somewhat limited.[258]

Implementation of Interventions to Reduce Unhealthy Alcohol Use

Several large-scale implementation studies have demonstrated that it is feasible to implement screening programs in real-world primary care systems. These studies have found that implementation of screening or SBIRT programs for unhealthy alcohol use substantially increased the odds that patients were screened for unhealthy alcohol use and received appropriate counseling.[274,275,276] Some studies have found that having support staff or embedded behavioral health practitioners conduct screening and interventions improves rates of these services over physician-based screening,[276-278] and that behavioral health practitioners provided fewer referrals to specialty care (instead providing the counseling themselves), likely because they had more time than pediatricians to address the patients' alcohol and substance use.[276] These findings are consistent with those of a recent review of implementation approaches, which concluded that implementation programs should ideally include a combination of patient-, clinician-, and organizational-oriented approaches and involve midlevel health professionals as well as physicians.[279]

A 12-week implementation study found that training and support plus financial reimbursement were associated with increases in screening for unhealthy alcohol use and brief interventions for those screening positive in 120 primary health care units across five European countries. Free access to a Web-based brief intervention tool without training and financial reimbursement did not increase screening or intervention delivery in this study.[280] This study further found that continuous provision of training and support, sufficient time to learn the intervention techniques, and time to tailor training to individual experienced barriers were rated as important by clinicians.[281]

In terms of intervention contact, many interventions in the trials included in this review were entirely consistent with published guidelines (**Table 3**), particularly those that were conducted in primary care settings and that involved direct contact with an interventionist. Several trials referred to an NIAAA guide[170, 190, 218] or the Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy (FRAMES) framework,[168, 206, 212, 219] which was explicitly incorporated into the WHO guide. The guides have not specifically incorporated the use of personalized *normative* feedback; however, it certainly fits under the recommendation to provide feedback on the patient's drinking level, universal to all of these guides.

Applicability

One strength of this evidence base is its relatively high applicability to U.S. primary care. Most of the included studies were conducted in primary care settings, in the United States, or both. Although some studies examining test performance had high-risk samples with higher than average rates of unhealthy alcohol use, the percent of unhealthy alcohol users generally ranged from the low 20s to low 30s in adults, which is consistent with the proportion of adults with heavy use episodes in the past month in the United States. The rates of AUD in the test performance studies in adults most commonly ranged from 9 to 11 percent, which is slightly, but not substantially, higher than the 6.0 percent nationwide rate of AUD. Among intervention trials, effect sizes in primary care–based studies and those conducted in the United States were generally comparable or larger than the full body of evidence, and most studies did not have highly restrictive inclusion criteria, suggesting the results of our pooled analyses are likely to hold up in primary care settings. In addition, a wide range of subpopulations were represented in the evidence, including studies targeting racial/ethnic minority patients, different age ranges, males and females, different geographic regions, pregnant and postpartum women, economically disadvantaged populations, veterans, and persons with medical comorbidities.

Limitations of Our Review

One potential limitation to our approach is that we did not include comparative effectiveness trials, which have the potential to identify important features or mechanisms of change. As discussed above, however, several other studies and reviews have not been able to identify key treatment components or mechanisms of change, even when examining comparative effectiveness studies.

We also did not include evidence regarding use of medication in treatment of AUD. While this is primarily relevant to treatment of more severe disorders rather than screen-detected samples, medication would likely be appropriate for some patients identified through screening.

Among adolescents, we did not include trials addressing prevention of unhealthy alcohol use. This was outside the scope of our review but may be an important body of literature to consider when developing recommendations for adolescents.

Also, our estimate of drinks per week has an extra level of uncertainty due to differences in the

size of a standard drink across studies. The most commonly reported definition of a standard drink was 10 g of ethanol/drink, but ranged from 8 to 14 g. We used 14 g as a conversion factor when studies reported grams rather than drinks, for comparability with studies conducted in the United States, which presumably used a conversion factor of 14. An ideal approach would have been to convert drinks per week to grams of ethanol/week; however, data were insufficient to do so. Since some countries do not have published standard drink sizes measured in grams/ethanol, we could not apply conversion factors based only on country in which the study took place.

Limitations of the Studies and Future Research Needs

We found no trials comparing screening programs with usual care (without universal screening). While these trials are difficult, and some kind of baseline assessment would be needed to understand baseline comparability between groups, it would nevertheless be useful to conduct a study with an unscreened comparison group to understand the population-level effect of screening in primary care settings.

We found no eligible studies that evaluated the versions of the AUDIT and AUDIT-C recently developed for the United States (USAUDIT and USAUDIT-C) that were published during our search window. The USAUDIT/USAUDIT-C is an adaptation of the AUDIT/AUDIT-C to the U.S. standard drink size that modifies the response categories for the quantity/frequency items to allow alignment with NIAAA recommendations. For example, the item asking about heavy use episodes was changed to be five/four or more drinks on one occasion for males/females, from six or more drinks in the original AUDIT/AUDIT-C. Indeed, one study has determined that the AUDIT-C miscategorized up to 21 percent of individuals in the United States due to the mismatch between the response categories and NIAAA-specific recommendations.[282] Although none of the included studies specifically assessed the USAUDIT relative to a reference standard, it is likely comparable to or better than the AUDIT and AUDIT-C relative to NIAAA-recommended limits. For example, women drinking one drink per day score positive on the original AUDIT-C but are still within NIAAA-recommended levels; these women would not screen positive on the USAUDIT-C. Indeed, in our review, studies assessing one- or two-item screeners that used five/four (males/females) drinks (as in the USAUDIT) tended to report better sensitivity than those using the six-drink standard (as in the original AUDIT), supporting its use in the U.S. population. In addition, one study in college students published after our search window found that the sensitivity was higher for the U.S. versions (AUDIT, 0.68; USAUDIT, 0.72; AUDIT-C, 0.75; USAUDIT-C, 0.87), although specificity was improved only for the full AUDIT/USAUDIT (AUDIT, 0.79; USAUDT, 0.84; AUDIT-C, 0.86; USAUDIT-C, 0.79).[255] CIs were not provided, so it is unclear if the differences were statistically significant, but these findings suggest that the USAUDIT/USAUDIT-C have at least comparable, and possibly better, test performance than the original version relative to NIAAA standards. Further test performance studies of the USAUDIT and USAUDIT-C are needed to confirm its accuracy in identifying unhealthy alcohol users.

Another limitation of the evidence on the accuracy of screening instruments is that studies sometimes used variations of the standard instruments and cut-points, and the gold standard was also heterogeneous across studies. The definition of "exceeding recommended limits" in studies

conducted outside the United States often differed from the U.S. definition of exceeding limits. This likely increased the variability in results. However, the fact that sensitivity and specificity were commonly above 0.70 across a wide range of variations supports the robustness of these tools, even with modifications.

One important limitation of the evidence on the benefits and harms of alcohol interventions is the lack of a consistently reported group of outcomes. The most commonly reported outcome was drinks per week, which was reported in only about two-thirds of the trials in adults. Other important outcomes were reported much less frequently. It would be beneficial for trials to routinely report outcomes with the greatest clinical meaning, such as the proportion of participants with alcohol use within recommended limits, the proportion with heavy use episodes, and health (including alcohol-related medical conditions), social, and legal outcomes. This includes reporting of health care utilization reflecting emergent or serious health effects (e.g., emergency department visits, inpatient stays), and patient-reported health outcomes such as alcohol-related problems or consequences would also be valuable. The TrEAT trial provides an excellent example of using multiple objective sources such as electronic medical records, government crime and transportation databases, as well as self-report.

It would also be useful for trials to plan a priori to report subgroup effects in important subpopulations, such as by age group, sex, race/ethnicity, and baseline severity. It is preferable to test interaction terms, although recognizing that these may be underpowered, reporting of subgroup effects could still be useful, even in the absence of statistically significant interactions.

We found only two trials of interventions to reduce alcohol use in adolescents, even though alcohol use in adolescents is relatively common. The one other trial we found (but excluded due to having only 3 months of followup) did not show positive results but was quite small (n=42), so results could have been limited more by power than by effect size.[283] In addition, we found one systematic review, which was not included in our evidence base, of experimental and quasiexperimental studies of brief alcohol interventions in any setting. This review identified 24 studies in adolescents.[258] It found an estimated reduction of 1.3 fewer drinking days per month and an 8-percentile improvement in alcohol-related problems with brief interventions, which is promising in this age group. Almost all of these interventions were conducted in school settings, so how these findings translate to primary care settings is not yet understood. More studies are needed in adolescents outside of school settings, particularly in primary care settings.

Although we found many trials targeting young adults, most of those involved only very brief interventions and had relatively small effects. Given the very high rates of unhealthy alcohol use in young adults, further development of interventions that could have a larger and more long-lasting effect is warranted, such as interventions with more and/or longer contacts and that involve interacting with a person rather than purely computer-based. Additionally, testing some of the computer-based interventions that showed the largest absolute effects in a health care setting would be useful, as these interventions would certainly be feasible for a health system to offer, and could have wide reach.

Data were also limited in older adults, with only four intervention trials. Given that NESARC data show increasing rates of unhealthy alcohol use in older adults and given that the largest

effects were seen in the oldest trial (published almost 20 years ago), ensuring that interventions continue to be effective in the current and future generations of older adults is important. In addition, the existing studies had limited racial/ethnic and socioeconomic diversity, so research including these important subpopulations is imperative.

Among general adult populations, areas for future research include more studies exploring features to facilitate dissemination and implementation would be useful. In addition, more studies exploring primary care–based treatment approaches in populations with comorbid medical and mental health conditions that are primary care–based would be useful.

One concern with this literature is the validity of self-report, given that it may be difficult to recall drinking amounts accurately and participants might find it uncomfortable to admit to high levels of alcohol use, particularly after participating in an intervention to reduce their use. Unfortunately, there is no good, widely available, objective measure of alcohol use, so studies necessarily rely on self-report. Some studies have suggested that accurate alcohol use can be collected through self-report, if done carefully,[284, 285] as it was with many of the included studies. Included trials typically described emphasizing the confidential nature of the data collection, and in many cases used mailed questionnaires or computer-based data collection instruments to minimize demand characteristics. Twelve trials[153, 157, 163, 165, 168, 172, 174, 175, 198, 203, 206, 209] had participants identify collateral informants who could confirm their alcohol use, which is thought to improve self-report accuracy. In addition, retrospective measures with shorter recall periods (e.g., 1 week, 1 month) tend to have better accuracy that longer recall periods (e.g., 1 year), and most recall periods were 1 to 3 months in the included trials.[286] Findings also suggest that retrospective recall leads to underestimates of drinking quantity,[287] particularly when heavy drinking is involved,[288] yet the included trials employed retrospective strategies. To compensate for this, many trials used the TLFB approach or similar calendar-based methods to estimate daily drinking,[289] which have better accuracy than general recall items. Most of these limitations would likely apply equally to intervention and control participants, thus limiting precision but not necessarily biasing results. We hypothesized that social desirability bias may be stronger in individuals who have participated in an alcohol reduction intervention but could not find studies that explored this. Careful assessment—such as use of TLFB methods—covering relatively short time periods, with blinded interviewers or neutral data collection methods such as computer-based or mailed questions and strenuous assurances of confidentiality, are important for future studies in this area.

Another important limitation to the body of evidence was the inability to tease out the contribution of several study characteristics to effect size heterogeneity because characteristics tended to clusters together. The field of alcohol research in nondependent users has moved toward lower-intensity interventions, which can be delivered to large numbers of persons more easily. Thus, newer trials generally enrolled more participants, had less restrictive inclusion criteria in terms of alcohol use severity, provided brief interventions, and frequently targeted college-age adults. Continued exploration of effects in primary care settings among adults of all ages, with subgroup analyses among different age groups, would be valuable for understanding the effect of these interventions in current primary care settings.

It would also be useful to see trials that evaluate the effectiveness of brief or electronically-based

interventions delivered through other existing public health infrastructure, such as already-existing Web sites or smoking cessation quit lines. For example, one trial in college students delivered a personalized, normative feedback intervention through Facebook and found reductions in drinking 3 months later.[290] More studies with longer followup utilizing such existing resources would explore the potential to leverage these mechanisms to deliver alcohol use interventions more broadly.

Ongoing studies are reported in **Appendix J**.

Conclusion

We found no direct evidence on the effect of screening programs for unhealthy alcohol use. Among adults, screening instruments are available that can accurately identify unhealthy alcohol users that are feasible for use in primary care settings, and interventions in persons who screen positive are associated with reductions in unhealthy alcohol use. Very limited evidence suggests a possible beneficial effect on hospitalizations and substance use violations, but the effect on all-cause mortality is uncertain, and other health outcomes showed no clear benefit. There is no evidence to suggest that these interventions have unintended harmful effects. More evidence is needed to determine whether screening for unhealthy alcohol use is beneficial for adolescents.

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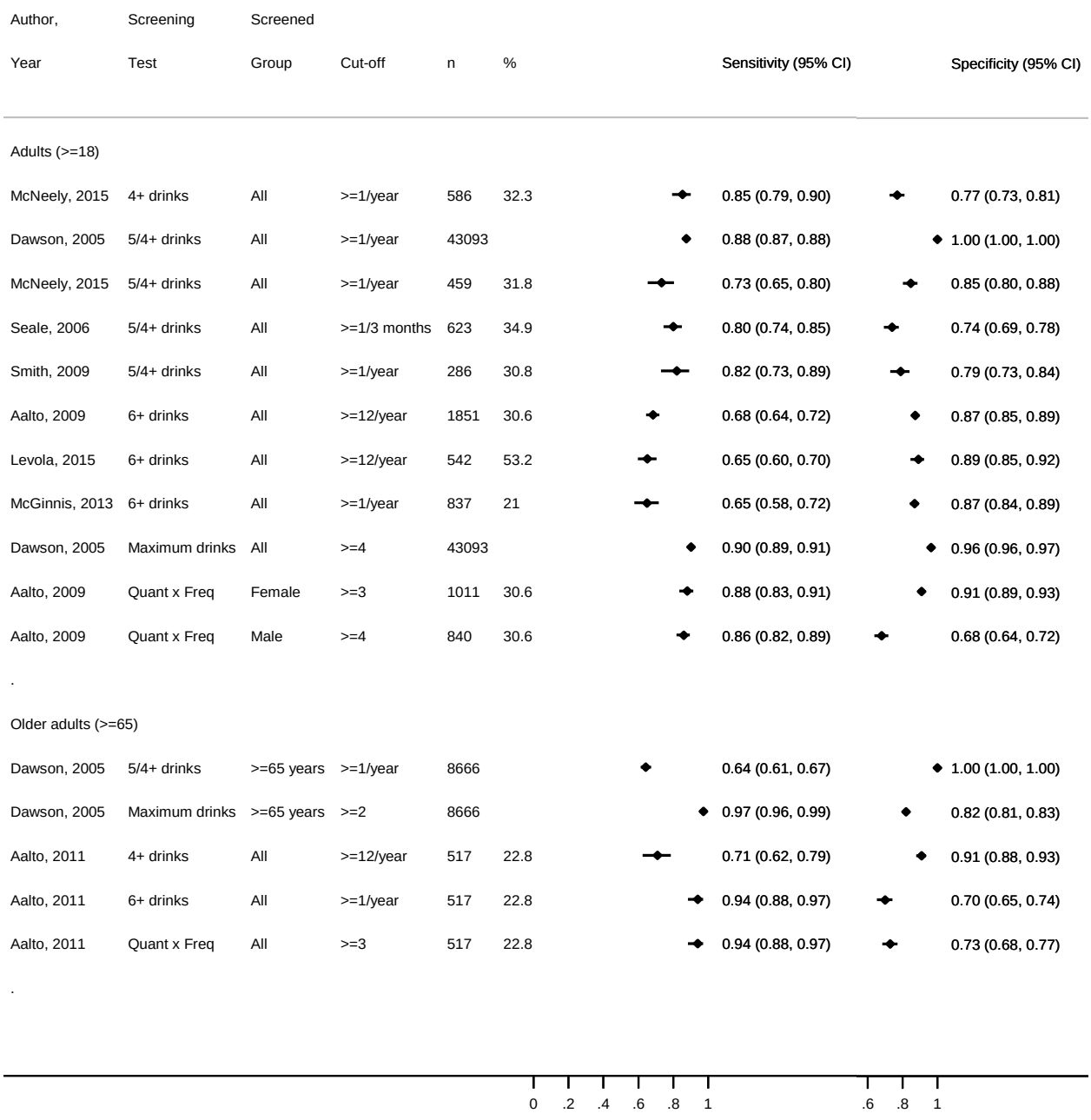
Figure 1. Test Accuracy of One- or Two-Item Screening Tests at the Optimal* Cutoff to Detect Unhealthy Alcohol Use (KQ2)

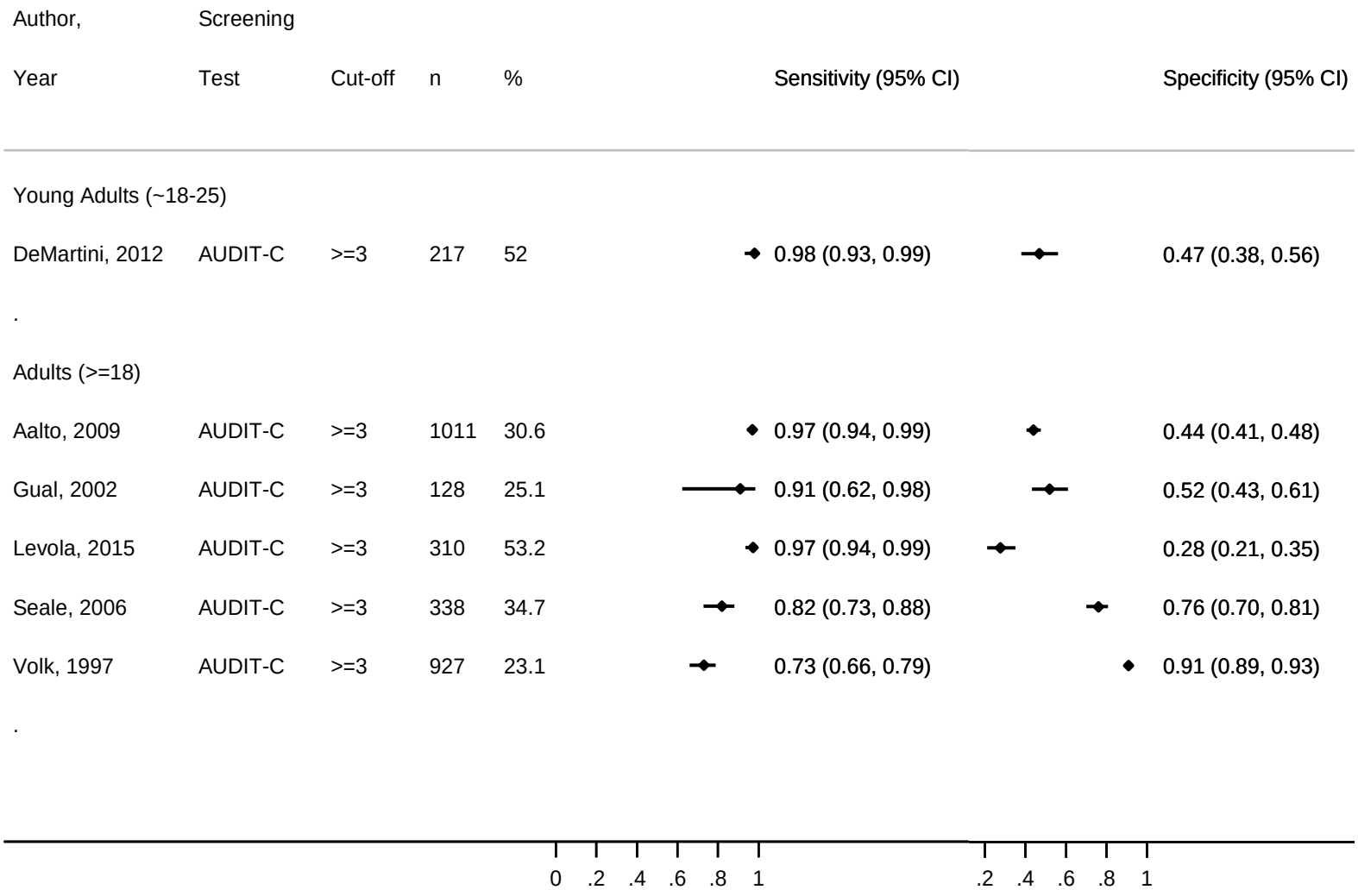


* Optimal cutoffs could vary by study and were selected as either the optimal cutoff determined by the authors or the reviewers.

Abbreviations: CI = confidence interval; freq = frequency; KQ = key question; n = number of participants; quant = quantity.

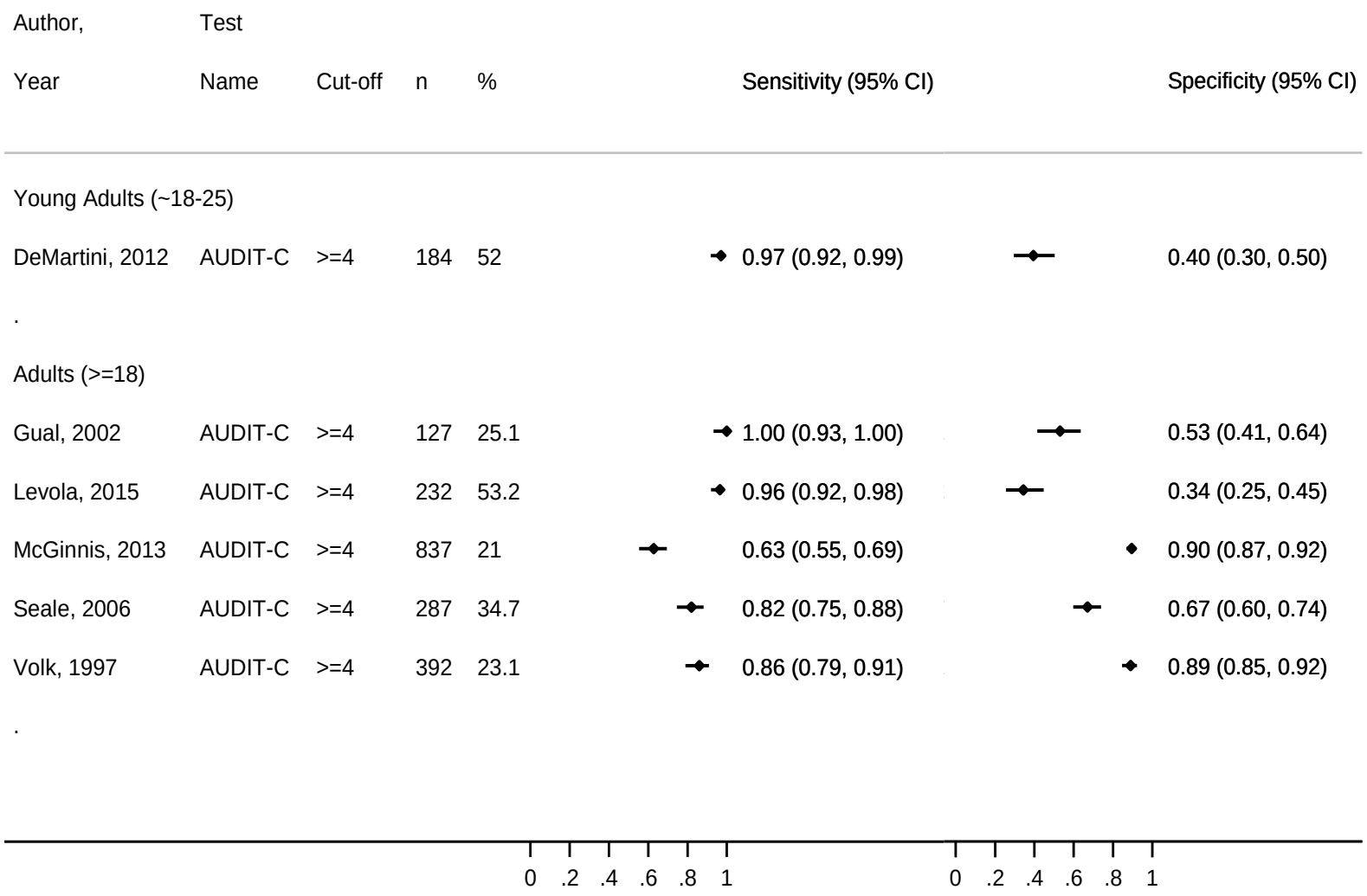
Note: McGinnis is an all male study. 4+ drinks includes modified AUDIT-3 (lower threshold for females and older adults) and SUBS. 6+ drinks includes AUDIT-3. Quant x Freq includes the first two items from the AUDIT; the score can range from 0 to 8.

Figure 2. Test Accuracy of the AUDIT-C at Cutoff of ≥3 to Detect Unhealthy Alcohol Use Among Females (KQ2)



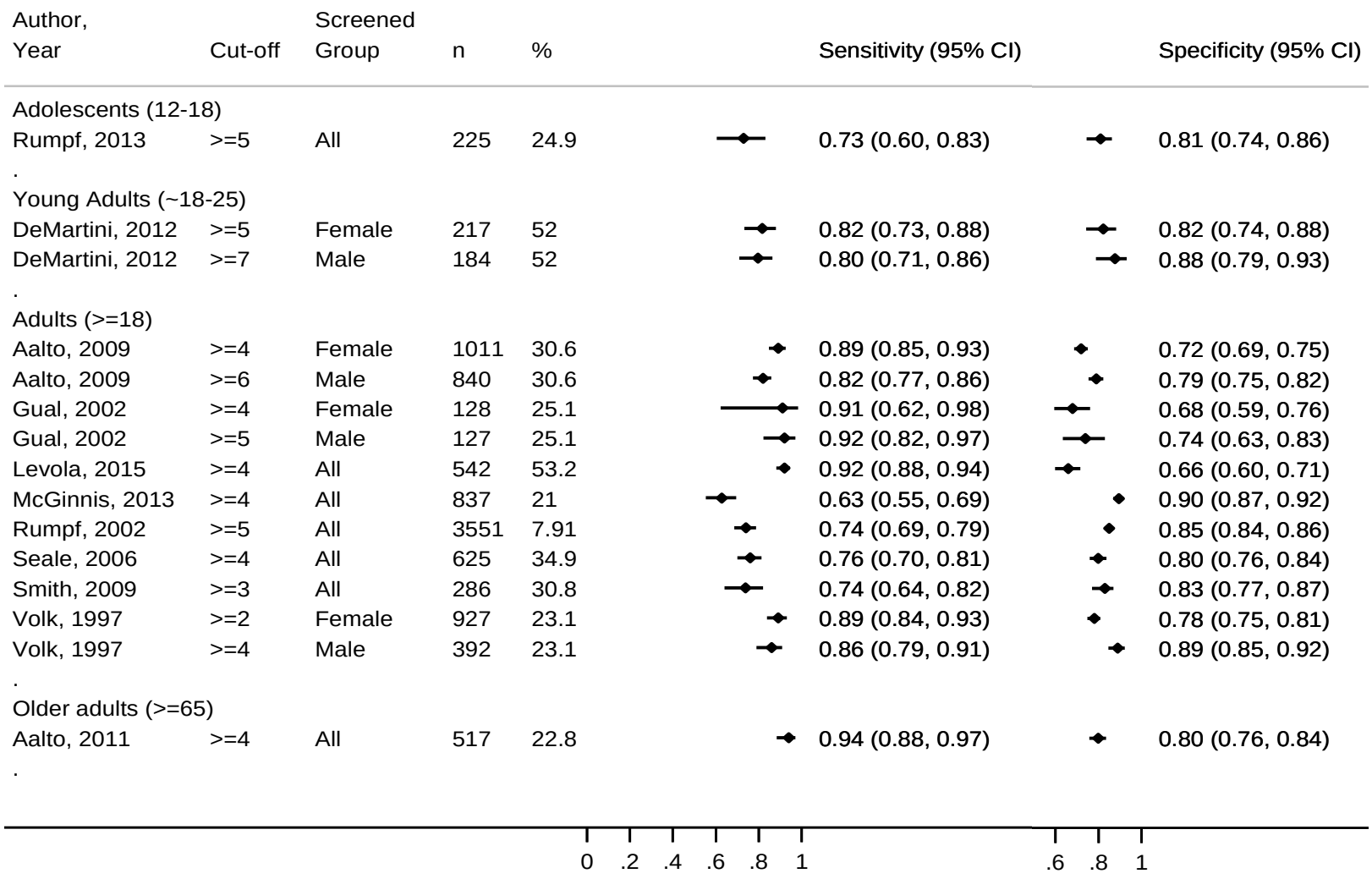
Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Figure 3. Test Accuracy of the AUDIT-C at Cutoff of ≥4 to Detect Unhealthy Alcohol Use Among Males (KQ2)



Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

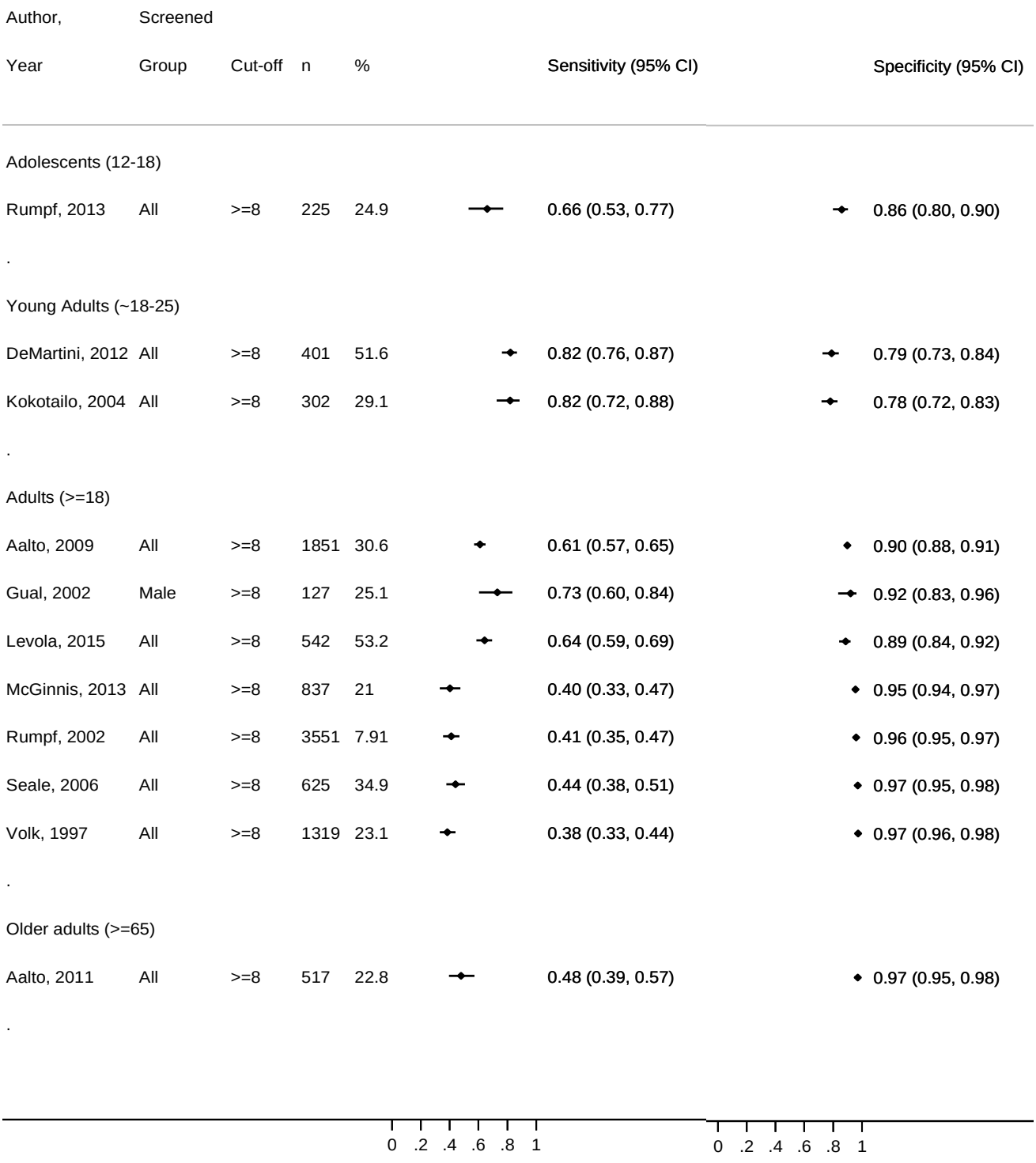
Figure 4. Test Accuracy of the AUDIT-C at the Optimal* Cutoff to Detect Unhealthy Alcohol Use (KQ2)



* Optimal cutoffs could vary by study and were selected as either the optimal cutoff determined by the authors or the reviewers.

Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

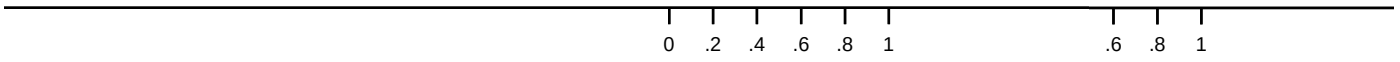
Figure 5. Test Accuracy of the AUDIT at Cutoff of ≥8 to Detect Unhealthy Alcohol Use Among Adolescents, Young Adults, Adults, and Older Adults (KQ2)



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Figure 6. Test Accuracy of the AUDIT at the Optimal* Cutoff to Detect Unhealthy Alcohol Use (KQ2)

Author, Year	Screened Group	Cut-off	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Adolescents (12-18)						
Rumpf, 2013	All	>=6	225	24.9	0.79 (0.66, 0.87)	0.79 (0.73, 0.85)
.						
Young Adults (~18-25)						
DeMartini, 2012	All	>=8	401	51.6	0.82 (0.76, 0.87)	0.79 (0.73, 0.84)
Kokotailo, 2004	All	>=7	302	29.1	0.88 (0.79, 0.93)	0.70 (0.64, 0.76)
.						
Adults (>=18)						
Aalto, 2009	Female	>=5	1011	30.6	0.79 (0.74, 0.84)	0.82 (0.79, 0.85)
Aalto, 2009	Male	>=7	840	30.6	0.85 (0.81, 0.89)	0.75 (0.71, 0.79)
Gual, 2002	Female	>=5	128	25.1	0.73 (0.43, 0.90)	0.96 (0.90, 0.98)
Gual, 2002	Male	>=7	127	25.1	0.87 (0.75, 0.93)	0.81 (0.71, 0.88)
Levola, 2015	Female w/ mild or mod depression	>=5	310	53.2	0.81 (0.74, 0.86)	0.75 (0.68, 0.81)
Levola, 2015	Male w/ mild depression	>=8	163	53.2	0.84 (0.76, 0.90)	0.78 (0.63, 0.82)
Levola, 2015	Male w/ moderate depression	>=9	69	53.2	0.90 (0.78, 0.96)	0.85 (0.68, 0.94)
McGinnis, 2013	All	>=4	837	21	0.71 (0.64, 0.77)	0.83 (0.80, 0.86)
Piccinelli, 1997	All	>=5	482	17.5	0.84 (0.75, 0.91)	0.90 (0.87, 0.93)
Rumpf, 2002	All	>=5	3551	7.91	0.78 (0.73, 0.82)	0.81 (0.80, 0.82)
Seale, 2006	All	>=4	625	34.9	0.84 (0.78, 0.88)	0.77 (0.73, 0.81)
Volk, 1997	Female	>=3	927	23.1	0.79 (0.73, 0.84)	0.87 (0.84, 0.89)
Volk, 1997	Male	>=4	392	23.1	0.91 (0.84, 0.95)	0.80 (0.75, 0.84)
.						
Older adults (>=65)						
Aalto, 2011	All	>=5	517	22.8	0.86 (0.78, 0.91)	0.87 (0.83, 0.90)
.						

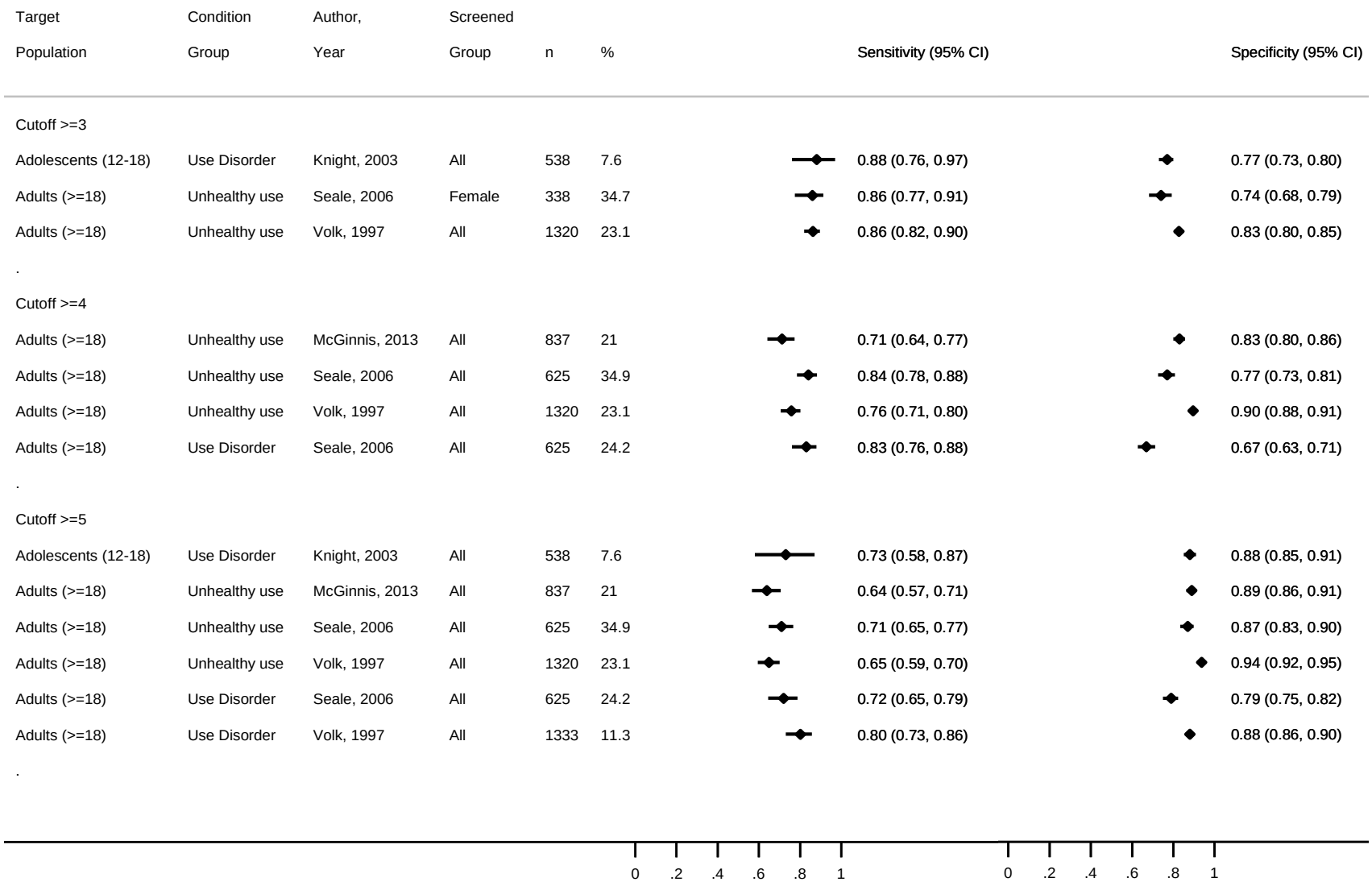


* Optimal cutoffs could vary by study and were selected as either the optimal cutoff determined by the authors or the reviewers.

Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Note: Degernhardt et al[108] did not provide confidence intervals and is not in the figure (adult males, cutoff ≥11: sensitivity, 0.784; specificity, 0.755; adult females, cutoff ≥9: sensitivity, 0.681; specificity, 0.864).

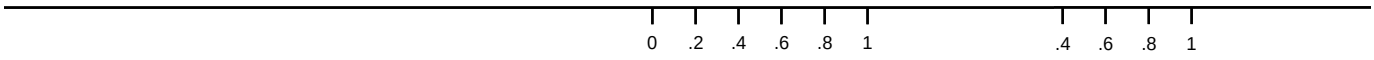
Figure 7. Test Accuracy of the AUDIT to Detect the Full Spectrum of Unhealthy Alcohol Use or Alcohol Use Disorder, at Cutoffs of ≥3, 4, or 5, in U.S.-Based Primary Care (KQ2)



Abbreviations: AUDIT= Alcohol Use Disorders Identification Test; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Figure 8. Test Accuracy of One- or Two-Item Screening Tests* at the Optimal Cutoff to Detect Alcohol Use Disorder (KQ2)

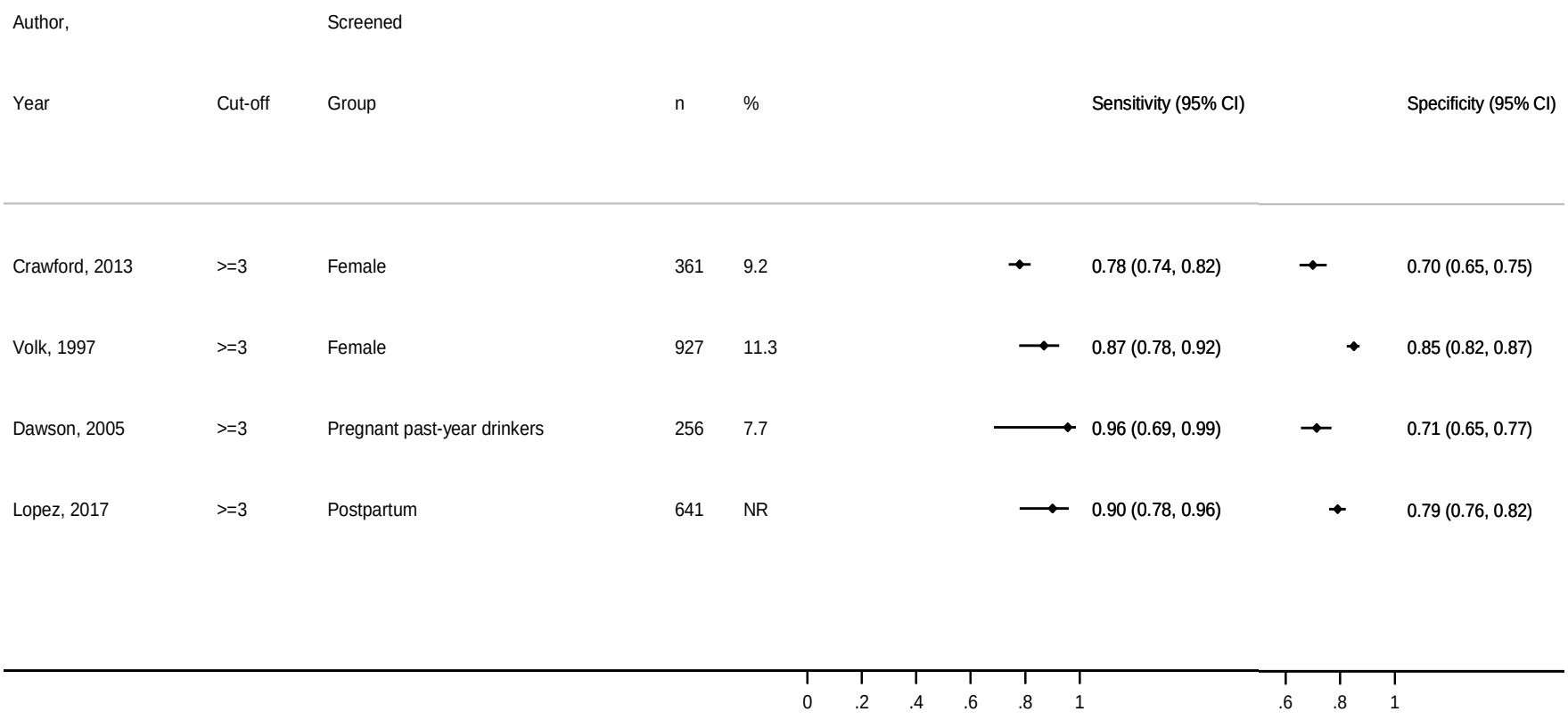
Author, Year	Screening Test	Cut-off	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Adolescents (12-18)						
Clark, 2016	Frequency	>=3 days	942	6.5	0.91 (0.80, 0.96)	0.92 (0.90, 0.94)
Harris, 2016	Frequency	>=Monthly	136	2.9	1.00 (0.51, 1.00)	0.95 (0.89, 0.97)
D'Amico, 2016	NIAAA Youth Screen	Mod/high risk	1573	3.9	0.87 (0.76, 0.94)	0.84 (0.82, 0.86)
Kelly, 2014	NIAAA Youth Screen	>=2 days	525	4.6	0.96 (0.83, 1.00)	0.85 (0.82, 0.88)
Levy, 2016	NIAAA Youth Screen	>=13	388	2.1	1.00 (0.68, 1.00)	0.94 (0.92, 0.97)
Clark, 2016	Quant x Freq	>=3 drinks/year	942	6.5	1.00 (0.93, 1.00)	0.91 (0.89, 0.92)
Clark, 2016	Quantity	>=2 drinks	942	6.5	0.94 (0.85, 0.98)	0.93 (0.92, 0.95)
.						
Young Adults (~18-25)						
Clark, 2016	Frequency	>=12 days	251	6.5	0.88 (0.70, 0.96)	0.80 (0.74, 0.85)
Clark, 2016	Quant x Freq	>=12 drinks per year	251	6.5	0.92 (0.75, 0.98)	0.75 (0.69, 0.80)
Clark, 2016	Quantity	>=3 drinks	251	6.5	0.81 (0.61, 0.91)	0.76 (0.70, 0.81)
.						
Adults (>=18)						
McNeely, 2015	4+ drinks	>=1/year	586	13.1	0.94 (0.86, 0.98)	0.65 (0.60, 0.69)
Bartoli, 2016	5/4+ drinks	>=1	242	15.3	0.92 (0.78, 0.98)	0.91 (0.87, 0.95)
Dawson, 2005	5/4+ drinks	>=1/year	43093		0.87 (0.86, 0.88)	0.82 (0.82, 0.82)
McNeely, 2015	5/4+ drinks	>=1/year	459	13.1	0.87 (0.75, 0.94)	0.74 (0.70, 0.78)
McNeely, 2016	5/4+ drinks	>=12/year	2000	14.0	0.71 (0.65, 0.76)	0.85 (0.83, 0.87)
Seale, 2006	5/4+ drinks	>=1/3 months	623	24.2	0.77 (0.69, 0.83)	0.60 (0.55, 0.64)
Smith, 2009	5/4+ drinks	>=1/year	286	11.5	0.88 (0.73, 0.95)	0.67 (0.61, 0.72)
Dawson, 2005	Maximum drinks	>=4	43093	7.7	0.90 (0.89, 0.91)	0.79 (0.78, 0.79)
Buchsbaum, 1995	Quantity	6-11 drinks/wk	155	31	0.73 (0.59, 0.83)	0.74 (0.65, 0.81)
.						



* 4+ drinks includes SUBS. 5/4+ drinks includes TAPS-1.

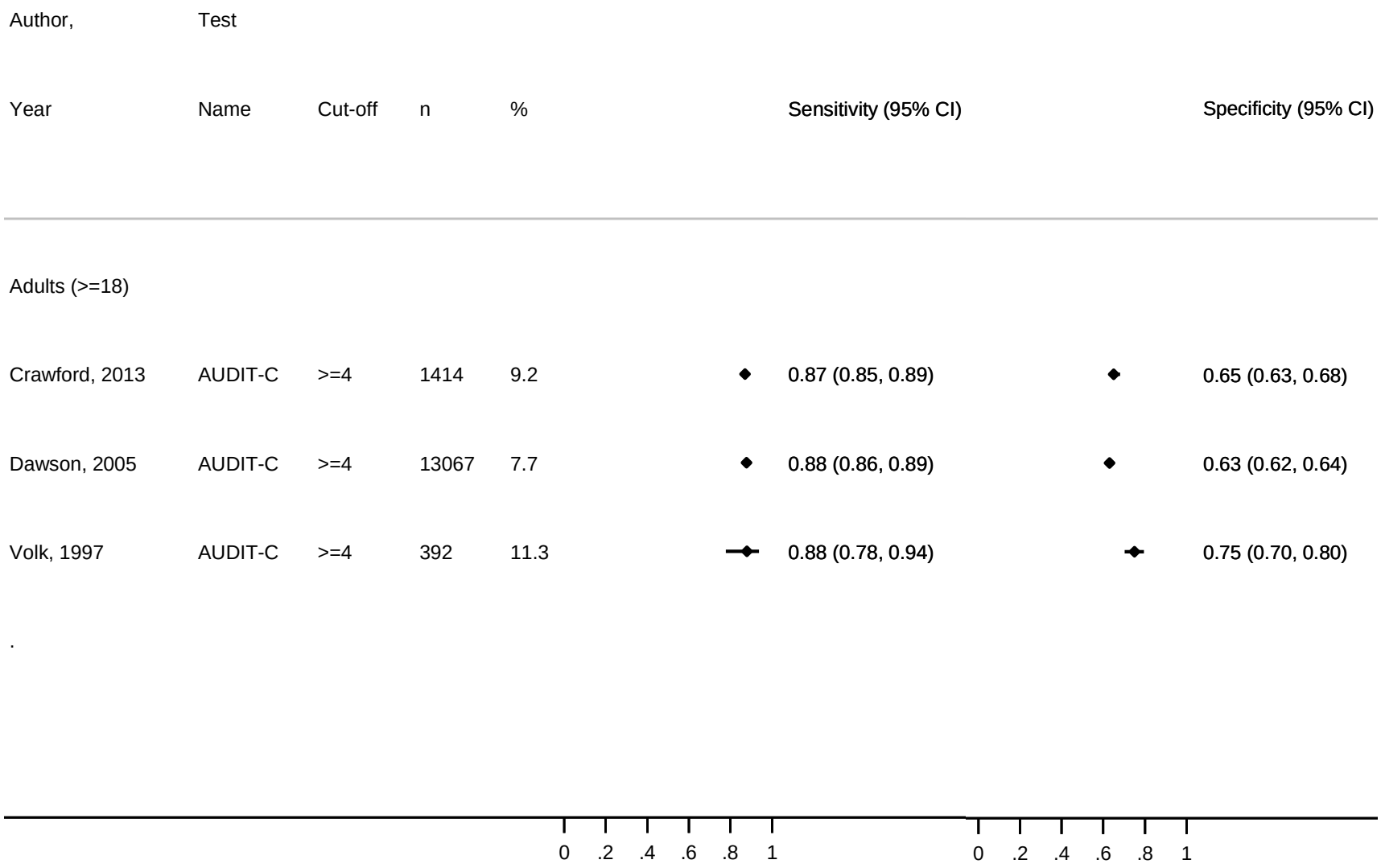
Abbreviations: CI = confidence interval; KQ = key question; mod = moderate; n = number of participants analyzed; NIAAA = National Institute on Alcohol Abuse and Alcoholism; wk = week.

Figure 9. Test Accuracy of the AUDIT-C at Cutoff of ≥3 to Detect Alcohol Use Disorder Among Females (KQ2)



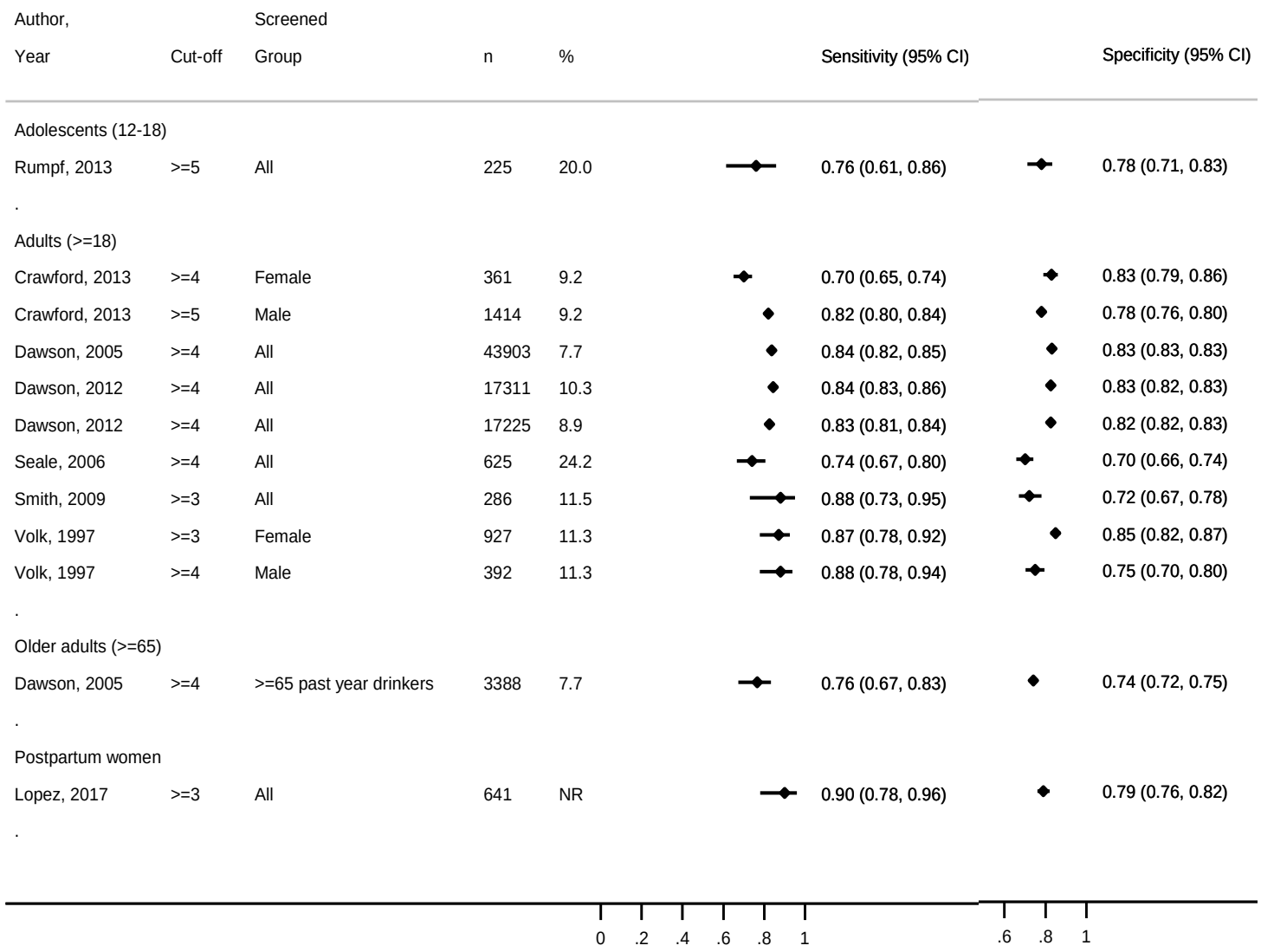
Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Figure 10. Test Accuracy of the AUDIT-C at Cutoff of ≥4 to Detect Alcohol Use Disorder Among Males (KQ2)



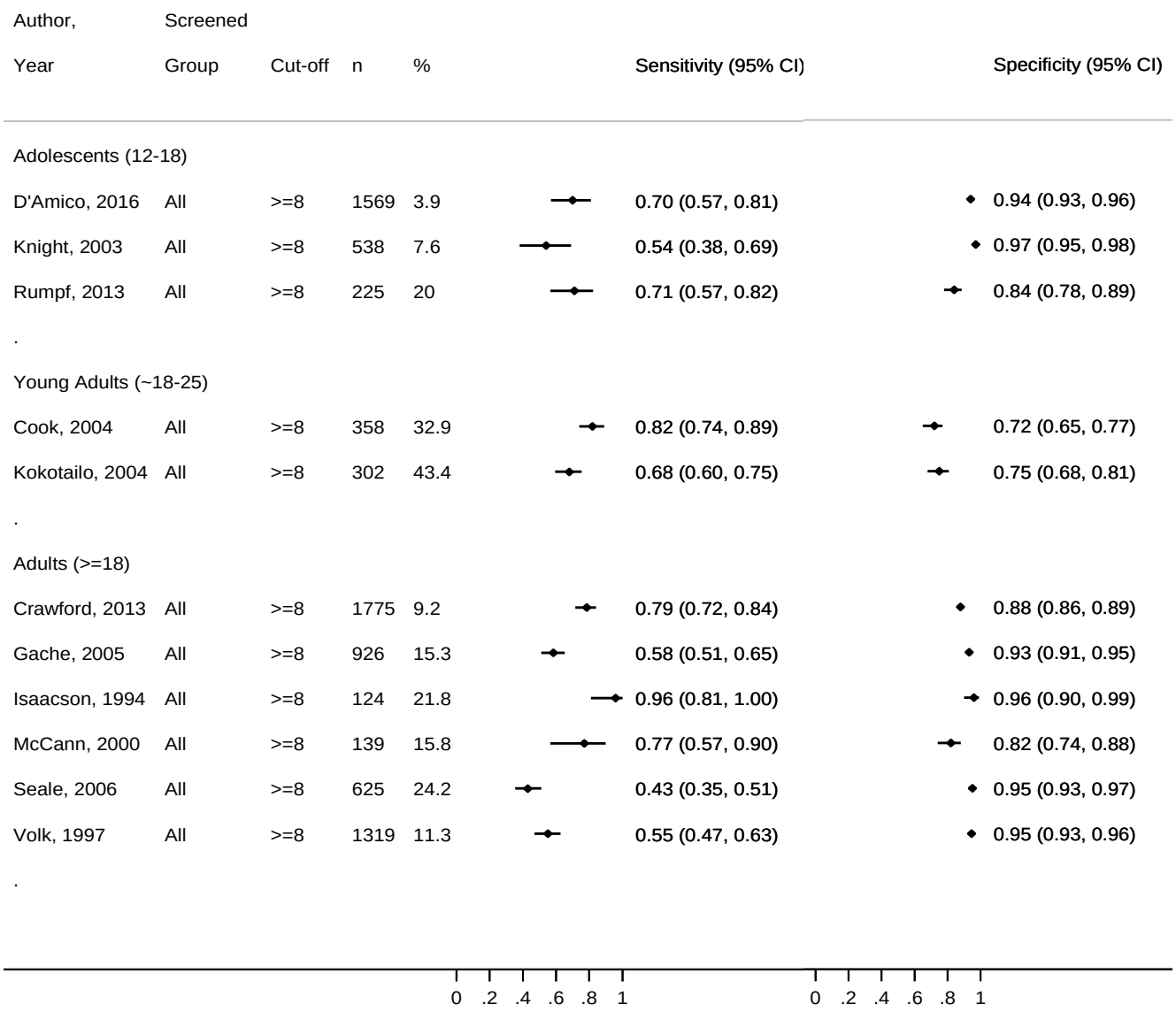
Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

Figure 11. Test Accuracy of the AUDIT-C at the Optimal Cutoff to Detect Alcohol Use Disorder (KQ2)



Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

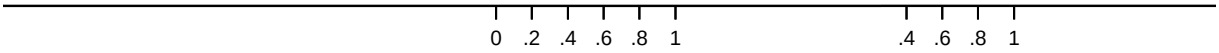
Figure 12. Test Accuracy of the AUDIT at Cutoff of ≥8 to Detect Alcohol Use Disorder (KQ2)



Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; KQ = key question; n = number of participants analyzed.

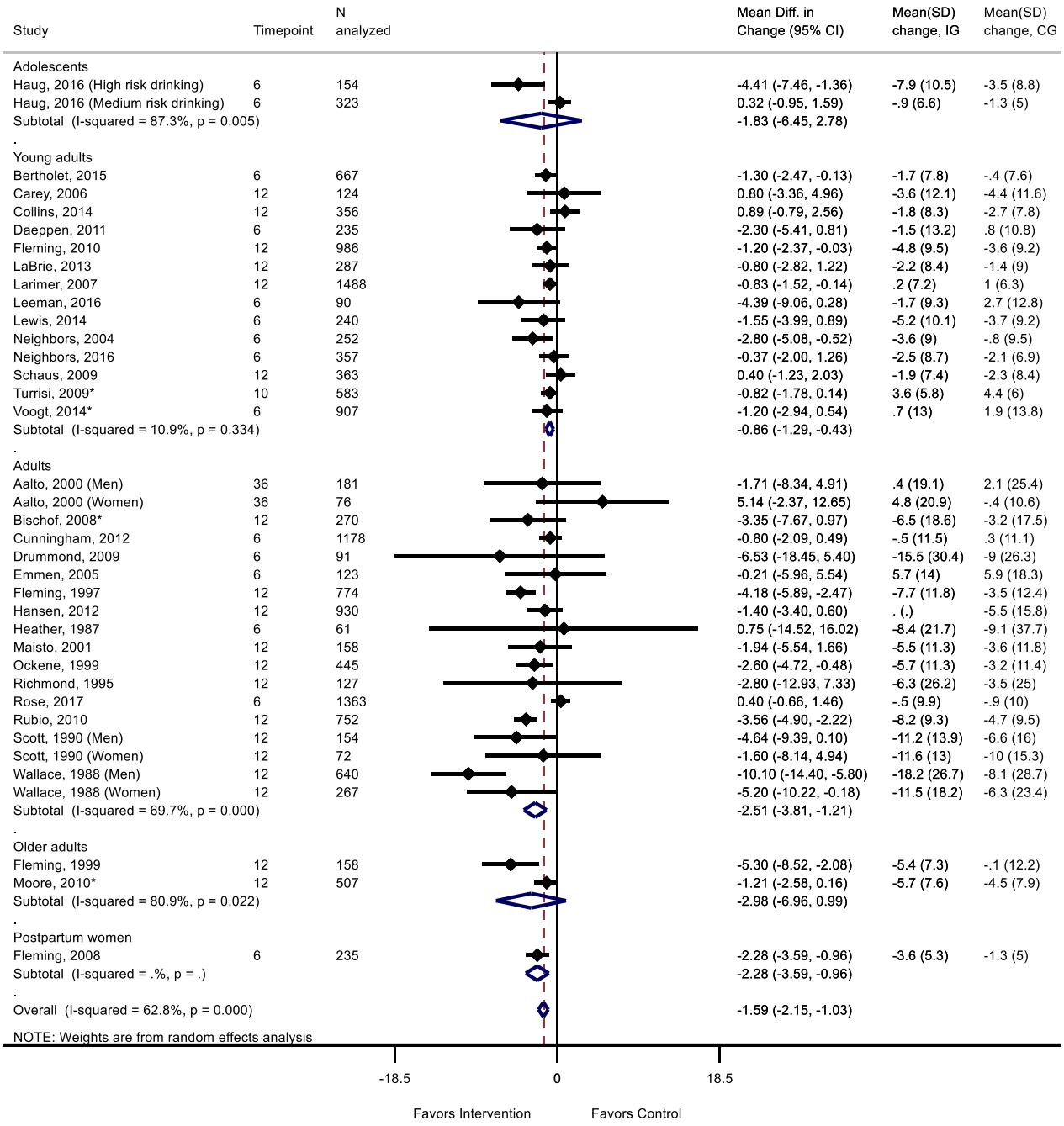
Figure 13. Test Accuracy of the AUDIT at the Optimal Cutoff to Detect Alcohol Use Disorder (KQ2)

Author, Year	Screened Group	Cut-off	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Adolescents (12-18)						
Knight, 2003	All	>=3	538	7.6	0.88 (0.76, 0.97)	0.77 (0.73, 0.80)
Rumpf, 2013	All	>=6	225	20.0	0.84 (0.71, 0.92)	0.77 (0.71, 0.83)
.						
Young Adults (~18-25)						
Aertgeerts, 2000	All	>=6	3564	14.1	0.80 (0.77, 0.83)	0.78 (0.76, 0.79)
Cook, 2004	All	>=8	358	32.9	0.82 (0.74, 0.89)	0.72 (0.65, 0.77)
Kokotailo, 2004	All	>=7	302	43.4	0.73 (0.65, 0.80)	0.67 (0.60, 0.74)
.						
Adults (>=18)						
Crawford, 2013	Female	>=6	361	9.2	0.78 (0.74, 0.82)	0.91 (0.88, 0.94)
Crawford, 2013	Male	>=7	1414	9.2	0.86 (0.84, 0.88)	0.82 (0.80, 0.84)
Degenhardt, 2001	All	>=7	370	27.6	0.87 (0.79, 0.92)	0.34 (0.28, 0.39)
Foxcroft, 2015	Male	>=10	138	43.8	0.48 (0.35, 0.60)	0.78 (0.67, 0.87)
Foxcroft, 2015	Female	>=6	282	43.8	0.63 (0.53, 0.72)	0.74 (0.67, 0.80)
Gache, 2005	Female	>=5	480	15.3	0.78 (0.71, 0.84)	0.88 (0.84, 0.91)
Gache, 2005	Male	>=6	480	15.3	0.77 (0.70, 0.83)	0.83 (0.79, 0.87)
Isaacson, 1994	All	>=8	124	21.8	0.96 (0.81, 1.00)	0.96 (0.90, 0.99)
McCann, 2000	All	>=6	139	15.8	0.82 (0.61, 0.93)	0.78 (0.69, 0.84)
Seale, 2006	All	>=5	625	24.2	0.72 (0.65, 0.79)	0.79 (0.75, 0.82)
Volk, 1997	All	>=5	1333	11.3	0.80 (0.73, 0.86)	0.88 (0.86, 0.90)
.						
Postpartum women						
Lopez, 2017	All	>=4	641	NR	0.87 (0.74, 0.94)	0.86 (0.83, 0.89)
.						



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; KQ = key question; n = number of participants analyzed.

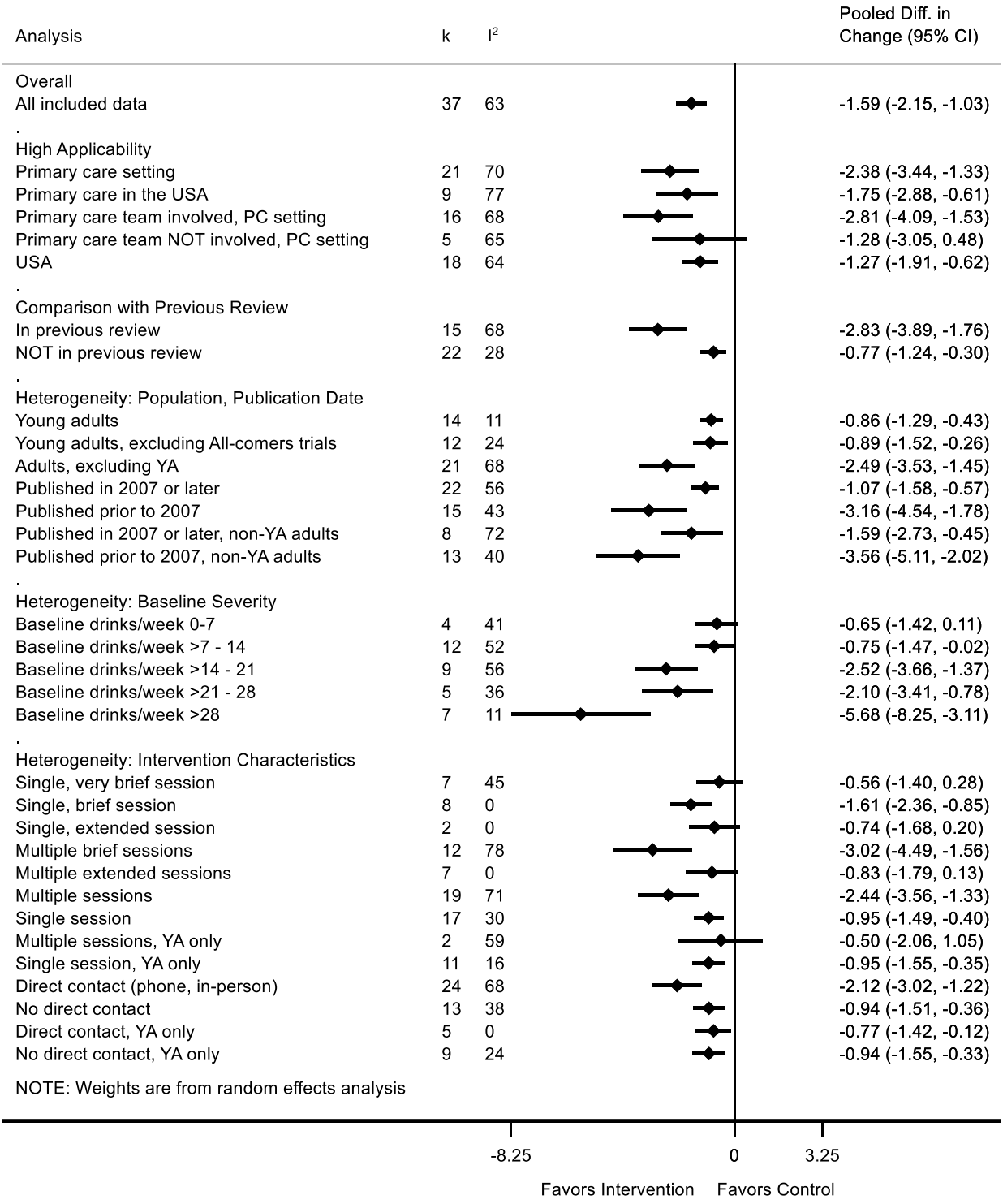
Figure 14. Forest Plot of Drinks per Week (KQ4a), Mean Difference in Change Between Alcohol Counseling Intervention Groups and Control Groups, by Population



Abbreviations: CI = confidence interval; Diff. = difference; SD = standard deviation; IG = intervention group; CG=control group.

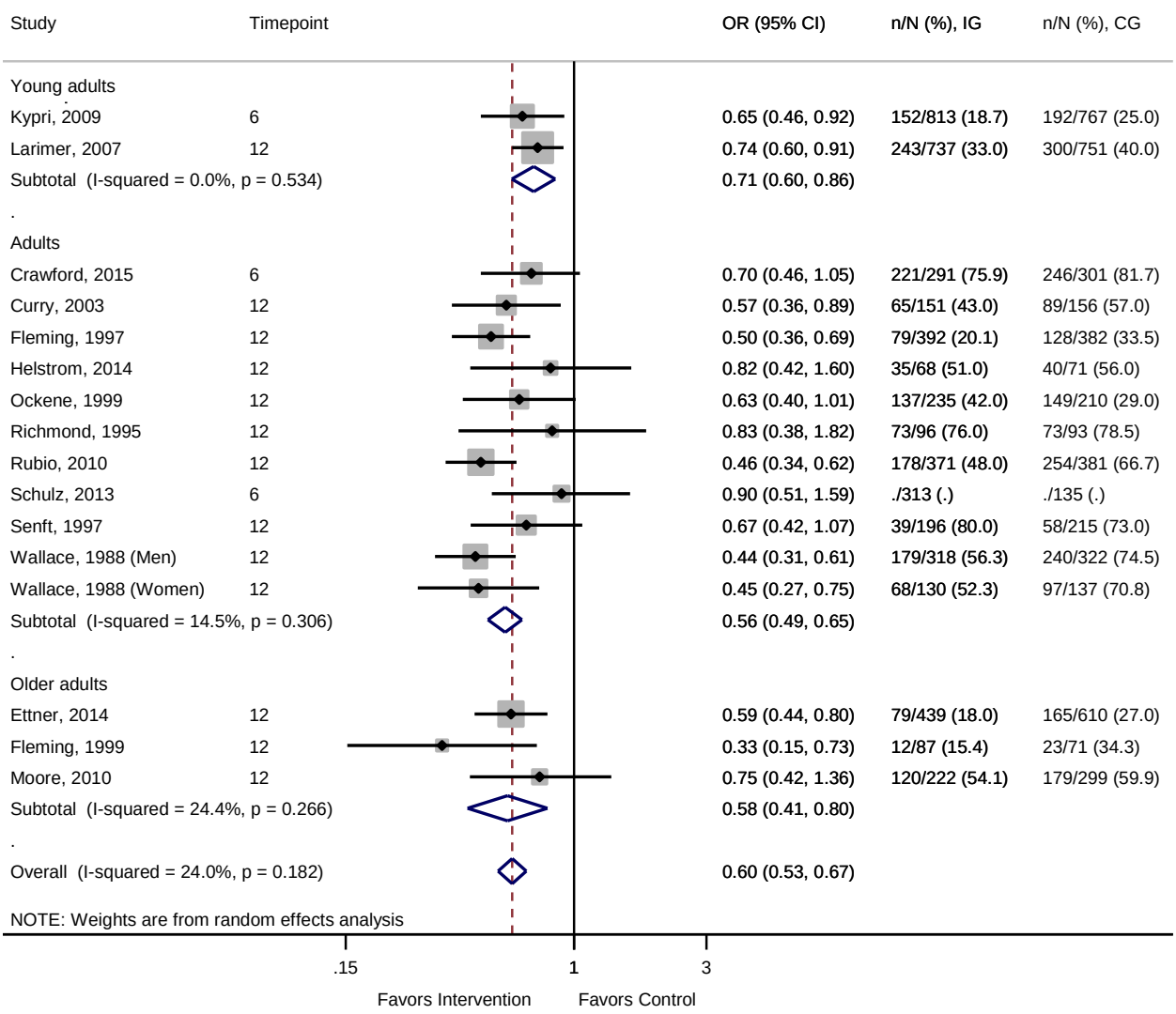
Note: Timepoint is measured in months.

Figure 15. Forest Plot of Subgroup and Sensitivity Analysis Results for Drinks per Week (KQ4a), Mean Difference in Change Between Alcohol Counseling Intervention Groups and Control Groups, by the Indicated Subgroup of Trials



Abbreviations: CI = confidence interval; Diff. = difference; k = number analyzed (trials or trial arms); PC = primary care; YA = young adult.

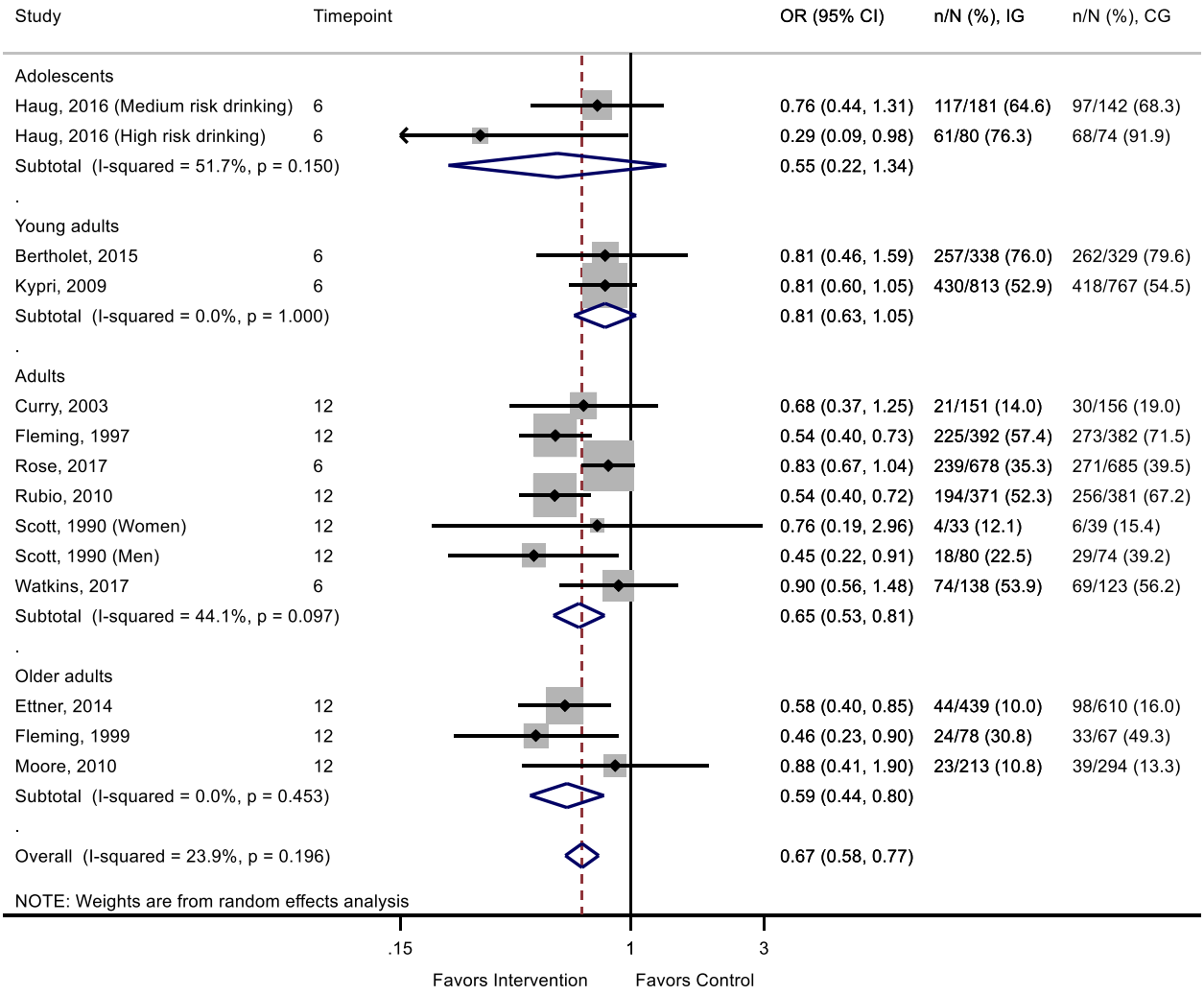
Figure 16. Forest Plot of Odds Ratios for Exceeding Recommended Limits (KQ4a), Comparing Alcohol Counseling Intervention Groups and Control Groups, by Population



Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; KQ = key question; n = number of participants analyzed; OR = odds ratio.

Note: Timepoint is measured in months.

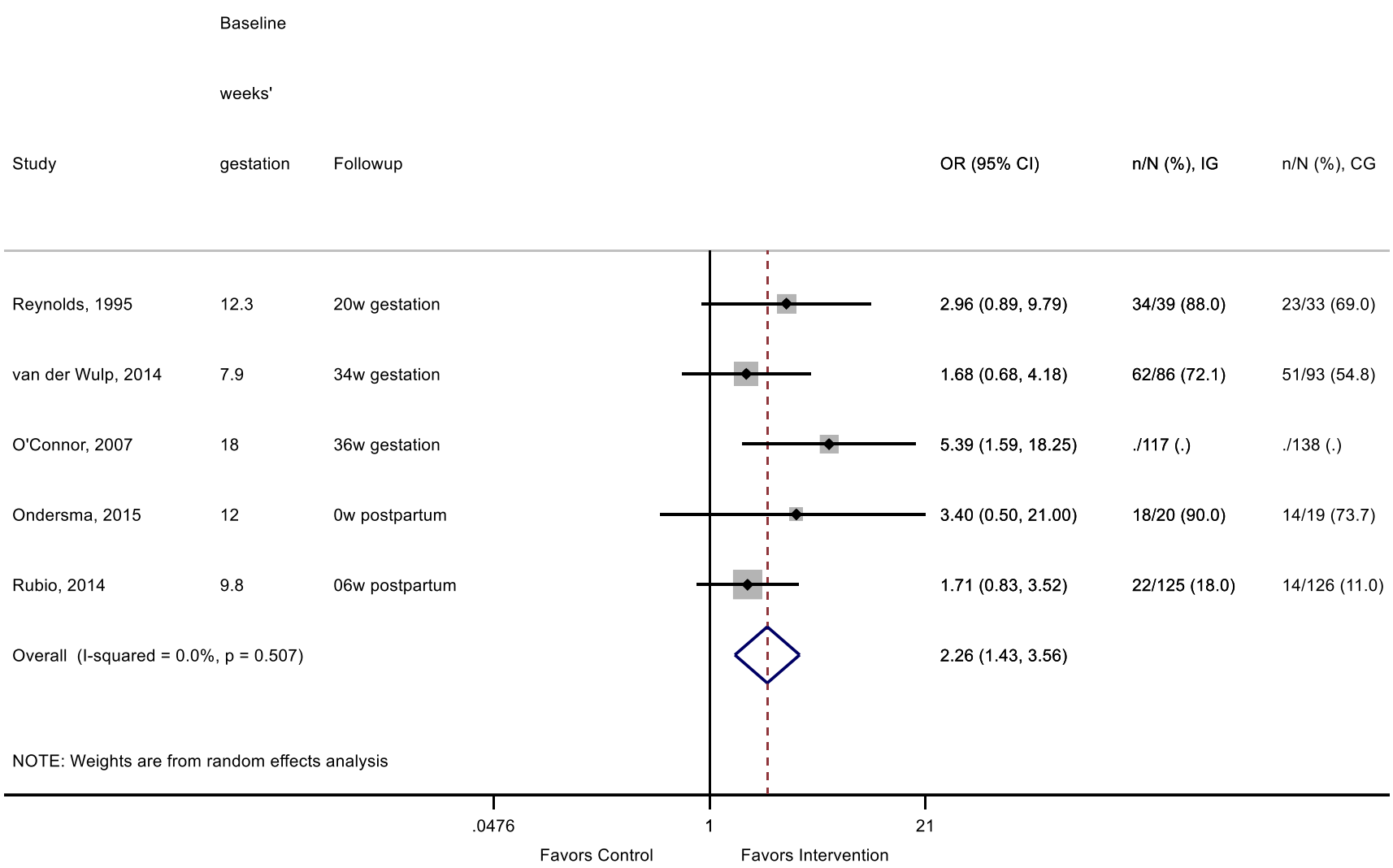
Figure 17. Forest Plot of Odds Ratios for Reporting a Heavy Use Episode (KQ4a), Comparing Alcohol Counseling Intervention Groups and Control Groups, by Population



Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; n = number of participants analyzed; OR = odds ratio.

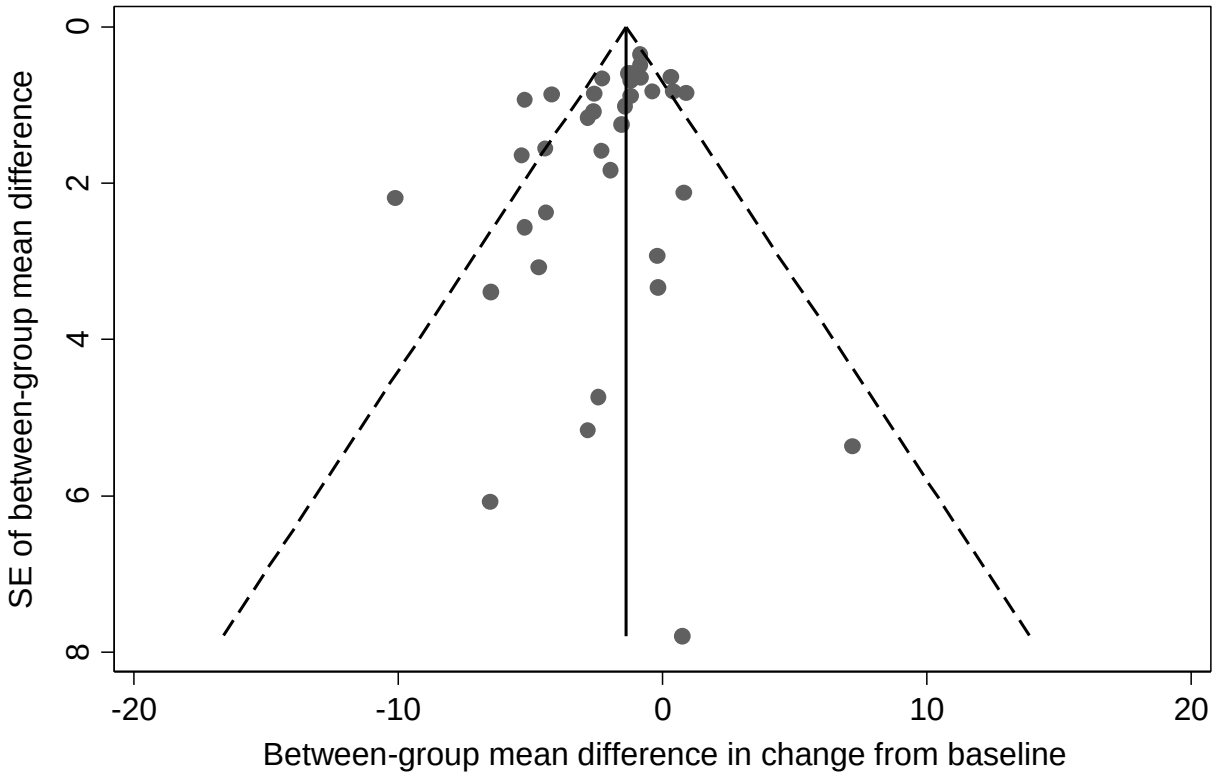
Note: Timepoint measured in months.

Figure 18. Forest Plot of Odds Ratios for Reporting Abstinence During Pregnancy (KQ4a), Comparing Alcohol Counseling Intervention Groups and Control Groups, Among Trials in Pregnant Women



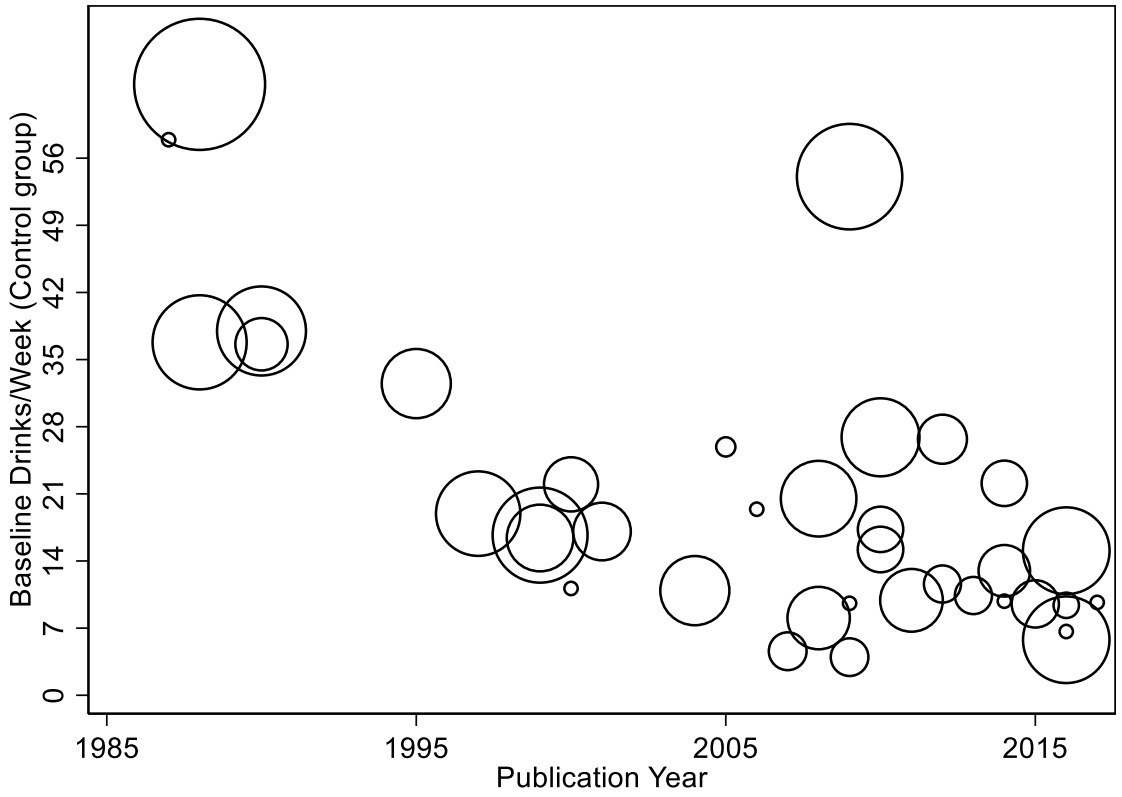
Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; KQ = key question; OR = odds ratio; w = weeks; n = number of participants randomized.

Figure 19. Funnel Plot of Between-Group Difference in Change From Baseline in Drinks per Week, by Standard Error (KQ4a)



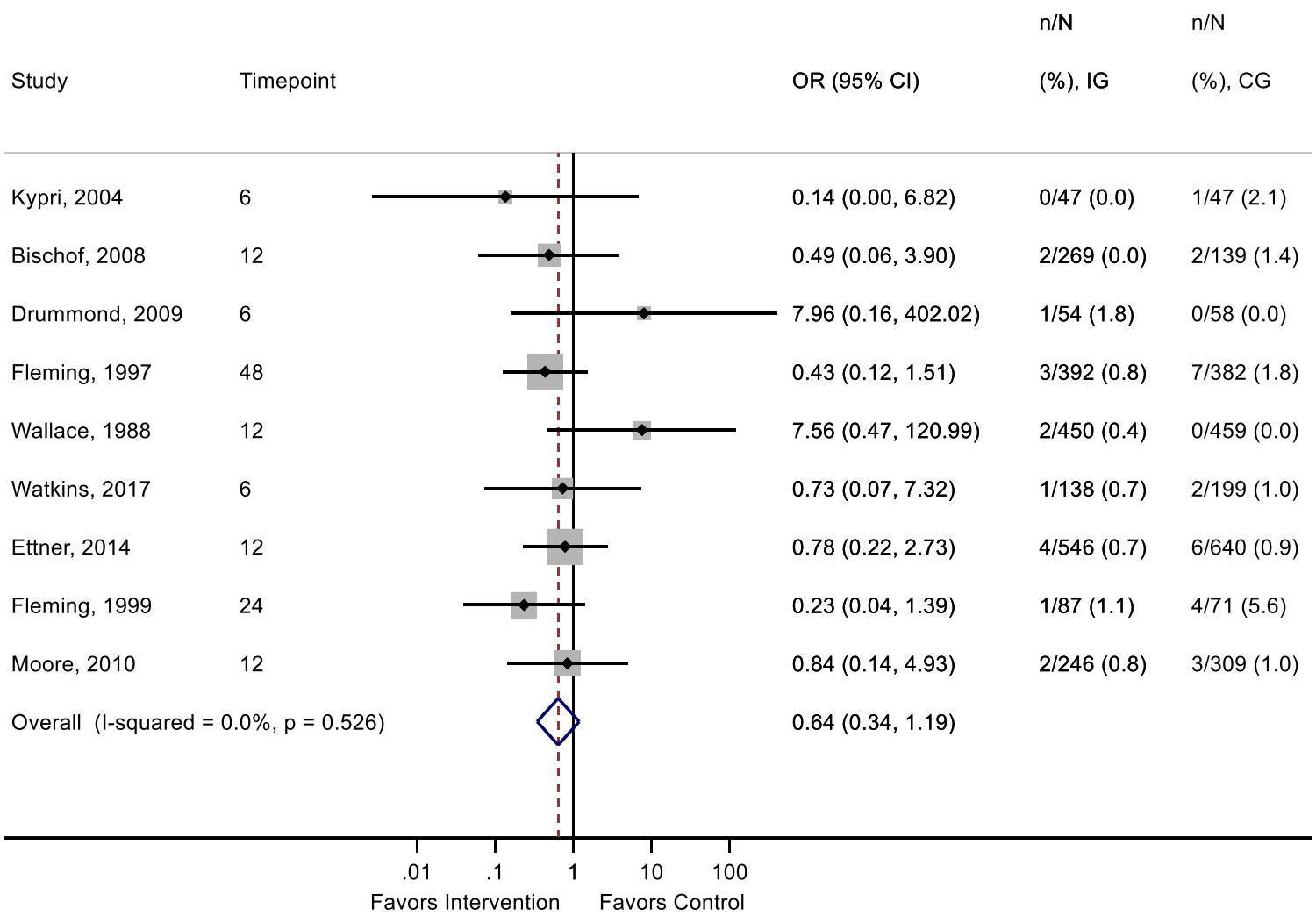
Abbreviations: KQ = key question; SE = standard error.

Figure 20. Scatter Plot of Baseline Alcohol Use in the Control Groups by Year of Publication, With Marker Weighted by the Between-Group Absolute Difference in Change From Baseline*



* Mean difference was set to 0.1 if the control group reported a greater reduction in alcohol use than the intervention group.

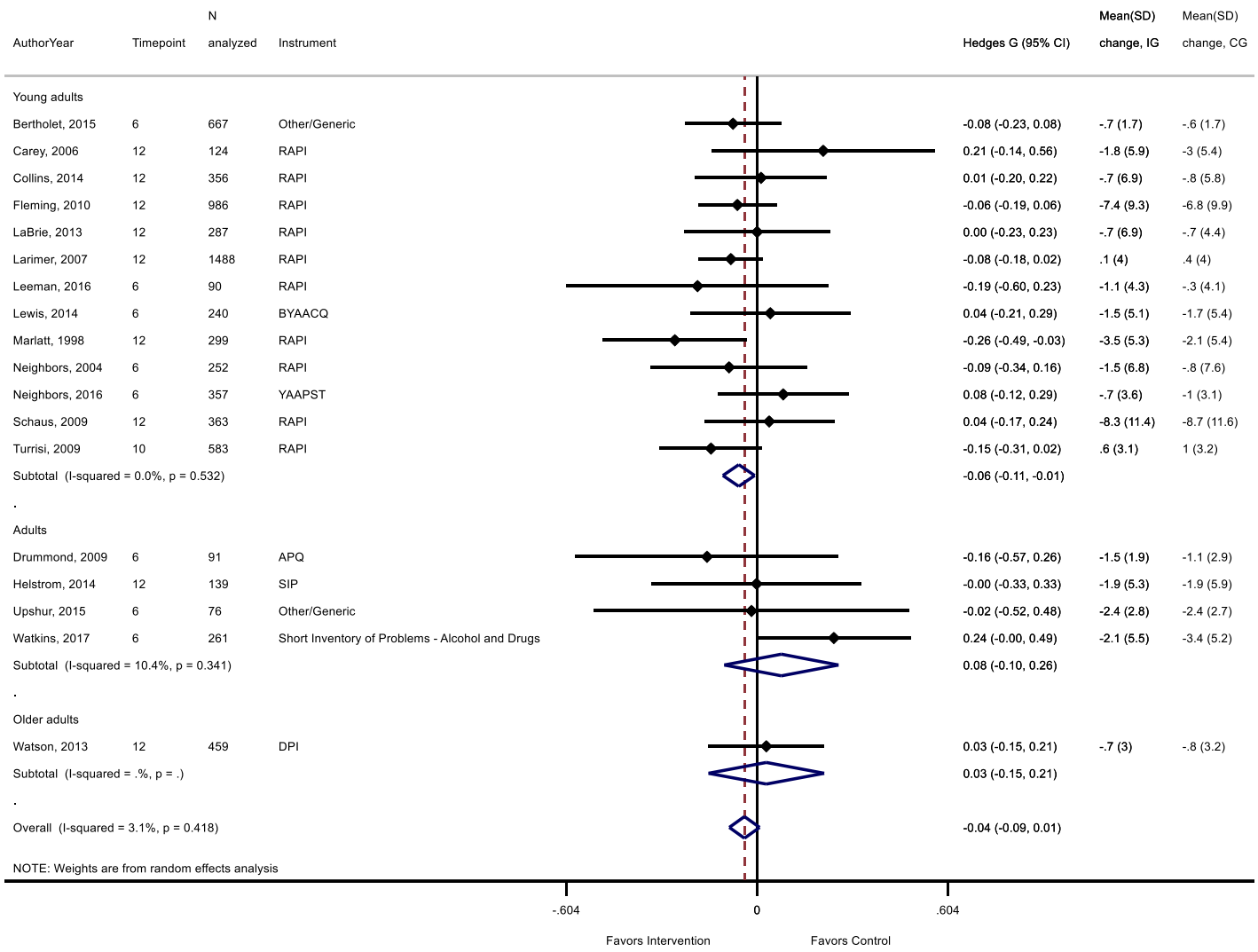
Figure 21. Forest Plot of Odds Ratios for Mortality (KQ4b), Comparing Alcohol Counseling Intervention and Control Groups, by Population



Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; KQ = key question; n = number of participants analyzed; OR = odds ratio.

Note: Timepoint is measured in months.

Figure 22. Forest Plot of Standardized Mean Difference in Change Between Groups on Measures of Alcohol-Related Problems or Consequences (KQ4b)



Abbreviations: APQ = Alcohol Problems Questionnaire; BYAACQ = Brief Young Adult Alcohol Consequences Questionnaire; CI = confidence interval; SD = standard deviation; IG = intervention group; CG = control group; Diff. = difference; DPI = Drinking Problems Index; RAPI = Rutgers Alcohol Problem Index; SD = standard deviation; SIP = Short Inventory of Problems; YAAPST = Young Adult Alcohol Problems Screening Test.

Note: Timepoint is measured in months.

Table 1. Unhealthy Alcohol Use: Terms and Definitions

Term	Source	Definition
Low-risk use/ Lower-risk use	ASAM[291]	Consumption of alcohol below the amount identified as hazardous and used in situations not defined as hazardous.
Moderate use	USDA[32]	For women: up to 1 drink per day For men: up to 2 drinks per day Should avoid alcohol completely: adolescents, women who are pregnant or trying to get pregnant, adults when planning to drive a vehicle or operate machinery, taking medication that interacts with alcohol, or if they have a medical condition that alcohol can aggravate.
Risky/At-risk use	NIAAA[1, 6, 292, 293]	Consumption of alcohol above recommended daily, weekly, or per occasion amounts, but not meeting criteria for alcohol use disorder. For women: no more than 3 drinks per day and no more than 7 drinks per week. For men: no more than 4 drinks per day and no more than 14 drinks per week. Should avoid alcohol completely: adolescents, women who are pregnant or trying to get pregnant, adults when planning to drive a vehicle or operate machinery, taking medication that interacts with alcohol, or if they have a medical condition that alcohol can aggravate. For adolescents, NIAAA defines moderate- and high-risk use based on days of alcohol use in the past year, by age group, as follows: Moderate risk: Age 12-15: 1 day/year Age 16-17: 6 days/year Age 18: 12 days/year Highest risk: Age 11: 1 day Age 12-15: 6 days Age 16: 12 days Age 17: 24 days Age 18: 52 days
Excessive use	CDC[294]	Binge drinking, heavy drinking, and any alcohol use by people younger than age 21 years and by pregnant women Binge drinking: ≥5/4 drinks per occasion for men/women Heavy drinking: ≥15/8 drinks per week for men/women
Unhealthy use	ASAM[291]	Any use that increases the risk or likelihood for health consequences (hazardous use [see below]), or has already led to health consequences (harmful use [see below])
Hazardous use	WHO[295]	A pattern of substance use that increases the risk of harmful consequences for the user. In contrast to harmful use, hazardous use refers to patterns of use that are of public health significance despite the absence of a current alcohol use disorder in the individual user.
	ASAM[291]	Alcohol use that increases the risk or likelihood of health consequences. This does not include alcohol use that has already led to health consequences.
Harmful use	WHO[296]	A pattern of drinking that is already causing damage to health. The damage may be either physical (e.g., liver damage from chronic drinking) or mental (e.g., depressive episodes secondary to drinking). This is the description for ICD-10 code F10.1, which is also labeled “Alcohol Abuse” in the 2018 ICD-10-CM codebook.
	ASAM[291]	Consumption of alcohol that results in health consequences in the absence of addiction.
Alcohol use disorder	DSM-5[297]	A maladaptive pattern of alcohol use leading to clinically significant impairment or distress, as manifested by two (or more) of the following, occurring within a 12-month period: 1. Having times when the patient drank more, or longer, than intended. 2. More than once wanted to cut down or stop, tried it, but could not. 3. Spending a lot of time drinking or being sick/getting over the after effects of drinking. 4. Wanting to drink so badly that they could not think of anything else. 5. Found that drinking (or being sick from drinking) often interfered with taking care of home or family responsibilities, caused problems at work, or caused problems at school. 6. Continuing to drink even though it was causing trouble with family and friends.

Table 1. Unhealthy Alcohol Use: Terms and Definitions

Term	Source	Definition
		7. Given up or cut back on activities that were important or interesting in order to drink. 8. More than once gotten into situations while or after drinking that increased the chances of getting hurt (e.g., driving, swimming, unsafe sexual behavior). 9. Continued to drink even though it was causing depression or anxiety, other health problems, or causing memory blackouts. 10. Having to drink much more than previously in order to get the desired effect, or finding that the usual number of drinks had much less effect than previously. 11. Experiencing the symptoms of withdrawal after the effects of alcohol were wearing off, such as trouble sleeping, shakiness, restlessness, nausea, sweating, racing heart, or seizure. Severity is determined based on the number of symptoms present: Mild: 2-3 symptoms Moderate: 4-5 symptoms Severe: 6 or more symptoms
Binge drinking/ heavy drinking episodes*	NIAAA[292, 293]	A pattern of drinking that brings blood alcohol concentration levels to 0.08 g/dL. This typically occurs after 4 drinks for women and 5 drinks for men—in about 2 hours.
	SAMHSA[298]	Drinking 5 or more alcoholic drinks on the same occasion on at least 1 day in the past 30 days.
Heavy drinking	SAMHSA[298]	Drinking 5 or more drinks on the same occasion on each of 5 or more days in the past 30 days.
Alcohol dependence	WHO/ICD-10 CM[299]	Three or more of the following at some time during the previous year: 1. A strong desire or sense of compulsion to take the substance 2. Difficulties in controlling substance-taking behavior in terms of its onset, termination, or levels of use 3. A physiological withdrawal state when substance use has ceased or been reduced, as evidenced by: the characteristic withdrawal syndrome for the substance; or use of the same (or a closely related) substance with the intention of relieving or avoiding withdrawal symptoms 4. Evidence of tolerance, such that increased doses of the psychoactive substance are required in order to achieve effects originally produced by lower doses (clear examples of this are found in alcohol- and opiate-dependent individuals who may take daily doses sufficient to incapacitate or kill nontolerant users) 5. Progressive neglect of alternative pleasures or interests because of psychoactive substance use, increased amount of time necessary to obtain or take the substance or to recover from its effects 6. Persisting with substance use despite clear evidence of overtly harmful consequences, such as harm to the liver through excessive drinking, depressive mood states consequent to periods of heavy substance use, or drug-related impairment of cognitive functioning; efforts should be made to determine that the user was actually, or could be expected to be, aware of the nature and extent of the harm

*According to ASAM[291] the preferred term is a heavy drinking episode.

Abbreviations: ASAM = American Society of Addiction Medicine; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders; NIAAA = National Institute on Alcohol Abuse and Alcoholism; SAMHSA = Substance Abuse and Mental Health Services Administration; WHO = World Health Organization; ICD-10-CM = International Classification of Diseases-10-Classification of Mental and Behavioral Disorders.

Table 2. Prevalence of Selected Types of Unhealthy Alcohol Use and Any Alcohol Use in the United States, 2016 National Survey on Drug Use and Health[11]

Population	% Heavy use episode, past month*	% Heavy drinking, past month†	% Alcohol use disorder, current	% Alcohol use, past month
Adolescents	4.9	0.8	2.0	9.2
Adults (18+)	26.2	6.6	6.0	55.0
Young adults (18-25)	38.4	10.1	10.7	57.1
Middle adults (26+)	24.2	6.0	5.2	54.6
Older adults (65+)	9.7	2.3	1.6	42.6
Pregnant women	4.3	0.9	‡	8.3

* ≥5 drinks on one occasion in the past month.
† ≥5 drinks on one occasion at least 5 times in the past month.
‡ Data not available.

Table 3. Published Clinical Guidance Documents From Major Health Organizations

Organization Year published	Guide	Screening tool recommended	Intervention approach	Other materials
NIAAA 2005	Helping Patients Who Drink Too Much: A Clinician's Guide	Single-item screener: How many times in the past year have you had 4/5 [F/M] or more drinks in a day? (Plus prescreen asking if they sometimes drink beer, wine, or other alcoholic beverages)	• Assess for use disorders • Advise and Assist (separate pathways for patients with and without an alcohol use disorder): state conclusions and recommendations, gauge readiness to change, approach/discussion points provided based on readiness to change • Followup: Continued discussions and support at subsequent visits, emphasizes empathy, supporting positive change; revisit goals/plan, engage others, consider referrals, address coexisting conditions, coordinate care	Clinician guide on medication for alcohol dependence, Patient education materials, Links/lists of other resources
NIAAA 2011	Alcohol Screening and Brief Intervention for Youth: A Practitioner's Guide	Two age-specific items about friends' drinking and patients' drinking frequency	• Guide patients (nonusers): reinforce healthy choices, elicit/affirm reasons not to use alcohol, educate about effects of alcohol on health • Assess risk level (users) • Advise and assist (users): Collaborate on personal goal and action plan; advise against drinking and driving and riding with someone who has been drinking; plan a full psychosocial interview; further approach/discussion points provided based on risk level • Followup: Continued discussions and support at subsequent visits, emphasizes empathy, supporting positive change; revisit goals/plan, engage parents, consider referrals	Links/lists of additional resources for clinicians, patients, parents
CDC 2014	Planning and Implementing Screening and Brief Intervention for Risky Alcohol Use	NIAAA single-item screener or USAUDIT-C (items 1-3 of the U.S. version of the AUDIT)	• Assess severity • Provide feedback on alcohol use • Listen for and reinforce change talk (e.g., explore pros and cons of alcohol use, assess readiness to change) • Advise, if patient agrees to hear your advice • Provide options: discussion of goals, consider action plan, consider referrals, seek agreement for followup	Implementation plan, patient handouts, provider training materials, links/lists of additional resources
AAFP 2017	Addressing Alcohol Use Practice Manual: An Alcohol Screening and Brief Intervention Program	Not specified	• Advise every risky drinker to reduce alcohol use or quit • Assess whether the patient is willing to reduce use or quit • Assist: If willing to change, develop personalized plan, consider referral; employ motivational interviewing techniques such as expressing empathy, supporting self-efficacy, pointing out previous successes, rolling with resistance, helping patients see the discrepancy between where they are and where they would like to be • Arrange followup	Implementation plan, links/lists of additional resources

Table 3. Published Clinical Guidance Documents From Major Health Organizations

Organization Year published	Guide	Screening tool recommended	Intervention approach	Other materials
WHO 2010	Brief Intervention, the ASSIST-Linked Brief Intervention for Hazardous and Harmful Substance Use: Manual for Use in Primary Care (addresses alcohol, tobacco, and other substances)	ASSIST	• Ask if patients are interesting in seeing screening results and provide feedback • Advise to reduce risk associated with substance use, but allow patients to take responsibility for their choices • Further discussion: how concerned about screening results, pros and cons of substance use, summarize and reflect, show concern and empathy • Provide patient materials	Intervention guides for multiple scenarios (e.g., multiple substances, high risk and injecting clients, longer or recurrent visits)
NIDA 2012	Screening for Drug Use in General Medical Settings: Resource Guide (addresses alcohol, tobacco, and other substances)	NIDA-modified ASSIST	• Assess risk level • Advise: review feedback and provide advice to reduce use • Assess the patient's readiness to change • Assist: help develop goal and action plan if patient will consider medication, consider referral • Arrange: referrals (if any) and followup visit (within 1-2 weeks for moderate- and high-risk patients)	Sample action plan worksheet, links/lists of additional resources

Abbreviations: AAFP = American Academy of Family Physicians; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDIT = Alcohol Use Disorders Identification Test; CDC = Centers for Disease Control and Prevention; F/M = females/males NIAAA = National Institute on Alcohol Abuse and Alcoholism; NIDA = National Institute on Drug Abuse; USAUDIT-C = United States Alcohol Use Disorders Identification Test – Consumption; WHO = World Health Organization.

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Adolescents	Chung, 2012[101]	Good	US	Community-based	Adolescents, ages 12-18 years	166,165	NR	48.6	White: 62.3 Black: 14.7 Hispanic: 16.5	NR	5+ drinks Frequency Quantity
	Clark, 2016[102]	Good	US	Primary care	Adolescents, ages 12-20 years, living in rural PA	1193	15.3	57	White: 93.4 Black: 1.3 Hispanic: 4.5	NR	Frequency Quantity Quant x Freq
	D'Amico, 2016[105]	Good	US	Primary care	Adolescents, ages 12-18 years	1573	15.5	57.5	White: 14.7 Black: 26.7 Hispanic: 51.4	NR	AUDIT Youth Screen
	Gryczynski, 2015[114]	Fair	US	Primary care	Adolescents, ages 12-17 years	525	NR	54	White: <1 Black: 93 Hispanic: 3	97% enrolled in school	ASSIST
	Harris, 2016[116]	Good	US	Primary care	Adolescents, ages 12-17 years	136	15.0	54.4	White: 18.4 Black: 27.9 Hispanic: 24.3	58% college graduate parent	Frequency
	Kelly, 2014[118]	Fair	US	Primary care	Adolescents, ages 12-17 years	525	NR	54.5	White: 0.8 Black: 92.8 Hispanic: NR	97.5% enrolled in school	Youth Screen
	Knight, 2003[119]	Good	US	Primary care	Adolescents, ages 14-18 years	538	16	68.4	White: 24.2 Black: 50.6 Hispanic: 18.8	NR	AUDIT
	Levy, 2016[123]	Fair	US	Other medical	Children, ages 9-18 years, with type 1 diabetes, asthma, cystic fibrosis, inflammatory bowel disease, or juvenile idiopathic arthritis	388	NR	51.5	White: 75.5 Black: NR Hispanic: NR	69.8% college graduate parent	Youth Screen
	Rumpf, 2013[130]	Fair	DEU	High School	Adolescents, ages 14-18 years	225	15.5	50.7	NR	NR	AUDIT AUDIT-C
	Santis, 2009[131]	Fair	CHL	High School	Students attending public school	95	15.9	44.2	NR	NR	AUDIT

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Young adults	Aertgeerts, 2000	Fair	BEL	University/ College	College freshmen, attending required medical exams	3564	18	54.4	NR	NR	AUDIT
	Clark, 2016[102]	Good	US	Primary care	Adolescents, living in rural PA, ages 18-20 years (this subgroup only)	251	NR	66.5	White: 93.4* Black: 1.3* Hispanic: 4.5*	NR	Frequency, Quantity, Quant x Freq
	Cook, 2004[84]	Good	US	Other medical	Young adults attending appointment at an urban STD clinic, ages 15-24 years	358	20.6	45.0	White: 46.0 Black: 49.0 Hispanic: NR	NR	AUDIT
	DeMartini, 2012[109]	Good	US	University/ College	College students, psychology subject pool, ages 18-25 years, current drinkers	401	19.04	54	White: 64 Black: NR Hispanic: NR	NR	AUDIT, AUDIT-C
	Kokotailo, 2004[120]	Good	US	University/ College	College students attending university health services appointment, ages 18-23 years	302	20.3	61.3	White: 90.1 Black: 2.0 Hispanic: 2.3	NR	AUDIT
	Northrup, 2013[127]	Fair	US	University/ College	White or black non-Hispanic undergraduate college students, ages 18-25 years	1500	19.4	68	White: 81 Black: 19 Hispanic: NR	NR	AUDIT, AUDIT-C
Adults	Aalto, 2009[93]	Fair	FIN	Other medical	Adults participating in the FINRISK study, ages 25-64 years	1851	45.4	54.4	NR	Education, mean: 13.7 years Employed: 73.7	AUDIT, AUDIT-C, 6+ drinks, Quantity x Frequency
	Bartoli, 2016[96]	Good	ITA	Other medical	Adults, age >18 years, admitted to outpatient clinic for anxiety or depressive disorder, with past-year alcohol use	242	44.3	57.0	NR	NR	5/4+ drinks

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Adults	Boschloo, 2010[97]	Fair	NLD	Community-based	Adults, ages 18-65 years, participated in the Netherlands Study of Depression and Anxiety (NESDA) who had diagnosis of past-year depressive and/or anxiety disorder OR who did not have a diagnosis of lifetime depressive and/or anxiety disorder	2404	41.3	65.8	NR	Education, mean: 12.1 years	AUDIT
	Bradley, 2003[98]	Good	US	Other medical	Women receiving VA outpatient care, age ≥18 years	393	46	100.0	White: 69.2 Black: 12.2 Hispanic: NR	HS degree or higher: 99.5%	AUDIT, AUDIT-C, 4+ drinks, 6+ drinks
	Buchsbaum, 1995[99]	Fair	US	Primary care	Adults age ≥18 years, drinking within the past 30 days	155	48	44.5	NR	HS degree or higher: 27.1% Full-time employment: 15.5% Part-time: 10.3%	Quantity
	Clements, 1998[103]	Fair	US	University/ College	College students enrolled in psychology courses, ages 18-55 years	306	25.8	74.8	White: 60.8 Black: 24.5 Hispanic: 10.5	NR	AUDIT
	Crawford, 2013[104]	Fair	US	Other medical	Adult veterans from the VA Mid-Atlantic Mental Illness Research, Education, and Clinical Center Recruitment Database	1775	37	20.3	White: 55 Black: NR Hispanic: NR	Education, average: 13 years Employed full- or part-time: 65%	AUDIT, AUDIT-C
	Dawson, 2005[106, 139]	Good	US	Community-based	Adult participants in the 2001-2002 NESARC, age ≥18 years	43093			NR	NR	AUDIT-C, 5/4+ drinks Maximum drinks

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Adults	Dawson, 2012[107]	Fair	US	Community-based	Adults, age ≥21 years, participated in NESARC	34,536	NR	NR	NR	NR	AUDIT-C
	Degenhardt, 2001[108]	Fair	AUS	Community-based	Adult participants of WHO trial of brief alcohol use interventions, ages 17-70 years	370	50.9	38.2	NR	NR	AUDIT
	Foxcroft, 2015[110]	Good	GBR	Primary care	Adults, ages 18-35 years	420	NR	67.1	White: 86.0 Black: NR Hispanic: NR	IMD Quintile I (lowest deprivation): 53.0%	AUDIT, AUDIT-C
	Gache, 2005[111]	Good	FRA, CHE	Primary care	Adults, age ≥18 years, nonabstainers	1207	43.3	51.6	NR	NR	AUDIT
	Gomez, 2005[112]	Fair	ESP	Primary care	Adults, age ≥15 years	500	44	56.2	NR	NR	AUDIT, AUDIT-C, 6+ drinks
	Gomez, 2006[113]	Fair	ESP	Primary care	Adults receiving primary care services, age ≥15 years	602	48.7	55.0	NR	NR	AUDIT, AUDIT-C
	Gual, 2002[115]	Fair	ESP	Primary care	Adults attending primary health care appointment, age ≥17 years	255	44.0	50.2	NR	Employed: 73% HS grad or higher: 39%	AUDIT, AUDIT-C
	Isaacson, 1994[117]	Fair	US	Primary care	Adults, new patients at an inner-city primary care clinic	124	45	52	NR	Clinic serves a population that is predominantly of lower SES	AUDIT
	Kumar, 2016[121]	Good	US	Primary care	Adults, age ≥18 years	399	46.8	48.4	White: 19.8 Black: 47.9 Hispanic: NR	HS degree or higher: 82.5% Income <$50,000: 79.4% Employed, full-time: 20.0% Employed, part-time: 9.3%	ASSIST

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Adults	Levola, 2015[122]	Fair	FIN	Other medical	FINRISK adults, ages 25-60 years, reporting at least mild (BDI-SF score ≥4) or moderate (≥8) symptoms of depression	556	44.7	57.4	NR	NR	AUDIT, AUDIT-C, 6+ drinks
	McCann, 2000[124]	Fair	US	Other medical	Adults seeking evaluation for ADHD	139	36.4	30.9	White: 95.7 Black: NR Hispanic: NR	NR	AUDIT
	McGinnis, 2013[125]	Fair	US	Primary care	Male VA patients, HIV-infected patients and matched controls, at least 1 alcoholic beverage in past year	837	52	0	White: 33 Black: 53 Hispanic: 8	NR	AUDIT, AUDIT-C, 6+ drinks
	McNeely, 2015[126]	Good	US	Primary care	Adults, ages 21-65 years	586	46	49.8	White: 18.7 Black: 50.2 Hispanic: 21.7	HS degree or higher: 84.1% Income <$50,000: 79.5%	4+ drinks, 5/4+ drinks
	McNeely, 2016[136, 147]	Fair	US	Primary care	Adults, age ≥18 years	2000	46	56.2	White: 33.4 Black: 55.6	HS degree or higher: 79.8% Unemployed: 21.0%	5/4+ drinks
	Piccinelli, 1997[128]	Fair	ITA	Primary care	Adults, ages 18-65 years	482	42.2	63.5	NR	HS degree or higher: 33.6% Employed: 56.8%	AUDIT
	Rumpf, 2002[129]	Fair	DEU	Community-based	Adults, ages 18-64 years, consuming alcohol in the past 12 months	3551	41.2	49.2	NR	HS degree or higher: 22.1%	AUDIT, AUDIT-C
	Seale, 2006[132]	Fair	US	Primary care	Adult drinkers attending primary care practices, 6+ drinks in the previous year	625	40.9	54.4	White: 60.8 Black: 38.1 Hispanic: 1.1	NR	AUDIT, AUDIT-C, 5/4+ drinks

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
Adults	Smith, 2009[133]	Good	US	Primary care	Adults attending a primary care clinic, age ≥18 years	286	49	54.2	White: 17.1 Black: 62.6 Hispanic: 16.1	HS degree or higher: 71.7%	AUDIT-C, 5/4+ drinks
	Volk, 1997[134]	Fair	US	Primary care	Adults attending primary care visits, age ≥18 years, self-identified as white, black, or Hispanic	1333	43.2	70.7	White: 38.4 Black: 35.3 Hispanic: 26.3	No more than high school degree: White: 31.1% Black: 45.2% Hispanic: 26.3% Annual income <$20,000 White: 36.6% Black: 68.5% Hispanic: 59.3%	AUDIT, AUDIT-C
Older adults	Aalto, 2011[94]	Good	FIN	Community-based	Older adults, ages 65-74 years	517	69.0	49.7	NR	NR	AUDIT, AUDIT-C, Quantity x Frequency, 6+ drinks, 4+ drinks
	Dawson, 2005[106, 139]	Good	US	Community-based	Adult participants in the 2001-2002 NESARC, age ≥65 years (for this subgroup only)	8666	NR	NR	NR	NR	AUDIT-C, 5/4+ drinks Maximum drinks
Pregnant women	Bull, 1999[100]	Fair	US	Primary care	Pregnant women attending prenatal appointments (mean, 15.2 weeks' gestation), American Indian or carrying an American Indian baby, ages 15-44 years	208	24.4	100.0	NR	NR	Quantity x Frequency
	Dawson, 2005[106, 139]	Good	US	Community-based	Adult participants in the 2001-2002 NESARC, age ≥18 years, pregnant past-year drinkers (this subgroup only)	256	NR	100.0	NR	NR	AUDIT-C

Table 4. Study and Population Characteristics for KQ2, by Population

Target population	Author, year	Quality rating	Country	Recruit. setting	Brief population description	N screened	Average age	% Female	Race/Ethnicity	SES	Screening tests
	Lopez, 2017[135]	Fair	ARG	Hospital	Postpartum women, ages 13-44 years	641	25.6	100.0	NR	≥12 years of formal education: 38%	AUDIT, AUDIT-C, T-ACE, TWEAK

* Race/ethnicity for the full sample (n=1193).

Abbreviations: ARG = Argentina; ASSIST = Alcohol, Smoking and Substance; AUDIT = Alcohol Use Disorders Identification Test; AUDIT-C = Alcohol Use Disorders Identification Test-Consumption; ESP = Spain; FRA = France; HS = high school; KQ = key question; NESARC = National Epidemiologic Survey on Alcohol and Related Conditions; NR = not reported; SES = socioeconomic status; US = United States; VA = U.S. Department of Veterans Affairs.

Table 5. Summary Population Characteristics for Key Question 2

Population	No. studies	No. participants	No. (%) good quality	No. (%) conducted in U.S.	Other countries represented	No. (%) in primary care	Other settings	Average age†	% Female†	No. (%) studies majority nonwhite
All populations	**45***	**277,938**	**17 (38)**	**28 (62)**		**23 (51)**		**35.3**	**49.6**	**13 (29)**
Adolescents	*10*	*171,363*	*5 (50)*	*8 (80)*	*CHL, DEU*	*7 (70%)*	*High school (2), Community (1)*	*15.5*	*48.8*	*5 (50)*
Adults (nonpregnant/ postpartum)	*35*	*114,182*	14 (40)	21 (60)		16 (46)		*38.1*	*53.1*	*7 (20)*
Young adults	6	6,376	4 (67)	5 (83)	BEL	1 (17)	University (4), Other medical (1)	18.5	57.5	1 (17)
Adults	27	99,084	8 (30)	15 (56)	AUS, DEU, ESP, FIN, FRA, CHE, UK, ITA, NLD	15 (56)	Other medical (5), Community (6), University (1)	43.3	51.8	6 (22)
Older adults	2	8,722	2 (100)	1 (50)	FIN	0 (0)	Community (2)	69.0	49.7	0 (0)
Pregnant women	*3*	*1,105*	1 (33)	*2 (67)*	*ARG*	*1 (33)*	*Community (1), Hospital (1)*	*25.3*	*100*	*2 (67)*

* 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 do not add up to the "All populations" totals.
† Weighted by n randomized.

Abbreviations: AUS = Australia; ARG = Argentina; BEL = Belgium; CHE = Czech Republic; CHL = Chile; DEU = Germany; ESP = Spain; FIN = Finland; FRA = France; ITA = Italy; NLD = Netherlands; No. = number; UK = United Kingdom; US = United States.

Table 6. Sensitivity and Specificity Range for One- or Two-Item Screeners, AUDIT-C, and AUDIT

Population (No. studies)	Condition	One- or two-item, optimal cutoff	NIAAA-recommended*	AUDIT-C, ≥3 cutoff (female)	AUDIT-C, ≥4 cutoff (male)	AUDIT-C, optimal cutoff	AUDIT, ≥8 cutoff	AUDIT, optimal cutoff	AUDIT, ≥3/4/5 cutoff, US primary care
Adolescents (10)	Unhealthy Alcohol Use	None	None	None	None	Se: 0.73 Sp: 0.81 k=1, n=225	Se: 0.66 Sp: 0.86 k=1, n=225	Se: 0.79 Sp: 0.79 k=1, n=225	None
	AUD	Se: 0.87-1.0 Sp: 0.84-0.95 k=5, n=3564	Se: 0.87-1.0 Sp: 0.84-0.94 k=3, n=2486	None	None	Se: 0.76 Sp: 0.78 k=1, n=225	Se: 0.54-0.71 Sp: 0.84-0.97 k=3, n=2332	Se: 0.84-0.88 Sp: 0.77 k=2, n=763	Se: 0.88 Sp: 0.77 k=1, n=538
Young Adults (6)	Unhealthy Alcohol Use	None	None	Se: 0.98 Sp: 0.47 k=1, n=217	Se: 0.97 Sp: 0.40 k=1, n=184	Se: 0.80-0.82† Sp: 0.82-0.88† k=1, n=401	Se: 0.82 Sp: 0.78-0.79 k=2, n=703	Se: 0.82-0.88 Sp: 0.70-0.79 k=2, n=703	None
	AUD	Se: 0.81-0.92 Sp: 0.75-0.80 k=1, n=251	None	None	None	None	Se: 0.68-0.82 Sp: 0.72-0.75 k=2, n=660	Se: 0.73-0.82 Sp: 0.67-0.78 k=3, n=4224	None
Adults (27)	Unhealthy Alcohol Use	Se: 0.65-0.90 Sp: 0.68-1.0 k=8, n=48,211	Se: 0.73-0.88 Sp: 0.74-1.0 k=4, n=44,461	Se: 0.73-0.97 Sp: 0.28-0.91 k=5, n=2714	Se: 0.82-1.0‡ Sp: 0.34-0.89‡ k=4, n=1038	Se: 0.74-0.92‡ Sp: 0.66-0.89‡ k=8, n=9447	Se: 0.38-0.73 Sp: 0.89-0.97 k=7, n=8852	Se: 0.68-0.91 Sp: 0.75-0.96 k=9 n=9832	Se: 0.64-0.86 Sp: 0.74-0.94 k=3, n=2782
	AUD	Se: 0.71-0.94 Sp: 0.60-0.91 k=7, n=46,985	Se: 0.71-0.92 Sp: 0.60-0.91 k=6, n=46,244	Se: 0.78-0.87 Sp: 0.69-0.85 k=3, n=15,167	Se: 0.87-0.88 Sp: 0.63-0.75 k=3, n=14,873	Se: 0.70-0.88 Sp: 0.70-0.85 k=6, n=82,444	Se: 0.43-0.96 Sp: 0.82-0.96 k=6, n=4908	Se: 0.48-0.96 Sp: 0.34-0.96 k=8, n=5746	Se: 0.72-0.83 Sp: 0.67-0.88 k=2, n=1958
Older Adults (2)	Unhealthy Alcohol Use	Se: 0.64-0.97 Sp: 0.70-1.0 k=2, n=9183	Se: 0.64 Sp: 1.0 k=1, n=8666	None	None	Se: 0.94 Sp: 0.80 k=1, n=517	Se: 0.48 Sp: 0.97 k=1, n=517	Se: 0.86 Sp: 0.87 k=1, n=517	None
	AUD	None	None	None	None	Se: 0.76 Sp: 0.74 k=1, n=8205	None	None	None
Pregnant Women (3)	Use	Se: 0.77 Sp: 0.93 k=1, n=208	None	None	None	None	None	None	None
	Unhealthy Alcohol Use	None	None	None	None	None	None	None	None
	AUD	None	None	Se: 0.90-0.96 Sp: 0.71-0.79 k=2, n=897	NA	Se: 0.90-0.96 Sp: 0.71-0.79 k=2, n=897	None	Se: 0.87 Sp: 0.86 k=1, n=641	None

* NIAAA-recommended screening instrument for adults: "How many times in the past year have you had 5/4 (M/F) or more drinks in a day?" preceded by a prescreening question that assessed alcohol use ("Do you sometimes drink beer, wine, or other alcoholic beverages?"). NIAAA-recommended screening instrument for adolescents: "Do you have any friends who drank beer, wine, or any drink containing alcohol in the past year?" and "In the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?" (For ages 9-14 years, the first question asks about friends' use; for ages 14-18 years, the first question asks about personal use).[98]

† More than one value reported because data was presented by subgroups (e.g., sex, race).

‡ McGinnis et al[125] was an outlier and was not included in the ranges presented. It reported the following: for AUDIT-C, ≥4 cutoff (male), sensitivity of 0.63 and specificity of 0.90 for unhealthy alcohol use.

Abbreviations: AUD = alcohol use disorder; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; NA = not applicable; NIAAA = National Institute on Alcohol Abuse and Alcoholism; Se = sensitivity; Sp = specificity; US = United States.

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
Adolescents	Haug, 2016[210]	Good	SWL	469	High school students, ages 16-19 years (only abstracted medium- and high-risk subgroups)	16.8	52.6	--	Secondary school: 89.7% Technical school or university: 6.3%	Beh
	Mason, 2015[215]	Fair	US	119	Adolescents, ages 14-18 years	16.4	71	Black: 84.0 Other: 16.0	--	Beh
Young adults	Bertholet, 2015[220]	Good	SWL	737	Men, age 21 years	20.8	0	--	--	Beh, Health/Other
	Carey, 2006[189]	Fair	US	509	College students ages 18-25 years	19.2	65	White: 89.0	--	Beh, Health/Other
	Collins, 2014[223]	Fair	US	724	College students age ≥18 years	20.8	56	White: 67.1 Black: 1.0 Asian: 18.5 AI/AN: 0.6 Hisp: 6.5 Other: 3.3	--	Beh, Health/Other
	Daeppen, 2011[192]	Fair	SWL	217	Men, age 20 years	19.9	0	--	Some postsecondary education: 57.2%	Beh
	Fleming, 2010[160] CHIPS	Fair	US, CAN	986	College students	21	50.9	White: 90.7	--	Beh, Health/Other
	Johnsson, 2006[194]	Fair	SWE	177	Incoming university students	21	24.8	--	--	Beh
	Kypri, 2004[161]	Good	NZL	104	College students ages 17-26 years	20	50	--	--	Beh, Health/Other
	Kypri, 2008[162]	Fair	NZL	576	College students, ages 17-29 years	20.1	52	--	--	Beh
	Kypri, 2009[195]	Fair	AUS	2435	College students ages 17-24 years	19.7	45.3	--	--	Beh
	LaBrie, 2009[196]	Fair	US	285	First-year female college students	17.9	100	White: 57.5 Black: 5.3 Asian: 10.5 Hisp: 13.0 Other: 13.7	--	Beh
	LaBrie, 2013[227]	Fair	US	554	College students, age 18-24 years	19.9	56.7	White: 75.7 Asian: 24.3	--	Beh, Health/Other
	Larimer, 2007[197]	Fair	US	1488	College students	NR	70.8	White: 80.8 Black: 0.8 Asian: 7.8 Hisp: 3.1 Other: 7.5	--	Beh, Health/Other, Harms
	Leeman, 2016[211]	Fair	US	208	College students, age 18-24 years	19.8	62.5	White: 68.3 Black: 16.8	--	Beh

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
								Hisp: 4.3 Other: 5.6		
	Lewis, 2014[225]	Fair	US	359	College students, ages 18-25 years	20.1	57.6	White: 70.0 Asian: 12.5 Other: 16.2	--	Beh, Health/Other
	Marlatt, 1998[198]	Fair	US	348	Incoming college students, age ≤19 years	NR	54	White: 84.0	--	Beh, Health/Other
	Martens, 2010[199]	Fair	US	263	College athletes	20.0	76	White: 85.5 Black: 1.9 Asian: 5.0 Hisp: 1.9 Other: 5.7	--	Health/Other
	Neighbors, 2004[200]	Fair	US	252	College students	18.5	58.7	White: 79.5 Asian: 13.7 Other: 6.8	--	Beh, Health/Other
	Neighbors, 2010[201]	Fair	US	818	Incoming college freshman students	18.7	57.6	White: 65.3 Black: 1.5 Asian: 24.2 AI/AN: 0.5 Hisp: 4.2 Other: 4.4	--	Beh, Harms
Young adults	Neighbors, 2016[239]	Fair	US	623	College students, ages 18-26 years	20.6	53.2	White: 61.7 Black: 5.4 Asian: 16.3 AI/AN: 1.0 Hisp: 21.3 Other: 15.6	--	Beh, Health/Other
	Schaus, 2009[170]	Fair	US	363	College students seeking care at university health services, age ≥18 years	20.6	52.1	White: 77.4 Black: 4.7 Asian: 2.8 AI/AN: 0.3 Hisp: 11.3 Other: 3.0	--	Beh, Health
	Turrisi, 2009[205]	Good	US	1275	Former high school athletes beginning college	17.9	55.6	White: 79.8 Black: 2.0 Asian: 10.6 AI/AN: 0.2 Hisp: 4.5 Other: 6.9	--	Beh, Health/Other
	Voogt, 2014[226] What Do You Drink (WDYD)	Good	NLD	913	College students, ages 18-24 years	20.8	39.7	--	--	Beh

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
Adults	Aalto, 2000[206] Lahti Project	Fair	FIN	265	Adults, ages 20-60 years	42	29.4	--	Comprehensive school: 48.7% Vocational school: 26.0% College: 21.1%	Beh, Health/Other
	Bischof, 2008[149]	Fair	DEU	408	Adults, ages 18-64 years	36.5	31.9	--	Years of schooling (mean): 10.5	Beh, Health/Other, Harms
	Burge, 1997[188]	Fair	US	242	Mexican American adults attending primary care appointment, age ≥18 years	39.4	25	White: 6.1 Black: 7.2 Hisp: 86.7	Mean education: 8.8 years Uninsured: 77%	Beh, Health/Other
	Butler, 2013[242] PRE-EMPT	Fair	GBR	1827	Adults, age ≥18 years	50.9	62	--	Managerial and professional occupations: 43.0%	Beh
	Chang, 2011[190]	Fair	US	511	Women with medical diagnoses potentially exacerbated by risky drinking	45.1	100	White: 75.5 Black: 21.8 Asian: 2.0 Hisp: 5.4	≥College degree: 62.2%	Beh
	Crawford, 2014[185]	Fair	GBR	802	Adults attending sexual health clinic, age ≥19 years	26.7	53.9	White: 77.3 Black: 13.0 Asian: 3.6 Other: 6.0		Beh, Health/Other
	Cunningham, 2012[231]	Fair	CAN	1767	Adults, age ≥19 years	40.7	33.6	--	Postsecondary education: 74.2%	Beh
	Curry, 2003[152]	Fair	US	307	Adults, age ≥18 years	46.9	35.5	White: 80.0	Post-high school education: 91.0% Annual income >$35,000: 67.5% Employed full- or part-time: 80.5%	Beh
	Drummond, 2009[208]	Fair	GBR	112	Males attending a primary care appointment, age ≥18 years	41.8	0	--	--	Beh, Health/Other
	Emmen, 2005[193]	Fair	NLD	123	Adults attending primary care appointment, age ≥18 years	49	24.4	--	Some post-secondary education: 47.2%	Beh, Health/Other (liver only)
	Fleming, 1997[153] TrEAT (Trial for Early Alcohol Treatment)	Good	US	774	Adults attending appointment with PCP, ages 18-65 years	NR	37.7	White: 91.6 Black: 4.2 Hisp: 1.3 Other: 2.9	Some college: 38.6% ≥College degree: 19.0%	Beh, Health/Other

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
Adults	Hansen, 2012[234]	Good	DNK	1380	Adults participating in epidemiologic household survey	57.9	44.9	--	15+ years education: 51.7%	Beh
	Heather, 1987[209] DRAMS (Drink Reasonably And Moderately with Self-control)	Fair	GBR	104	Adults attending GP appointment, ages 18-65 years	36.4	25	--		Beh, Health/Other
	Helstrom, 2014[240]	Fair	US	139	Veterans attending PCP appointment, ages 23-83 years	57.2	2	White: 55.0	Financially comfortable ("enough money to get by"): 79.9%	Beh, Health/Other
	Hilbink, 2012[233]	Fair	NLD	712	Adults presenting to primary care, age ≥18 years	47.5	30.3	--	High education level: 32.7%	Beh
	Kaner, 2013[186] Screening and Intervention Program for Sensible Drinking (SIPS)	Fair	GBR	756	Adults attending appointment with GP, age ≥18 years	44.5	37.8	White: 91.7	College degree or equivalent: 33.8%	Beh
	Maisto, 2001[163]	Fair	US	301	Adults attending appointment with PCP, age ≥21 years	45.6	30.2	White: 76.7 Black: 21.9 AI/AN: 0.3 Hisp: 0.3 Other: 0.7	Post-high school education: 56.8%	Beh
	Ockene, 1999[165]	Fair	US	530	Adults attending a primary care appointment, ages 21-70 years	43.9	35.3	White: 82.6 Other: 17.4	≥High school graduate +/- some college: 47.0% ≥College graduate: 37.2%	Beh
	Richmond, 1995[175]	Fair	AUS	285	Adults attending appointment with GP, ages 18-70 years	37.3	44.3	--	--	Beh
	Rose, 2017[245]	Fair	US	1855	Adults scheduled for a routine primary care visit, age ≥18 years	NR	52.5	White: 95.0	≤High school/GED: 31.5% Some college: 10.5% ≥BA: 59.0%	Beh
	Rubio, 2010[168]	Good	ESP	752	Adults attending appointment with PCP, ages 18-65 years	NR	34.7	--	Some college: 38.4% ≥College degree: 3.7%	Beh

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
	Watkins, 2017[246]	Fair	US	397	Adults attending a primary care visit at FQHC, age ≥18 years	42	20.4	White: 43.8 Black: 13.3 Asian: 1.3 Hisp: 31.0 Other: 40.3	<High school: 27.9% High school graduate/ GED: 31.0% >High school: 41.1%	Beh, Health/Other
	Saitz, 2003[169]	Fair	US	312	Adults attending primary care appointment	43	36.5	White: 19.1 Black: 56.1 Hisp: 16.5	High school education: 63.4% Unemployed: 40.0%	Beh
	Schulz, 2013[228]	Fair	DEU	448	Adults, age ≥18 years	41.7	43.5	--	High education level: 34.0% Monthly income ≥€2001: 39.7	Beh
	Scott, 1990[171]	Fair	GBR	226	Adults, ages 17-69 years	44.7	31.9	--	--	Beh, Health/Other
	Senft, 1997[172]	Fair	US	516	Adults attending primary care appointment, age ≥21 years	42.5	29.5	White: 82.0 Other: 18.0	≥Some college: 59.5%	Beh, Health/Other
	Upshur, 2015[218] Project RENEWAL	Fair	US	82	Homeless women attending a PCP appointment, age ≥18 years	45.4	100	White: 32.9 Black: 41.5 Other: 25.6	Lived in shelter or on street in past 3 months: 70.7% Monthly income primarily from SSI, SSDI, and food stamps: $850	Beh, Health/Other
	Wallace, 1988[174]	Fair	GBR	909	Adult primary care patients, ages 17-69 years	42	29.4	--	--	Beh, Health/Other
	Wilson, 2014[224]	Fair	GBR	102	Adults with hypertension, age ≥18 years	64	12	--	Unemployed: 74.4%	Beh, Health/Other (BP only)
Older adults	Ettner, 2014[183] Project SHARE	Good	US	1186	Primary care patients, age ≥60 years	71	34.3	White: 97.3 Black: 0.3 Asian: 0.9 AI/AN: 1.5 Hisp: 5.9	Some college: 27% ≥College degree: 59% Income ≥$100,000: 30%	Beh, Health/Other
	Fleming, 1999[157] Project GOAL (Guiding Older Adult Lifestyles)	Fair	US	158	Older adults attending primary care appointment, age ≥65 years	NR	33.5	--	--	Beh, Health/Other
	Moore, 2010[176] Healthy Living As You Age (HLAYA)	Fair	US	631	Adults attending appointment with PCP, age ≥55 years	68.4	29	White: 87.3 Hisp: 9.2 Other: 3.3	Some college: 30.7% ≥College degree: 45.8%	Beh, Health/Other

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
	Watson, 2013[230]	Good	GBR	529	Older adults attending primary care appointments, age ≥55 years	62.8	19.7	--	College degree or equivalent: 41.8% Local authority/public housing: 14.8%	Beh, Health/Other, Harms
Pregnant women	Chang, 1999[181]	Fair	US	250	Pregnant women attending their first prenatal appointment (mean, 16 weeks' gestation), ages 18-43 years	30.7	100	White: 78.0 Black: 14.0 Asian: 2.0 Hisp: 6.0	Some college: 29% ≥College degree: 56% Married: 74%	Beh, Health/Other
	Chang, 2005[191]	Fair	US	304	Pregnant women attending a prenatal appointment (mean, 12 weeks' gestation)	NR	100	White: 78.6 Black: 7.6 Other: 13.8	Median education: 16 years Median annual income for home ZIP code: $55,357 Married/in a committed relationship: 80.5%	Beh
	O'Connor, 2007[202]	Fair	US	345	Pregnant women attending a prenatal appointment at a WIC clinic (mean, 18 weeks' gestation)	28.1	100	White: 7.9 Black: 18.9 Hisp: 34.5 Other: 4.3	Mean education: 11.4 years Annual income ≤$15,000: 67.2%	Beh, Health/Other
	Ondersma, 2015[217]	Fair	US	48	Pregnant women, seeking services at a prenatal care clinic (mean, 12 weeks' gestation), age ≥18 years	NR	100	Black: 81.3	≥High school: 66.7% Any public assistance: 81.3% Married: 20.8%	Beh, Health/Other, Harms
	Osterman, 2014[221]	Fair	US	122	Pregnant women attending prenatal appointment (mean, 24 weeks' gestation), ages 18-44 years	25.4	100	White: 30.3 Black: 58.2 Hisp: 3.3 Other: 5.7	Some college: 41.8% ≥College degree: 3.3% Annual income ≤$15,000: 69.7% Married: 14.8%	Beh, Health/Other
	Reynolds, 1995[203]	Fair	US	78	Pregnant women attending prenatal appointment (mean, 12 weeks' gestation)	22.4	100	White: 33.3 Black: 66.7	Income: <$5,000: 58.3% <$10,000: 88.0%	Beh
	Rubio, 2014[184]	Fair	US	330	Pregnant women attending their 1st or 2nd obstetric appointment (mean, 10 weeks' gestation), age ≥18 years	23.8	100	White: 53.6 Black: 43.0 Other: 3.3	Some postsecondary education: 26.5% ≥College degree: 10.2% Medicaid: 89.0%	Beh, Health/Other

Table 7. Trial and Population Characteristics for KQ4, by Population

Target population	Author, year Study name	QR	Country	n rand	Brief population description	Mean age, yrs	Female, %	Race/ ethnicity, %	SES variables	Outcomes reported
Pregnant women	Tzilos, 2011[235]	Fair	US	50	Pregnant women attending a prenatal care appointment (mean, 25 weeks' gestation), ages 18-45 years	25.6	100	White: 16.0 Black: 82.0 Hisp: 2.0	Education level: 0-8 grades: 10.0% 9-11 grades: 48.0% High school graduate/ GED: 30.0% Some college: 12.0% WIC food assistance: 72.0% FIA assistance: 44.0%	Beh, Health/Other
	van der Wulp, 2014[222]	Fair	NLD	393	Pregnant women (mean, 8 weeks' gestation), age ≥18 years	32.6	100	--	High education level: 66.2% High income: 33.9% Steady partner: 56.7%	Beh
Postpartum women	Fleming, 2008[158]	Fair	US	235	Postpartum women (mean, 6.4 weeks postpartum) attending appointments for postpartum care, age ≥18 years	NR	100	White: 81.7 Black: 6.8 Asian: 0.9 AI/AN: 7.2 Hisp: 2.5 Other: 0.9	Some college: 31.5% ≥College degree: 31.5% Working full- or part time: 19.5% Married: 60.8%	Beh
	Ondersma, 2016[212]	Fair	US	123	Postpartum women in postdelivery recovery, age ≥18 years	27.1	100	White: 4.1 Black: 87.0 Other: 9.0	≥High school: 74.8% Receipt of food assistance: 74.8%	Beh

Abbreviations: AI/AN = American Indian/Alaska Native; AUS = Australia; Beh = behavioral; CAN = Canada; DEU = Germany; DNK = Denmark; FIN = Finland; FQHC = federally qualified health clinic; GBR = Great Britain; GP = general practitioner; Hisp = Hispanic; KQ = key question; NLD = Netherlands; NZL = New Zealand; PCP = primary care provider; QR = quality rating; rand = randomized; SES = socioeconomic status; SSDI = Social Security Disability Insurance; SSI = Supplemental Security Income; SWE = Sweden; SWL = Switzerland; US = United States; yrs = years.

Table 8. Summary Study Characteristics for Key Questions 4 and 5

Population	No. studies	No. randomized	No. (%) good quality	No. (%) conducted in U.S.	Other countries represented	No. (%) in primary care	Other settings	Median % followup (range)	No. (%) in previous review
All populations	**68**	**36,528**	**10 (15)**	**41 (60)**		**42 (62)**		**82 (59-100)**	**19 (28)**
Adolescents	2	588	1 (50)	1 (50)	SWL	1 (50)	High school	96 (93-98)	0 (0)
Adults (nonpregnant/ postpartum)	*55*	33,662	*9 (16)*	30 (55)		*32 (58)*		82 (59-96)	*17 (31)*
Young adults	22	14,214	4 (18)	15 (68.2)	AUS, CAN, NLD, NZL, SWE, SWL	4 (18)	University (k=16), military recruitment center (k=2)	84 (65-90)	4 (18)
Adults	29	16,944	3 (10)	12 (41)	AUS, CAN, DEU, DNK, ESP, FIN, GBR, NLD	24 (83)	Other medical (k=2), research registry (k=1), epidemiologic household surveys (k=2)	77 (59-96)	11 (38)
Older adults	4	2504	2 (50)	3 (75)	GBR	4 (100)	--	88 (83-92)	2 (50)
Pregnant/ postpartum	*11*	*2278*	*0*	*10 (91)*		*9 (82)*		*81 (63-100)*	*2 (18)*
Pregnant women	9	1920	0	8 (89)	NLD	8 (89)	--	81 (63-100)	1 (11)
Postpartum women	2	358	0	2 (100)	--	1 (50)	Postpartum recovery	79 (70-88)	1 (50)

Abbreviations: AUS = Australia; CAN = Canada; DEU = Germany; DNK = Denmark; ESP = Spain; FIN = Finland; GBR = Great Britain; NLD = Netherlands; No. = number; NZL = New Zealand; RCT = randomized controlled trial; SWE = Sweden; SWL = Switzerland; WIC = Women, Infants, and Children.

Table 9. Summary Population Characteristics for Key Questions 4 and 5

Population	No. studies	Average age*	% Female*	% White*† (no. studies reporting)	% Black*† (no. studies reporting)	% Asian*† (no. studies reporting)	% American Indian/Alaska Native*† (no. studies reporting)	% Hispanic*† (no. studies reporting)	No. (%) studies majority nonwhite‡	No. (%) studies majority low SES§	Average baseline alcohol use* (no. studies reporting)
All populations	**68**	**35.0**	**48.8**	**74.7 (37)**	**11.4 (28)**	**10.3 (16)**	**1.0 (9)**	**9.7 (22)**	**11 (16)**	**12 (18)**	**Drinks/week: 16 (44) HUE/week: 1.8 (16)**
Adolescents	*2*	*16.7*	*56.3*	*NR*	*84 (1)*	*NR*	*NR*	*NR*	*1 (50)*	*0*	*Drinks/week: 12 (1) HUE/week: 0.4 (1)*
Adults (nonpregnant/ postpartum)	*55*	*35.5*	*44.8*	*77.6 (28)*	*6.7 (17)*	*10.7 (14)*	*0.7 (8)*	*9.2 (17)*	*4 (7)*	*5 (9)*	*Drinks/week: 16 (40) HUE/week: 2.0 (14)*
Young adults	22	19.8	51.5	75.0 (14)	2.7 (9)	13.6 (11)	0.5 (5)	6.8 (9)	0	0	Drinks/week: 11 (17) HUE/week: 2.6 (8)
Adults	29	44.7	42.1	76.2 (12)	18.7 (7)	1.5 (2)	0.9 (2)	16.7 (6)	4 (14)	5 (17)	Drinks/week: 22 (20) HUE/week: 1.0 (5)
Older adults	4	68.5	29.8	93.8 (2)	0.3 (1)	0.9 (1)	1.5 (1)	7.0 (2)	0	0	Drinks/week: 14 (3) HUE/week: 1.0 (1)
Pregnant/ postpartum	*11*	*28.1*	*100*	*49.3 (9)*	*31.4 (10)*	*1.5 (2)*	*7.2 (1)*	*14.5 (5)*	*6 (55)*	*7 (64)*	*Drinks/week: 6 (3) HUE/week: 0.8 (1)*
Pregnant women	9	28.2	100	47.9 (7)	30.7 (8)	2.0 (1)	NR	18.1 (4)	5 (56)	6 (67)	Drinks/week: 1.8 (2) HUE/week: NR (0)
Postpartum women	2	27.1	100	55.0 (2)	34.4 (2)	0.9 (1)	7.2 (1)	2.5 (1)	1 (50)	1 (50)	Drinks/week: 8 (1) HUE/week: 0.8 (1)

* Weighted by n randomized.

† Among studies conducted in the U.S. (k=39).

‡ Assuming studies not reporting race/ethnicity were majority white.

§ Assuming studies not reporting SES are not majority low SES; low SES defined as >50% uninsured, Medicaid, annual income <$15,000, or on public assistance or >20% homeless.

Abbreviations: HUE = heavy use episodes; No. = number; RCT = randomized controlled trial; SES = socioeconomic status.

Table 10. Summary Intervention Characteristics for Key Questions 4 and 5 (All Intervention Conditions): Number (%) of Intervention Arms With Designated Characteristics

Population	k	Single session*			Multiple sessions*		Other	Est. total contact minutes, median (range)	Web- or computer-based only	PNF	MI or ME	CBT	Other elements (no. arms)	Primary care team involved	PCP delivered most/all of intervention
		VB	B	E	B	E									
All populations	**94**	**51 (54)**			**40 (43)**		**3 (3)**	**30 (1-600)**	**30 (32)**	**58 (62)**	**36 (38)**	**12 (13)**		**29 (31)**	**16 (17)**
		18	**15**	**15**	**23**	**16**									
Adolescents	*2*	*1 (50)*			*1 (50)*		--	*20†*	*0 (0)*	*2 (100)*	*1 (50)*	*0 (0)*	--	*0 (0)*	*0 (0)*
		0	*0*	*1*	*1*	*0*									
Adults (nonpregnant/ postpartum)	*80*	*44 (55)*			*33 (41)*		*3 (4)*	*30 (1-600)*	*27 (34)*	*53 (66)*	*29 (36)*	*9 (11)*	--	*29 (36)*	*16 (20)*
		19	*16*	*9*	*18*	*15*									
Young adults	38	30 (79)			7 (18)		1 (mail only)	35 (1-600)	23 (61)	34 (89)	10 (26)	3 (8)	Parent involvement (2)	2 (5)	2 (5)
		10	12	8	5	2									
Adults	38	14 (37)			22 (58)		2 (not prescribed)	30 (3-555)	4 (11)	18 (47)	17 (45)	5 (13)	PHF (4), FRAMES (2), Stepped care (2)	24 (63)	13 (34)
		9	4	1	11	11									
Older adults	4	0 (0)			4 (100)		--	80 (30-140)	0 (0)	1 (25)	2 (50)	1 (25)	PHF (2), Stepped care (1)	3 (75)	1 (25)
		0	0	0	2	2									
Pregnant/ postpartum	*12*	*6 (50)*			*6 (50)*			*22 (10-80)*	*3 (25)*	*3 (25)*	*6 (50)*	*3 (25)*		*0 (0)*	*0 (0)*
		0	*1*	*5*	*4*	*2*									
Pregnant women	10	5 (50)			5 (50)		--	22 (10-80)	2 (20)	2 (20)	4 (40)	2 (20)	PHF (1), FRAMES (1), Partner involvement (1)	0 (0)	0 (0)
		0	1	4	3	2									
Postpartum women	2	1 (50)			1 (50)		--	30 (20-40)	1 (50)	1 (50)	2 (100)	1 (50)	FRAMES (1)	0 (0)	0 (0)
		0	0	1	1	0									

***** Intensity categories defined as: Very brief (VB) = single contact, ≤5 min; Brief (B) = ≤15 min; Extended (E) = ≥15 min.

† Able to estimate total minutes for only one trial in adolescents.

Abbreviations: B = brief; CBT = cognitive behavioral therapy; E = extended; Est. = estimated; FRAMES = Feedback of personal risks or impairment, Responsibility, Advice, Menu, Empathy, Self-efficacy; k = number of study arms; ME = motivational enhancement; MI = motivational interviewing; No. = number; PCP = primary care provider; PHF = personalized health-related feedback; PNF = personalized normative feedback; VB = very brief.

Table 11. Summary of Meta-Analysis Results, Primary Drinking Outcomes for Key Question 4

Outcome (effect measure)	Population	Pooled effect (95% CI)	No. studies (groups)	N analyzed	I^2, %	Tau^2
Drinks per week, between-group difference in change from baseline (weighted mean difference)	**All Populations**	**-1.59 (-2.15 to -1.03)**	**32 (37)**	**15,974**	**63**	**1.40**
	Adolescents	-1.83 (-6.45 to 2.78)	1 (2)	477	87	9.77
	Young Adults	-0.86 (-1.29 to -0.43)	14 (14)	6935	11	0.07
	General Adults	-2.51 (-3.81 to -1.21)	15 (18)	7662	70	3.73
	Older Adults	-2.98 (-6.96 to 0.99)	2 (2)	665	81	6.77
	Pregnant Women	NR	0	--	--	--
	Postpartum Women	-2.28 (-3.59 to -0.96)	1 (1)	235	NA	NA
% Exceeding recommended drinking limits (OR)	**All Populations**	**0.60 (0.53 to 0.67)**	**15 (16)**	**9760**	**24**	**0.01**
	Adolescents	NR	0	--	--	--
	Young Adults	0.71 (0.60 to 0.86)	2 (2)	3068	0	0.0
	General Adults	0.56 (0.49 to 0.65)	10 (11)	4964	14	0.01
	Older Adults	0.58 (0.41 to 0.80)	3 (3)	1728	24	0.02
	Pregnant Women	NR	0	--	--	--
	Postpartum Women	NR	0	--	--	--
% With heavy use episodes (OR)	**All Populations**	**0.67 (0.58 to 0.77)**	**12 (14)**	**8108**	**24**	**0.01**
	Adolescents	0.55 (0.22 to 1.34)	1 (2)	**477**	**52**	**0.24**
	Young Adults	0.81 (0.63 to 1.05)	2 (2)	2247	0	0.0
	General Adults	0.65 (0.53 to 0.81)	6 (7)	3683	44	0.03
	Older Adults	0.59 (0.44 to 0.80)	3	1701	0	0.0
	Pregnant Women	NR	0	--	--	--
	Postpartum Women	NR	0	--	--	--
% Abstinent from alcohol (OR)	Pregnant Women	2.26 (1.43 to 3.56)	5	796	0	0.0

Abbreviations: CI = confidence interval; N = number of participants; No. = number; NR = not reported; OR = odds ratio.

Table 12. Summary of Evidence Table

Key question	No. of Studies (k), no. of Observations (n)	Summary of findings	Consistency/ precision	Reporting bias	Overall study quality	Body of evidence limitations	EPC assessment of overall strength of evidence	Applicability
KQ1. Benefits of screening	k=0	NA	NA	NA	NA	NA	Insufficient	NA
KQ2. Screening accuracy	k= 45 n=277,938	For adolescents, data supported the use of the NIAAA Youth Screen and other one- or two-item screeners to detect AUD; however, data were insufficient to determine whether brief (1- to 3-item) screeners or AUDIT can detect unhealthy use. Preliminary evidence suggests lower cutoffs than the standard ≥8 would be preferred for AUDIT if used. For adults, brief (1- to 3-item) 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, 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 a longer instrument, such as AUDIT, with greater specificity.	Reasonably consistent, reasonably precise (Adolescents, to detect AUD) NA (Adolescents, to predict unhealthy use) Reasonably consistent, reasonably precise (Adults)	None suspected	Good: 17 Fair: 28	Information around the administration of the screening test and reference standard often not well reported (order of tests, blinding of interviewer to the results of the index test while administering the reference standard).	Moderate (Adolescents, to detect AUD) Insufficient (Adolescents, to detect full spectrum of unhealthy alcohol use) High (Adults)	Many in U.S. primary care, including studies covering both general populations and targeted subgroup with comorbidities and in different types of settings (e.g., including the VA and Indian Health Service). U.S.-based studies outside of primary care included epidemiologic surveys with sampling representative of the U.S. population, with oversampling of racial/ethnic minorities in some cases. Young adult studies primarily in college settings.

Table 12. Summary of Evidence Table

Key question	No. of Studies (k), no. of Observations (n)	Summary of findings	Consistency/ precision	Reporting bias	Overall study quality	Body of evidence limitations	EPC assessment of overall strength of evidence	Applicability
KQ3. Harms of screening	k=0	NA	NA	NA	NA	NA	Insufficient	NA
KQ4a. Benefits of interventions: alcohol use and other risky behavior	k=68 RCTs n=36,528	Interventions reduced drinks/week (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-month followup, or during the late pregnancy or early postpartum period for abstinence during pregnancy. Benefits remained through 24 months 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 for adolescents Reasonably consistent, reasonably precise for adults	Suspected, due to detected small-study bias	Good: 10 Fair: 58	Inconsistency of outcomes reported, and some important outcomes sparely reported, such as proportion meeting or exceeding recommended drinking limits; risk of social desirability bias	Low (Adolescents) Moderate (Adults)	Majority of trials conducted in U.S., in primary care, and in the past 10 years, with representation from a wide range of important subpopulations (e.g., young adults, older adults, pregnant and postpartum women, low income, with comorbidities, racial/ethnic minorities)

Table 12. Summary of Evidence Table

Key question	No. of Studies (k), no. of Observations (n)	Summary of findings	Consistency/ precision	Reporting bias	Overall study quality	Body of evidence limitations	EPC assessment of overall strength of evidence	Applicability
KQ4b. Benefits of interventions: health, social, and legal outcomes	k=41 n=20,324	No evidence in adolescents. In adults, studies reported statistically nonsignificant reduction in all-cause mortality (OR, 0.64 [95% CI, 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 ED visits, controlled substance or liquor violations at 4-year followup 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 (Adults) Other outcomes: Inconsistent, imprecise (Adults)	Possible for mortality, since all studies reporting had at least 1 death.	Good: 6 Fair: 35	Wide range of outcomes reported with little replication and few studies reporting any particular outcome; mortality underpowered with ascertainment usually not described	Insufficient (Adolescents) Low (Adults)	Majority of trials conducted in U.S., in primary care, and in the past 10 years, with representation from a wide range of important subpopulations (e.g., young adults, older adults, pregnant and postpartum women, low income, with comorbidities, racial/ethnic minorities)

Table 12. Summary of Evidence Table

Key question	No. of Studies (k), no. of Observations (n)	Summary of findings	Consistency/ precision	Reporting bias	Overall study quality	Body of evidence limitations	EPC assessment of overall strength of evidence	Applicability
KQ5. Harms of interventions	k=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	None detected	Good: 1 Fair: 5	Sparsely reported	Low	Majority of trials conducted in U.S., in primary care, and in the past 10 years.

Abbreviations: EPC = evidence-based practice center; k = number of studies; KQ = key question; n = number of participants; NA = not applicable; No. = number; OR = odds ratio; RCT = randomized controlled trial; U.S. = United States; WMD = weighted mean difference.

Table 13. Positive and Negative Predictive Values for a Range of Sensitivity and Specificity Based on U.S. Prevalence of Unhealthy Alcohol Use[11]

Target population	Condition	Condition, %	PPV 70/80*	PPV 80/90*	PPV 90/90*	NPV 70/80*	NPV 80/90*	NPV 90/90*
Adolescents	Heavy use episode, past month	4.9	15.3	29.2	31.7	98.1	98.9	99.4
	Heavy drinking, past month	0.8	2.7	6.1	6.8	99.7	99.8	99.9
	AUD, current	2.0	6.7	14.0	15.5	99.2	99.5	99.8
Adults (18+ years)	Heavy use episode, past month	26.2	55.4	74.0	76.2	88.2	92.7	96.2
	Heavy drinking, past month	6.6	19.8	36.1	38.9	97.4	98.4	99.2
	AUD, current	6.0	18.3	33.8	36.5	97.7	98.6	99.3
Young adult (18-25 years)	Heavy use episode, past month	38.4	68.6	83.3	84.9	81.0	87.8	93.5
	Heavy drinking, past month	10.1	28.2	47.3	50.3	96.0	97.6	98.8
	AUD, current	10.7	29.5	48.9	51.9	95.7	97.4	98.7
Middle adults (26+ years)	Heavy use episode, past month	24.2	52.8	71.9	74.2	89.3	93.4	96.6
	Heavy drinking, past month	6.0	18.3	33.8	36.5	97.7	98.6	99.3
	AUD, current	5.2	16.1	30.5	33.1	98.0	98.8	99.4
Older adults (65+ years)	Heavy use episode, past month	9.7	27.3	46.2	49.2	96.1	97.7	98.8
	Heavy drinking, past month	2.3	7.6	15.8	17.5	99.1	99.5	99.7
	AUD, current	1.6	5.4	11.5	12.8	99.4	99.6	99.8
Pregnant women	Heavy use episode, past month	4.3	13.6	26.4	28.8	98.3	99.0	99.5
	Heavy drinking, past month	0.9	3.1	6.8	7.6	99.7	99.8	99.9
	AUD, current	†	NA	NA	NA	NA	NA	NA

* Sensitivity/Specificity.
† Data not available.

Abbreviations: AUD = alcohol use disorder; NA = not applicable; NPV = negative predictive value; PPV = positive predictive value.

Table 14. Comparison With the 2012 USPSTF Review: Differences in Change in Alcohol Outcomes Between Alcohol Counseling Intervention Groups and Control Groups

Target population	Outcome	Current review	2012 review
General adult populations	Drinks/week	-2.51 (95% CI, -3.81 to -1.21)	-3.6 (95% CI, -4.8 to -2.4)
	% Within recommended limits*†	RD, 14% (95% CI, 9% to 16%)	RD, 11% (95% CI, 8% to 13%)
	% Heavy use episode‡	RD, -10% (95% CI, -14% to -5%)	RD, -12% (95% CI, -16% to -7%)
Older adults	Drinks/week	-2.98 (95% CI, -6.96 to 0.99)	-1.7 (95% CI, -2.8 to -0.6)
	% Within recommended limits*†	RD, 13% (95% CI, 5% to 20%)	RD, 9% (95% CI, 2% to 16%)
	% Heavy use episode‡	RD, -10% (95% CI, -14% to -5%)	Not available
Younger adults	Drinks/week	-0.86 (95% CI, -1.29 to -0.43)	-1.7 (95% CI, -0.07 to -2.6)
	Heavy use episodes/month	-0.2 (95% CI, -0.6 to 0.2)	-0.9 (95% CI, -0.3 to -1.5)
Pregnant women	Drinks/week	No difference (2 studies)	No difference (1 study)
	Abstinence	OR, 2.26 (95% CI, 1.43 to 3.56)	Greater abstinence in subgroup only of 1 study
Adolescents	Drinks/week; drinking days in past month	Mixed results (2 studies)	No evidence

* The outcome exceeding recommended limits was flipped to reflect within recommended limits, for consistency with the previous review.

† The assumed control group percent within recommended limits was 33% for general adult populations, 56% for older adult populations.

‡ The assumed control group percent with a heavy use episode was 39% for general adult populations, 31% for older adult populations.

Abbreviations: RD = risk difference; USPSTF = United States Preventive Services Task Force.

Abbreviations

4P's Plus = Past use, Pregnancy, use by Parents and Partners
5 A's = Ask, Advise, Assess, Assist, Arrange
AAP = American Academy of Pediatrics
ACOG = American College of Obstetricians and Gynecologists
ADHD = Attention Deficit Hyperactivity Disorder
ADI = Adolescent Drinking Index
ADV = average daily volume
AHRQ = Agency for Healthcare Research and Quality
AREAS = Academic Role Expectations and Alcohol Scale
ARPS = Alcohol-Related Problems Survey
ASAM = American Society of Addiction Medicine
ASI = Addictions Severity Index
ASSIST = Alcohol, Smoking and Substance Involvement Screening Test
AUD = Alcohol Use Disorder
AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule
AUDIT = Alcohol Use Disorders Identification Test
AUDIT-C = Alcohol Use Disorders Identification Test, Consumption
BRFSS = Behavioral Risk Factor Surveillance System
BSTAD = Brief Screener for Tobacco, Alcohol, and other Drugs
CAGE = Cut-down, Annoyed, Guilty, Eye-opener
CARET = Comorbidity Alcohol Risk Evaluation Tool
CI = confidence interval
CIDI = Composite International Diagnostic Interview
CRAFFT = Car, Relax, Alone, Forget, Family, Friends, Trouble
DISC-IV = Diagnostic Interview Schedule for Children, Version Four
DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition
DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition
ED = emergency department
FASDs = fetal alcohol spectrum disorders
FDA = Food and Drug Administration
FRAMES = Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy
GRADE = Grading of Recommendations Assessment, Development and Evaluation
HIV = human immunodeficiency virus
ICD = International Statistical Classification of Diseases and Related Health Problems
KQ = Key Question
M/F = men/women
MI = Motivational Interviewing
MINI-Plus = Mini International Neuropsychiatric Interview Plus
NESARC = National Epidemiologic Survey on Alcohol and Related Conditions
NET = Normal drinker, Eye opener, Tolerance
NIAAA = National Institute on Alcohol Abuse and Alcoholism
NNT = number needed to treat
NR = not reported
NSDUH = National Survey on Drug Use and Health

OR = odds ratio
PMPM = per member per month
RAPI = Rutgers Alcohol Problem Index
RCT = randomized controlled trial
REML = restricted maximum likelihood
RR = risk ratio
SASQ = Single Item Alcohol Screening Questionnaire
SBIRT = Screening, Brief Intervention, Referral, and Treatment
SES = socioeconomic status
shARPS = Short Alcohol-Related Problems Survey
SIP = Short Inventory of Problems
STI = sexually transmitted infection
T-ACE = Tolerance-Annoyed, Cut-down, Eye-opener
TLFB = Timeline Followback
TrEAT = Trial for Early Alcohol Treatment
TWEAK = Tolerance, Worried, Eye-openers, Amnesia, Kut-down
U.K. = United Kingdom
U.S. = United States
USAUDIT = Alcohol Use Disorders Identification Test, United States
USAUDIT-C = Alcohol Use Disorders Identification Test-Consumption, United States
USPSTF = U.S. Preventive Services Trask Force
VA = United States Department of Veterans Affairs
WHO = World Health Organization
WIC = Women, Infants, and Children
WMD = weight mean difference

Literature Search Strategies for Primary Literature

Key:
/ = subject heading
$ = truncation
*=truncation
ab = word in abstract
adj# = adjacent within x number of words
hw = subject heading word
id = key phrase identifier
kw = keyword
md = methodology
pt = publication type
ti = word in title
**Note: The scope of the review initially contained medicated-assisted therapy, which is reflected in the search strategy below.*

Cochrane Central Register of Controlled Trials (CENTRAL)

Issue 9 of 12, September 2016

#1	alcohol*:ti,ab,kw near/1 (use* or abuse* or misuse* or depend* or addict* or excess* or harmful or risk* or hazardous or problem* or unhealthy):ti,ab,kw
#2	(harmful* or risk* or hazardous or problem* or binge* or heavy or excessive or unhealthy):ti,ab,kw next drink*:ti,ab,kw
#3	"heavy episodic":ti,ab,kw
#4	#1 or #2 or #3
#5	screen*:ti,ab,kw
#6	assessment:ti,ab,kw next (tool* or instrument*):ti,ab,kw
#7	(alcohol*):ti,ab,kw near/5 (scale* or inventor* or questionnaire* or survey* or index* or checklist* or interview*):ti,ab,kw
#8	#5 or #6 or #7
#9	"Alcohol Use Disorders Identification Test":ti,ab,kw
#10	AUDIT-C:ti,ab,kw
#11	"Alcohol Smoking and Substance Involvement Screening Test":ti,ab,kw
#12	SASQ:ti,ab,kw
#13	"Single Alcohol Screening":ti,ab,kw next question*:ti,ab,kw
#14	"National Institute on Alcohol Abuse and Alcoholism Single Item":ti,ab,kw
#15	"NIAAA Single Item":ti,ab,kw
#16	"Cut down Annoyed Guilty Eye-opener":ti,ab,kw
#17	"Brief Screener for Tobacco Alcohol and other Drugs":ti,ab,kw
#18	BSTAD:ti,ab,kw
#19	"Comorbidity Alcohol Risk Evaluation Tool":ti,ab,kw
#20	"Tolerance Annoyed Cut down Eye opener":ti,ab,kw
#21	"Tolerance Worried Eye-opener Amnesia Kut down":ti,ab,kw
#22	SMAST-AID:ti,ab,kw
#23	"4Ps Plus":ti,ab,kw
#24	"Substance Use Risk Profile-Pregnancy":ti,ab,kw
#25	{Rands, #9-`#24}
#26	#4 and (#8 or #25) Publication Year from 2011 to 2016, in Trials
#27	(sensitivit* or specificit*):ti,ab,kw
#28	"predictive value":ti,ab,kw
#29	accuracy:ti,ab,kw
#30	false:ti,ab,kw next (negativ* or positiv*):ti,ab,kw
#31	(miss or error):ti,ab,kw next rate*:ti,ab,kw
#32	(advice or advise*):ti,ab,kw
#33	ROC:ti,ab,kw next curve*:ti,ab,kw
#34	receiver:ti,ab,kw next operat*:ti,ab,kw
#35	{or #27-#34}
#36	(#4 and #8) or #25
#37	#35 and #36 Publication Year from 1998 to 2016, in Trials
#38	alcohol:ti,ab,kw near/1 reduc*:ti,ab,kw
#39	alcohol:ti,ab,kw next (therap* or treatment*):ti,ab,kw

#40 controlled:ti,ab,kw next drink*:ti,ab,kw
#41 naltrexone:ti,ab,kw
#42 revia:ti,ab,kw
#43 depade:ti,ab,kw
#44 vivitrol:ti,ab,kw
#45 acamprosate:ti,ab,kw
#46 campral:ti,ab,kw
#47 disulfiram:ti,ab,kw
#48 antabuse:ti,ab,kw
#49 antabus:ti,ab,kw
#50 counsel*:ti,ab,kw
#51 behavio*:ti,ab,kw and chang*:ti,ab,kw
#52 behavio*:ti,ab,kw and intervention*:ti,ab,kw
#53 behavio*:ti,ab,kw and modification*:ti,ab,kw
#54 (motivational next interview*):ti,ab,kw
#55 (cognitive next behavio*):ti,ab,kw or cbt:ti,ab,kw
#56 behavio*:ti,ab,kw and therapy:ti,ab,kw
#57 (brief next intervention*):ti,ab,kw
#58 "self help":ti,ab,kw
#59 computer:ti,ab,kw next (based or mediated or assisted):ti,ab,kw
#60 email*:ti,ab,kw or internet:ti,ab,kw or (text next messag*):ti,ab,kw or web:ti,ab,kw or website:ti,ab,kw
#61 "patient education":ti,ab,kw or "health education":ti,ab,kw or "health promotion":ti,ab,kw
#62 "12 step":ti,ab,kw or "twelve step":ti,ab,kw or "alcoholics anonymous" or AA:ti,ab,kw
#63 intervention*:ti or psychosocial:ti
#64 {or #38-#63}
#65 #4 and #64 Publication Year from 2011 to 2016, in Trials
#66 #26 or #37 or #65

Ovid Medline, Ovid MEDLINE In-Process & Other Non-Indexed Citations, Ovid MEDLINE Daily Update

1 Alcohol-Related Disorders/
2 Alcoholic intoxication/
3 Alcoholism/
4 Binge Drinking/
5 (alcohol$ adj1 (use$ or abuse$ or misuse$ or depend$ or addict$ or excess$ or harmful or risk$ or hazardous or problem$ or unhealthy)).ti,ab.
6 ((harmful$ or risk$ or hazardous or problem$ or binge$ or heavy or excessive or unhealthy) adj drink$).ti,ab.
7 heavy episodic.ti,ab.
8 or/1-7
9 Mass screening/
10 screen$.ti,ab.
11 (assessment adj (tool$ or instrument$)).ti,ab.
12 (alcohol$ adj5 (scale$ or inventor$ or questionnaire$ or survey$ or index$ or checklist$ or interview$)).ti,ab.
13 Substance Abuse Detection/
14 or/9-13
15 "Alcohol Use Disorders Identification Test".ti,ab.
16 AUDIT-C.ti,ab.
17 "Alcohol Smoking and Substance Involvement Screening Test".ti,ab.
18 SASQ.ti,ab.
19 Single Alcohol Screening Question$.ti,ab.
20 "National Institute on Alcohol Abuse and Alcoholism Single Item".ti,ab.
21 NIAAA Single Item.ti,ab.
22 Cut down Annoyed Guilty Eye-opener.ti,ab.
23 "Brief Screener for Tobacco Alcohol and other Drugs".ti,ab.
24 BSTAD.ti,ab.
25 Comorbidity Alcohol Risk Evaluation Tool.ti,ab.
26 Tolerance Annoyed Cut down Eye opener.ti,ab.
27 Tolerance Worried Eye-opener Amnesia Kut down.ti,ab.
28 or/15-27
29 clinical trials as topic/ or controlled clinical trials as topic/ or randomized controlled trials as topic/
30 (clinical trial or controlled clinical trial or randomized controlled trial).pt.

31 Random$.ti,ab.
32 control groups/ or double-blind method/ or single-blind method/
33 clinical trial$.ti,ab.
34 controlled trial$.ti,ab.
35 or/29-34
36 8 and (14 or 28) and 35
37 "Sensitivity and Specificity"/
38 "Predictive Value of Tests"/
39 ROC Curve/
40 False Negative Reactions/
41 False Positive Reactions/
42 Diagnostic Errors/
43 "Reproducibility of Results"/
44 Reference Values/
45 Reference Standards/
46 Observer Variation/
47 Receiver operat$.ti,ab.
48 ROC curve$.ti,ab.
49 sensitivit$.ti,ab.
50 specificit$.ti,ab.
51 predictive value.ti,ab.
52 accuracy.ti,ab.
53 false positive$.ti,ab.
54 false negative$.ti,ab.
55 miss rate$.ti,ab.
56 error rate$.ti,ab.
57 or/37-56
58 (8 and 14) or 28
59 57 and 58
60 limit 59 to (english language and yr="1998 -Current")
61 Animals/ not (Humans/ and Animals/)
62 60 not 61
63 remove duplicates from 62
64 Alcohol deterrents/
65 (alcohol adj1 reduc$).ti,ab.
66 (alcohol adj (therap$ or treatment$)).ti,ab.
67 controlled drink$.ti,ab.
68 Naltrexone/
69 naltrexone.ti,ab.
70 revia.ti,ab.
71 depade.ti,ab.
72 vivitrol.ti,ab.
73 acamprosate.ti,ab.
74 campral.ti,ab.
75 Disulfiram/
76 disulfiram.ti,ab.
77 antabuse.ti,ab.
78 antabus.ti,ab.
79 Behavior Therapy/
80 Cognitive Therapy/
81 Counseling/
82 Directive Counseling/
83 Patient Education as Topic/
84 Risk Reduction Behavior/
85 Feedback, psychological/
86 Health education/
87 Health promotion/
88 Motivation/
89 Internet/
90 Motivational interviewing/
91 Persuasive communication/
92 Self-help groups/

93 Text messaging/
94 Therapy, computer-assisted/
95 (advice or advise$).ti,ab.
96 counsel$.ti,ab.
97 behavio?r$ chang$.ti,ab.
98 behavio?r$ intervention$.ti,ab.
99 behavio?r$ modification$.ti,ab.
100 motivational interview$.ti,ab.
101 (cognitive behavio$ or behavio$ therapy or cbt).ti,ab.
102 brief intervention$.ti,ab.
103 self help.ti,ab.
104 text messag$.ti,ab.
105 (web or website).ti,ab.
106 (computer adj (based or mediated or assisted)).ti,ab.
107 12 step.ti,ab.
108 twelve step.ti,ab.
109 Alcoholics Anonymous/
110 alcoholics anonymous.ti,ab.
111 (intervention$ or psychosocial).ti.
112 or/64-110
113 8 and 112
114 Alcohol-Related Disorders/dt, pc, rh, th [Drug Therapy, Prevention & Control, Rehabilitation, Therapy]
115 Alcoholic intoxication/dt, pc, rh, th
116 Alcoholism/dt, pc, rh, th
117 Binge Drinking/dt, pc, rh, th
118 113 or 114 or 115 or 116 or 117
119 clinical trials as topic/ or controlled clinical trials as topic/ or randomized controlled trials as topic/
120 (clinical trial or controlled clinical trial or randomized controlled trial).pt.
121 Random$.ti,ab.
122 control groups/ or double-blind method/ or single-blind method/
123 clinical trial$.ti,ab.
124 controlled trial$.ti,ab.
125 119 or 120 or 121 or 122 or 123 or 124
126 118 and 125
127 36 or 126
128 limit 127 to (english language and yr="2011 -Current")
129 Animals/ not (Humans/ and Animals/)
130 128 not 129
131 remove duplicates from 130
132 63 or 131

PsycInfo

1 Alcohols/
2 Alcohol Abuse/
3 Alcohol Intoxication/
4 Acute Alcoholic Intoxication/
5 Chronic Alcoholic Intoxication/
6 Binge Drinking/
7 Alcoholism/
8 (alcohol$ adj1 (use$ or abuse$ or misuse$ or depend$ or addict$ or excess$ or harmful or risk$ or hazardous or problem$ or unhealthy)).ti,ab,id.
9 ((harmful$ or risk$ or hazardous or problem$ or binge$ or heavy or excessive or unhealthy) adj drink$).ti,ab,id.
10 heavy episodic.ti,ab,id.
11 or/1-10
12 Screening/
13 Health Screening/
14 Screening Tests/
15 Intake Interview/
16 Symptom Checklists/
17 Interviews/
18 Questionnaires/

19 Rating Scales/
20 Self Report/
21 General Health Questionnaire/
22 Computer Assisted Diagnosis/
23 screen$.ti,ab,id.
24 (assessment adj (tool$ or instrument$)).ti,ab,id.
25 (alcohol$ adj5 (scale$ or inventor$ or questionnaire$ or survey$ or index$ or checklist$ or interview$)).ti,ab,id.
26 self report$.ti,ab,id.
27 identif$.ti.
28 or/12-27
29 "Alcohol Smoking and Substance Involvement Screening Test".ti,ab,tm.
30 AUDIT-C.ti,ab,tm.
31 "Alcohol Smoking and Substance Involvement Screening Test".ti,ab,tm.
32 SASQ.ti,ab,tm.
33 Single Alcohol Screening Question$.ti,ab,tm.
34 "National Institute on Alcohol Abuse and Alcoholism Single Item".ti,ab,tm.
35 NIAAA Single Item.ti,ab,tm.
36 Cut down Annoyed Guilty Eye-opener.ti,ab,tm.
37 "Brief Screener for Tobacco Alcohol and other Drugs".ti,ab,tm.
38 BSTAD.ti,ab,tm.
39 Comorbidity Alcohol Risk Evaluation Tool.ti,ab,tm.
40 Tolerance Annoyed Cut down Eye opener.ti,ab,tm.
41 Tolerance Worried Eye-opener Amnesia Kut down.ti,ab,tm.
42 or/29-41
43 random$.ti,ab,id,hw.
44 placebo$.ti,ab,hw,id.
45 controlled trial$.ti,ab,id,hw.
46 clinical trial$.ti,ab,id,hw.
47 clinical trial.md.
48 Experiment Controls/
49 or/43-48
50 11 and (28 or 42) and 49
51 limit 50 to (english language and yr="2011 -Current")
52 Test Validity/
53 Test Reliability/
54 Interrater Reliability/
55 validity.ti,ab,id.
56 reliability.ti,ab,id.
57 Receiver operat$.ti,ab,id.
58 ROC curve$.ti,ab,id.
59 sensitivit$.ti,ab,id.
60 specificit$.ti,ab,id.
61 predictive value.ti,ab,id.
62 accuracy.ti,ab,id.
63 false positive$.ti,ab,id.
64 false negative$.ti,ab,id.
65 miss rate$.ti,ab,id.
66 error rate$.ti,ab,id.
67 or/52-66
68 (11 and 28) or 42
69 67 and 68
70 limit 69 to (english language and yr="1998 -Current")
71 Acamprosate/
72 acamprosate.ti,ab,id.
73 campral.ti,ab,id.
74 Naltrexone/
75 revia.ti,ab,id.
76 depade.ti,ab,id.
77 vivitrol.ti,ab,id.
78 Disulfiram/
79 disulfiram.ti,ab,id.
80 antabuse.ti,ab,id.

81 antabus.ti,ab,id.
82 Alcohol Rehabilitation/
83 Rehabilitation Counseling/
84 (alcohol adj1 reduc$).ti,ab,id.
85 (alcohol adj (therap$ or treatment$)).ti,ab,id.
86 controlled drink$.ti,ab,id.
87 Health Promotion/
88 Motivation/
89 Behavior Modification/
90 Behavior Change/
91 behavio?r$ chang$.ti,ab,id.
92 behavio?r$ intervention$.ti,ab,id.
93 behavio?r$ modification$.ti,ab,id.
94 behavior therapy/
95 cognitive behavior therapy/
96 cognitive therapy/
97 Cognitive Techniques/
98 (cognitive behavio$ or behavio$ therapy or cbt).ti,ab,id.
99 brief intervention$.ti,ab,id.
100 Persuasive Communication/
101 Motivational Interviewing/
102 motivational interview$.ti,ab,id.
103 Health Knowledge/
104 Health Behavior/
105 Health Education/
106 Client Education/
107 Feedback/
108 Online Therapy/
109 Computer Assisted Therapy/
110 Computer Mediated Communication/
111 Computer Assisted Testing/
112 Internet/
113 (computer adj (based or mediated or assisted)).ti,ab,id.
114 text messag$.ti,ab,id.
115 email$.ti,ab,id.
116 internet.ti,ab,id.
117 (web or website).ti,ab,id.
118 Self Help Techniques/
119 self help.ti,ab,id.
120 counseling/
121 Group Counseling/
122 counseling.ti,ab,id.
123 counselling.ti,ab,id.
124 Alcoholics Anonymous/
125 Twelve Step Programs/
126 alcoholics anonymous.ti,ab,id.
127 12 step.ti,ab,id.
128 twelve step.ti,ab,id.
129 advice.ti,ab,id.
130 advise$.ti,ab,id.
131 (intervention$ or psychosocial).ti.
132 or/71-131
133 11 and 49 and 132
134 limit 133 to (english language and yr="2011 -Current")
135 51 or 70 or 134

PubMed, publisher-supplied

#29 Search #28 AND publisher[sb] AND ("2011/01/01"[Date - Publication] : "3000"[Date - Publication]) AND English[Language]

#28 Search (#9 OR #26) AND #27

#27 Search random*[tiab] OR clinical trial*[tiab] OR controlled trial*[tiab]

#26 Search #4 AND #25

#25 Search #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24

#24 Search intervention*[ti] OR psychosocial[ti]

#23 Search “12 step”[tiab] OR “twelve step”[tiab] OR “alcoholics anonymous”[tiab]

#22 Search "patient education"[tiab] OR "health education"[tiab] OR "health promotion"[tiab]

#21 Search email*[tiab] OR internet[tiab] OR text messag*[tiab] OR web[tiab] OR website[tiab] OR computer based[tiab] OR computer mediated[tiab] OR computer assisted[tiab]

#20 Search self help[tiab]

#19 Search brief intervention*[tiab]

#18 Search motivational interview*[tiab]

#17 Search behavio* therap*[tiab]

#16 Search cognitive behavio*[tiab] OR cbt[tiab]

#15 Search (behavio* chang*[tiab]) OR (behavio* intervention*[tiab]) OR (behavio* modification*[tiab])

#14 Search counsel*[tiab]

#13 Search naltrexone[tiab] OR revia[tiab] OR depade[tiab] OR vivitrol[tiab] OR acamprosate[tiab] OR campral[tiab] OR disulfiram[tiab] OR antabuse[tiab] OR antabus[tiab]

#12 Search controlled drink*[tiab]

#11 Search alcohol therap*[tiab] OR alcohol treatment*[tiab]

#10 Search alcohol reduc*[tiab] OR reduc* alcohol[tiab]

#9 Search #4 AND #8

#8 Search #5 OR #6 OR #7

#7 Search alcohol[tiab] AND (scale*[tiab] OR inventor*[tiab] OR questionnaire*[tiab] OR survey*[tiab] OR index*[tiab] OR checklist[tiab] OR interview[tiab])

#6 Search (assessment tool*[tiab] OR assessment instrument*[tiab])

#5 Search screen*[tiab]

#4 Search #1 OR #2 OR #3

#3 Search “heavy episodic”[tiab]

#2 Search harmful drink*[tiab] OR risky drink*[tiab] OR hazardous drink*[tiab] OR problem* drink*[tiab] OR binge drink*[tiab] OR heavy drink*[tiab] OR excessive drink*[tiab] OR unhealthy drink*[tiab]

#1 Search alcohol use*[tiab] OR alcohol abuse*[tiab] OR alcohol misuse*[tiab] OR alcohol depend*[tiab] OR alcohol addict*[tiab] OR alcohol problem[tiab] OR harmful alcohol [tiab] OR risky alcohol [tiab] OR hazardous alcohol [tiab] OR unhealthy alcohol [tiab] OR excess* alcohol [tiab] OR alcoholism[title]

Appendix A Table 1. Comparison of *DSM-IV* and *DSM-5* Alcohol-Related Disorders

DSM-IV	Symptoms (past year)	DSM-5
Any 1= Alcohol Abuse	Found that drinking (or being sick from drinking) often interfered with taking care of home or family responsibilities, caused problems at work, or caused problems at school.	2+ symptoms = Alcohol Use Disorder Mild: 2-3 symptoms Moderate: 4-5 symptoms Severe: 6+ symptoms
	More than once gotten into situations while or after drinking that increased the chances of getting hurt (e.g., driving, swimming, unsafe sexual behavior).	
	More than once gotten arrested, been held at a police station, or had other legal problems because of drinking (Not in DSM-5)	
	Continued to drink even though it was causing trouble with family and friends.	
Any 3 = Alcohol Dependence	Had to drink much more than previously in order to get the desired effect, or finding that the usual number of drinks had much less effect than previously.	
	Experienced the symptoms of withdrawal after the effects of alcohol were wearing off, such as trouble sleeping, shakiness, restlessness, nausea, sweating, racing heart, or seizure.	
	Had times when the patient drank more, or longer, than intended.	
	More than once wanted to cut down or stop, tried it, but could not.	
	Spent a lot of time drinking or being sick/getting over the aftereffects of drinking.	
	Given up or cut back on activities that were important or interesting in order to drink.	
	Continued to drink even though it was causing depression or anxiety, other health problems, or causing memory blackouts.	
	Wanted to drink so badly that the patient could not think of anything else. (Not in DSM-IV)	

Abbreviations: DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, 4th Edition; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, 5th Edition.

Appendix A Table 2. Inclusion and Exclusion Criteria

Category	Included	Excluded
Aim	Screening for unhealthy alcohol use and interventions for nondependent unhealthy alcohol use, with or without addressing other substances or behaviors	Studies in which the only aim is targeting another behavior (e.g., drug or tobacco use) (i.e., change in alcohol use is not a stated aim, even if it is a reported outcome)
Condition	Unhealthy alcohol use*, including: • Risky or hazardous use: consumption of alcohol above recommended daily, weekly, or per-occasion amounts; consumption levels that increase the risk for health consequences • Harmful use: a pattern of drinking that is already causing damage to health; damage may be either physical (e.g., liver damage from chronic drinking) or mental (e.g., depressive episodes secondary to drinking) • A diagnosis of an alcohol use disorder (e.g., according to *Diagnostic and Statistical Manual of Mental Disorders [DSM]* or *International Classification of Diseases [ICD]* diagnostic systems	
Population	**All KQs:** Adolescents and adults (age ≥12 years) **KQs 1–3:** Studies whose participants are not selected on the basis of alcohol use or a related behavior or condition **KQs 4, 5:** Studies in which at least 50% of the enrolled sample is recruited via population-based screening *A priori* subpopulations at greater risk for unhealthy alcohol use or its consequences will be examined based on the following: age, sex, race/ethnicity, socioeconomic status, pregnancy status, concurrent unhealthy drug use, severity of disorder, and presence of comorbid mental health conditions	Studies limited to: • Treatment-seeking individuals (including those responding to recruitment advertising) • Persons with concomitant psychotic disorders (e.g., schizophrenia) • Persons presenting in an emergency setting for alcohol-related issues (e.g., motor vehicle injury) • Other groups not generalizable to primary care (e.g., psychiatric inpatients, persons who are court-mandated to treatment, incarcerated persons) • **KQs 4, 5:** Persons with dependent alcohol abuse (or studies in which >50% of the enrolled sample is persons with dependent alcohol use)
Screening	**KQs 1, 3:** Screening for alcohol use using a brief standardized instrument or set of questions that is conducted in person or via telephone, mail, or electronically **KQ 2:** Accuracy of screening instruments will be limited to the following instruments, which are most widely used and feasible for application in primary care: • National Institute on Alcohol Abuse and Alcoholism (NIAAA) single- (for adults) or two-item (for adolescents) screening test, or comparable, including the Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD) (for adolescents) • Alcohol Use Disorders Identification Test (AUDIT), its abbreviated version (AUDIT-C), and variants of these • Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST) (for accuracy of detecting alcohol use only) • Comorbidity Alcohol Risk Evaluation Tool (CARET) (for the elderly) • TWEAK and T-ACE (for pregnant women)	• Studies without any screening instruments or question(s) • Laboratory tests

Appendix A Table 2. Inclusion and Exclusion Criteria

Category	Included	Excluded
Interventions	• Counseling designed to reduce unhealthy alcohol use, with or without referral • Counseling interventions can vary in their approach (e.g., 12-step program, cognitive behavioral therapy, motivational enhancement therapy), specific strategies (e.g., action plans, diaries), delivery method (e.g., face-to-face, electronic, individual, group-based), length of contact (e.g., brief, extended), and the number of contacts (e.g., single, multiple)	• Financial incentive • Vocational rehabilitation • Community-based media or policy interventions • Interventions to prevent initiation of use among nonusers • Pharmacotherapy
Comparators	**KQs 1, 3:** No screening or usual care **KQ 2:** Comparison with reference standard (i.e., structured or semistructured clinical interview) **KQs 4, 5:** • No intervention • Usual care • Waitlist • Attention control (e.g., intervention is similar in format and intensity but on a different content area) • Minimal intervention (e.g., no more than one single brief contact per year, brief written materials such as pamphlets)	Active intervention (e.g., comparators with a reasonable expectation of affecting change in alcohol consumption)
Setting	**KQs 1–3:** Population-based screening that takes place in a setting that is applicable to primary care, including: primary care clinics; prenatal clinics; obstetrics/gynecology clinics; specialty medical treatment settings (e.g., diabetes management, dialysis clinics); research clinics/office, home, or other community settings, including electronic or computer-based screening **KQs 4, 5:** Interventions in a screen-detected population that take place in a traditional primary care setting or one that is applicable to or referable from primary care, including: primary care clinics; prenatal clinics; obstetrics/gynecology clinics; school health clinics; behavioral/mental health clinics; substance abuse treatment centers; research clinics/office, home, or other community settings, including electronic or computer-based interventions. Screening to identify eligible participants must take place in broad-based, general settings comparable to primary care with a defined population (e.g., primary care clinic, Special Supplemental Nutrition Program for Women, Infants, and Children [WIC], college freshman orientation)	Screening that takes place in: • Behavioral/mental health clinic • Substance abuse treatment center • Emergency department/trauma center • Worksites, including occupational screening • Inpatient/residential facility • Other institutions (e.g., correctional facility)

Outcomes	**KQs 1a, 4a:**
	• Alcohol use (**required**), self-report and/or biologic measures, including:
	  ○ Frequency and/or quantity of alcohol use
	  ○ Abstinence (use/no use)
	  ○ Severity of alcohol use disorder (reported as an index measured by a standardized questionnaire, such as the Short Inventory of Problems, Addiction Severity Index, or the Severity of Dependence Scale)
	  ○ Meeting criteria for alcohol use disorder
	• Other risky behaviors (e.g., other drug use, risky sexual behaviors)
	
	KQs 1b, 4b:
	• All-cause mortality
	• Alcohol-related mortality (intentional and unintentional)
	• Alcohol-related morbidity (e.g., mental health symptoms/disorders; alcohol-related liver problems,
		• Attitudes, knowledge, and beliefs related to alcohol use
		• Intention to change behavior
		• Intervention participation/compliance
		• Alcohol use initiation

Appendix A Table 2. Inclusion and Exclusion Criteria

Category	Included	Excluded
	including fatty liver disease, alcoholic hepatitis, and alcoholic cirrhosis; cancer; cardiovascular disease, such as cardiomyopathy; neuropathy; cognitive impairment; gastritis; gastric ulcers; pancreatitis; anemia; injuries, assaults, and accidents; visits to emergency department and inpatient stays) • Obstetrical/perinatal/neonatal outcomes (e.g., perinatal mortality, preterm labor/delivery, low birth weight, placental abruption, intrauterine growth restriction, preeclampsia, antepartum or postpartum hemorrhage, gestational hypertension, decreased neonate length/head circumference, neonate neurobehavioral effects, congenital anomalies, neonatal abstinence syndrome, neonatal intensive care unit admission, decreased length of neonate hospitalization, fetal alcohol spectrum disorders) • Quality of life • Alcohol-related problems, such as legal problems, social and family relations, employment, and school/educational outcomes **KQ 2:** Sensitivity and specificity or data to calculate one or both **KQs 3, 5:** • Serious harms at any time point after the screening or intervention began (e.g., death, seizure, cardiovascular event, or other medical issue requiring urgent medical treatment; serious obstetrical/perinatal/neonatal complication attributable to included medications) • Demoralization due to failed quit attempt • Stigma, labeling, and/or discrimination • Privacy issues (e.g., insurability status) • Job loss • Interference with the doctor-patient relationship	
Outcome assessment timing	At least 6 months after baseline measurement (except for studies in pregnant women, for which shorter followup times will be included)	
Study design	**KQs 1, 3:** Studies that compare individuals who receive screening with those receiving no screening or usual care, including randomized, controlled trials and nonrandomized controlled trials **KQ 2:** Studies of screening accuracy reporting sensitivity and specificity compared with a structured or semistructured clinical interview **KQs 4, 5:** Randomized, controlled trials and nonrandomized controlled trials	Prospective and retrospective cohort studies, case control studies**,** time series studies, before-after studies with no comparison group, cross-sectional studies, case studies, case series, and editorials/commentaries
Country	Studies conducted in countries categorized as “Very High” on the 2014 Human Development Index (as defined by the United Nations Development Programme)	Studies conducted in countries that are not categorized as “Very High” on the 2014 Human Development Index
Publication date	Studies whose primary results were published from 1985 to present	Studies whose primary results were published prior to 1985
Publication language	English	Languages other than English
Quality	Fair or good quality	Poor quality (according to design-specific USPSTF criteria)

*According to the American Society of Addiction Medicine

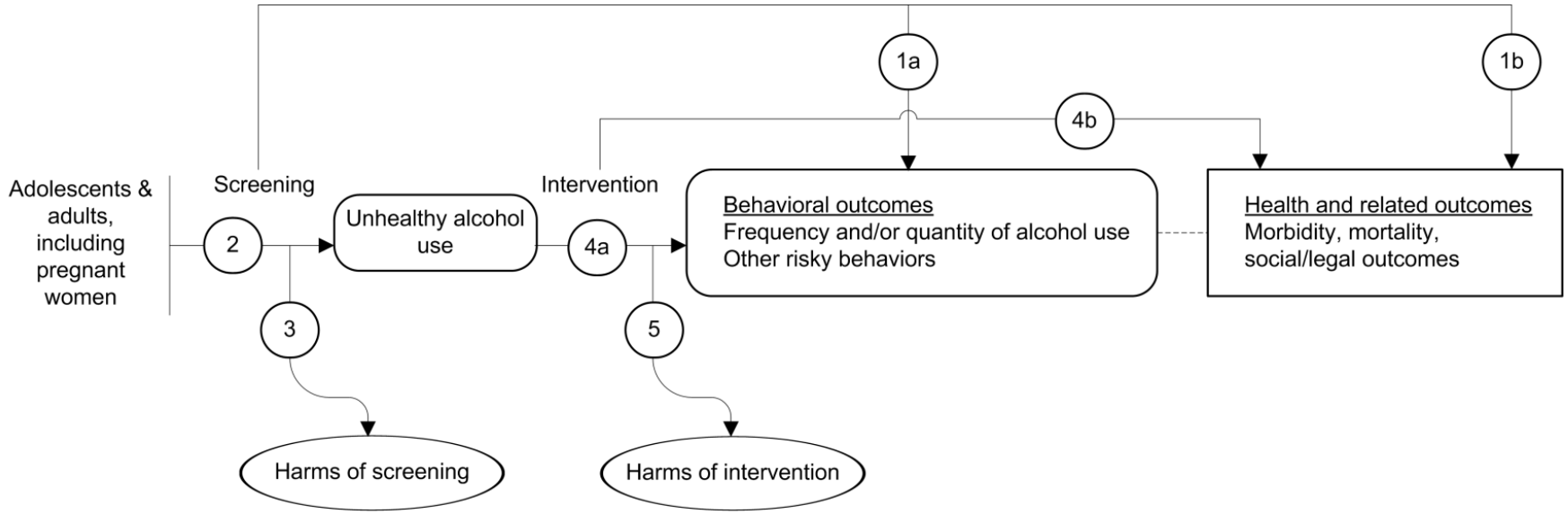
Abbreviations: KQ = Key Question; USPSTF = U.S. Preventive Services Task Force.

Appendix A Table 3. Quality Assessment Criteria*

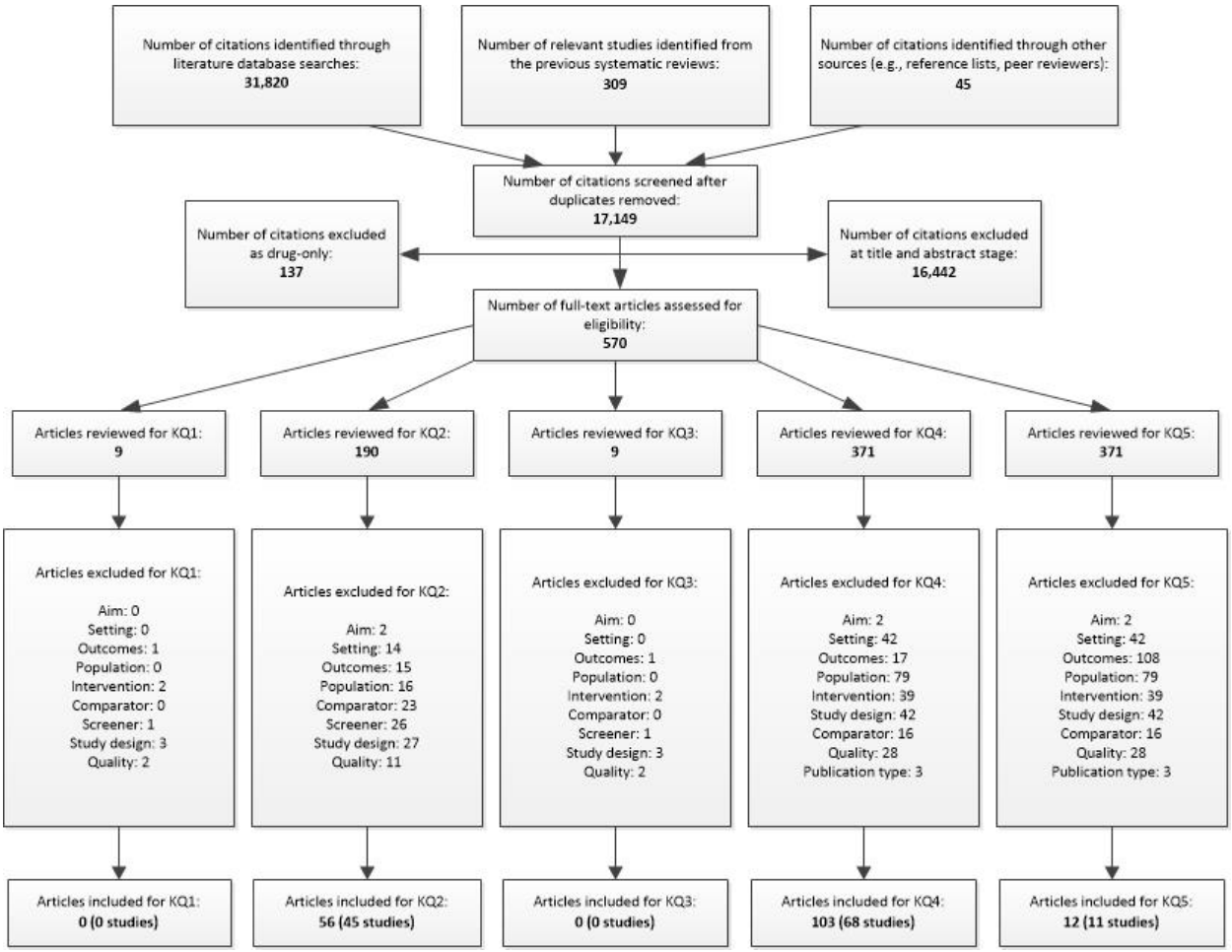
Study Design	Adapted Quality Criteria
Randomized and non-randomized controlled trials, adapted from the U.S. Preventive Services Task Force methods[85]	**Bias arising in the randomization process or due to confounding** • Valid random assignment/random sequence generation method used • Allocation concealed • Balance in baseline characteristics **Bias in selecting participants into the study** • CCT only: No evidence of biased selection of sample **Bias due to departures from intended interventions** • Fidelity to the intervention protocol • Low risk of contamination between groups • Participants were analyzed as originally allocated **Bias from missing data** • No, or minimal, post-randomization exclusions • Outcome data are reasonably complete and comparable between groups • Reasons for missing data are similar across groups • Missing data are unlikely to bias results **Bias in measurement of outcomes** • Blinding of outcome assessors • Outcomes are measured using consistent and appropriate procedures and instruments across treatment groups • No evidence of inferential statistics **Bias in reporting results selectively** • No evidence that the measures, analyses, or subgroup analyses are selectively reported
Test accuracy studies, adapted from QUADAS-2[299, 300]	**Patient Selection** • Was a consecutive or random sample of patients enrolled? • Did the study avoid inappropriate exclusions? **Index Test** • Were the index test results interpreted without knowledge of the reference standard results? • If a threshold was used, was it prespecified or was a range of values presented? **Reference Standard** • Is the reference standard likely to correctly classify the target condition? • Were the reference standard results interpreted without knowledge of the index test? • Were staff trained in the use of the reference standard? • Was fidelity of the reference standard monitored or reported? **Flow and Timing** • Was there an appropriate interval between the index test and reference standard? • Did all patients receive a reference standard? • Did all patients receive the same reference standard? • Were all patients included in the analysis?

* Good quality studies generally meet all quality criteria. Fair quality studies do not meet all the criteria but do not have critical limitations that could invalidate study findings. Poor quality studies have a single fatal flaw or multiple important limitations that could invalidate study findings. Critical appraisal of studies using *a priori* quality criteria are conducted independently by at least two reviewers. Disagreements in final quality assessment are resolved by consensus, and, if needed, consultation with a third independent reviewer.

Appendix A Figure 1. Analytic Framework



Appendix A Figure 2. Literature Flow Diagram



Evidence Supporting Current Recommended Limits

The National Institute on Alcohol Abuse and Alcoholism (NIAAA) recommends that men ages 21 to 64 years consume no more than four drinks per day and no more than 14 drinks per week (56 grams/day or 196 grams/week). Corresponding values for nonpregnant women and men aged 65 years and old are no more than three drinks per day and no more than 14 drinks per week (56 grams/day or 196 grams/week). The evidence regarding the association between average daily volume (ADV) of alcohol intake and mortality and morbidity generally supports these limits. A 2006 meta-analysis including 34 prospective cohort studies of all-cause mortality found that mortality risk begins to exceed the level of nondrinkers at an ADV of approximately 38 grams of ethanol (2.7 standard drinks, according to the U.S. standard of 14g per drink).[33] Sex-specific dose response curves in the same meta-analysis found that the risk of all-cause mortality began to increase at a lower ADV for women (~35 grams) than men (~45 grams). Similar risk levels have been reported in older meta-analyses, with risk of all-cause mortality becoming higher for drinkers compared with nondrinkers at ADV 30 to 50 grams for women and 40 to 70 grams for men.[7, 301] The evidence regarding the increased risk of cardiovascular disease has been mixed, with some studies indicating a protective effect at lower levels of consumption, however recent evidence cautions that this effect may be misrepresented.[8, 33, 302] A meta-analysis of 28 studies found an increased risk of coronary heart disease compared with nondrinkers at a heavy volume of consumption (ADV 89 grams, or 6.4 drinks/day).[34] In addition, researchers found an increased risk of hemorrhagic stroke (ADV 50 grams, 3.6 drinks/day), ischemic stroke (ADV 100 grams, 7.1 drinks/day), and type 2 diabetes (men: ADV 60 grams, 4.3 drinks/day; women: ADV 50 grams, 3.6 drinks/day) in drinkers compared with abstainers.[34, 303] The results for stroke are similar to those found in another meta-analysis of 35 observational studies, however the evidence around the risk of type 2 diabetes have been mixed.[304-306]

Evidence has shown that there is a dose-response relationship between alcohol intake and the risk of liver disease and cancer, with similar levels of increased harm reported for both conditions.[8] The risk of developing liver cirrhosis was found to be increased at an ADV of 25 grams (or 1.8 drinks/day), with the increased risk for all types of liver disease reported at lower levels of consumption in women (7–13 drinks per week) than men (14–27 drinks per week).[34] Evidence supports a likely causal relationship between excessive alcohol consumption and cancers of the oral cavity, pharyngeal, laryngeal, esophageal, liver, colon, rectal, and female breast.[8, 304, 307] The meta-analysis by Corrao and colleagues found that the risk of developing pharyngeal, oral, colon, rectal, esophageal, laryngeal, liver, and breast cancers was significantly increased in drinkers compared with abstainers at ADVs of 25 grams and higher.[34] These results were similar to those reported in other recent meta-analyses.[8, 308-310] However, the association between light to moderate alcohol consumption and cancer is less clear, and may vary by sex and cancer site. A 2015 systematic review and meta-analysis of two large U.S. cohort studies (n=135,965) found a small, but significant association between light to moderate drinking (<15 g/day for women and <30 g/day for men) and overall alcohol-related cancer risk when compared with abstainers.[311] The risk of alcohol-related cancer among men was weaker than that among women, largely due to the strong association between light (5-14.9 g/day) consumption and female breast cancer (RR=1.13 [95% CI, 1.06 to 1.20]).[311] Similarly, a 2013 systematic review and meta-analysis of 222 case-control and cohort studies found that light drinking (≤12.5 g/day) increased the risk of esophageal squamous cell carcinoma (RR=1.30 [95% CI, 1.09 to 1.56]),

oral cavity and pharynx cancer (RR=1.17 [95% CI, 1.06 to 1.29]), and female breast cancer (RR=1.05 [95% CI, 1.02 to 1.08]).[312] However, this review did not find evidence of increased risk for cancer of the colorectum, liver, or larynx.[312]

NIAAA recommends that pregnant women avoid alcohol altogether. Excessive alcohol use during pregnancy has been associated with adverse pregnancy outcomes, such as preterm birth, low birth weight, and Fetal Alcohol Spectrum Disorders.[313, 314] According to the U.S. Centers for Disease Control and Prevention (CDC),[315] there is no known safe amount of alcohol use during pregnancy or while trying to get pregnant; however, there has been considerable debate regarding whether low to moderate drinking is associated with adverse birth outcomes. A 2011 systematic review of 36 case control and cohort studies investigated the dose-response relationship between alcohol consumption before and during pregnancy and risks of low birth weight, preterm birth, and small-size-for-gestational age (SGA), and found that, compared with abstainers, the risk of low birth weight and SGA had no effect up to 10 grams/day and preterm birth had no effect up to 18 grams/day of pure alcohol consumption.[316] Other reviews examining the effects of low to moderate prenatal alcohol exposure have had similar findings, citing a lack of consistent effect of alcohol on adverse pregnancy outcomes.[317-319] However, some evidence suggests that low to moderate alcohol use during pregnancy may have more subtle effects on cognitive and neurological development, and that the prevalence of adverse pregnancy outcomes may depend on other factors, including the mother's socioeconomic status.[320, 321]

Due to its ability to impair vision, psychomotor skills/abilities, reaction-time, and risk-taking judgment, alcohol has been associated with both intentional and unintentional injuries.[8] Alcohol is commonly used prior to suicide.[322] The risk of injury and violence is increased with ADV of 25 grams (1.8 drinks/day, RR=1.12, 95% CI 1.06-1.18).[34] According to CDC, 7,266 suicides (23%) and 243,516 years of potential life lost (YPLL) were attributable to alcohol annually in 2001–2005.[322] Alcohol also plays a key role in motor vehicle accidents, and even very low levels of consumption may impair driving. In general, the relationship between alcohol use and risk of motor vehicle accidents has been shown to be exponential.[8, 323] For example, dose-response curves suggest that consumption of 10 gram of pure alcohol is associated with a 24% increase in the odds of a motor vehicle accident (OR=1.24, 95% CI 1.18 to 1.31), while consumption of 120 grams is associated with an 52-fold increase (OR=52.0, 95% CI, 34.50 to 78.28).[324] The legal limit of blood alcohol concentration (BAC) for operating a motor vehicle in all but one state in the United States is 0.08 g per 100 ml blood; however, there is evidence that BAC as low as 0.03 g/ml can impair faculties necessary for safe driving, such as vision, psychomotor skills/abilities, and reactiontime.[325] A BAC as low as 0.02 g/ml is associated with a 74% increase in the odds of a fatal motor vehicle injury (OR=1.74, 95% CI, 1.43 to 2.14); at a BAC of 0.08 g/ml the odds are much higher (OR=13.0, 95% CI, 11.1 to 15.2).[326] Further, positive BACs in drivers younger than 21 as associated with higher relative crash risks.[327]

Evidence for the Benefits of Reducing Alcohol Use

While the relationship between excessive alcohol use and mortality is well established in the epidemiological literature,[328, 329] the effect of reducing alcohol consumption and whether "safe" levels of alcohol use exist are still matters of public health debate. Several reviews have investigated the association between reductions in volume of alcohol use and all-cause mortality.

A 2013 systematic review of 16 studies among individuals with alcohol use disorders at baseline found that mortality risk decreased by more than half in individuals who reduced their drinking to abstention compared with those who continued heavy drinking (OR=0.35 [95% CI, 0.20 to 0.60]).[266] Further, participants who reduced their drinking to below the study's definition of heavy consumption (which varied across studies), but did not attain abstinence, also reduced their risk of mortality compared with those who continued heavy drinking (OR=0.61; 95% CI, 0.39 to 0.94).[266] Another systematic review of 87 studies found that higher- (≥65 grams/day, or 4.6 U.S. drinks/day) and medium-volume (25–<45 g/day, 1.8 to 3.2 drinks/day) drinkers had a significantly higher risk of mortality compared with occasional drinkers (RR=1.52 [95% CI, 1.40 to 1.66] and RR=1.13 [95% CI, 1.05 to 1.22] respectively).[330]

Studies have shown that higher levels of alcohol consumption are associated with increased blood pressure and the incidence of hypertension.[8, 331, 332] However, there is evidence that the detrimental effects of alcohol on hypertensive heart disease can be mitigated by reducing alcohol consumption, especially among heavy drinkers. A 2017 systematic review and meta-analysis of 36 randomized controlled trials found that heavy drinkers (those drinking ≥6 drinks/day, where one drink=12 g) who reduced their drinking by 50 percent had significant improvements in systolic (MD= -5.50 mm Hg [95% CI, -6.70 to -4.30]) and diastolic blood pressure (MD= -3.97 [95% CI, -4.70 to -3.25]).[333] However, this association did not hold true for moderate drinkers (2–3 drinks/day).[333] Similarly, a 2001 systematic review and meta-analysis of 15 randomized controlled trials found that individuals who consumed ≥3 drinks/day at baseline and had significantly reduced their drinking by any amount experienced a significant reduction in systolic (MD= -3.31 mm Hg [95% CI, -2.52 to -4.10]) and diastolic blood pressure (MD= -2.04 mm Hg [95% CI, -1.49 to -2.58]).[334]

Evidence Related to a Protective Effect of Alcohol Use on Cardiovascular Disease and Cognitive Impairment

Some studies have characterized the relationship between alcohol consumption and various chronic conditions as a J-shaped curve, with slightly greater risk among abstainers compared with low to moderate drinkers, and progressive disease as drinking increases.[335, 336] This association has been most strongly supported by studies examining the association between low to moderate alcohol consumption and ischemic heart disease (IHD). A meta-analysis examining the impact of low to moderate alcohol consumption (<30 grams/day) on IHD risk found that moderate drinkers without heavy drinking episodes had a significantly lower risk for IHD than lifetime abstainers (RR=0.64 [95% CI, 0.53 to 0.71]), whereas moderate drinkers who engaged in heavy drinking episodes had a slight, but statistically nonsignificant, higher risk for IHD (RR=1.12 [95% CI, 0.91 to 1.37]).[337]

Similarly, some studies have reported a protective effect in the association between low levels of alcohol consumption and varying degrees of cognitive impairment. A 2008 systematic review of 23 studies found evidence to suggest that small amounts of alcohol may protect against dementia (RR=0.63 [95% CI, 0.53 to 0.75]), but not for vascular dementia or general cognitive decline for older adults, aged ≥65 years, when compared with nondrinkers.[338] The analysis identified a wide range within its included studies in which low to moderate alcohol consumption was found to be beneficial for reducing risk of dementia, from ≥1 drink/day to 1—28 units/week.[338] Similarly, a

meta-analysis of 15 studies found significant beneficial effects for light to moderate drinkers (range 1-28 drinks/week, varying by study) and dementia (RR=0.74 [95% CI, 0.61 to 0.91]), but also for vascular dementia (RR=0.75 [95% CI, 0.57 to 0.98]) and Alzheimer disease (RR=0.72 [95% CI, 0.61 to 0.86]) among older drinkers when compared with nondrinkers.[339] On the other hand, this review did not find a beneficial effect of low to moderate alcohol consumption on cognitive decline.[339]

However, this so-called "protective effect" remains controversial due to the potential misclassification of former heavy drinkers as abstainers in those studies, biasing the results in favor of light to moderate drinkers.[340] For example, a meta-analysis examining the protective effect of moderate alcohol use on all-cause mortality found that estimates of mortality risk from alcohol were significantly altered by study design and characteristics, such as the misclassification of former drinkers as abstainers and lack of adjustment for confounding lifestyle variables.[330] Moreover, a recent review summarized reasons for skepticism about the effects of low-dose alcohol consumption, including the lack of controlled studies investigating the association, the biological mechanisms for the health benefits being recently disconfirmed, evidence for adverse physiological effects of low-dose alcohol consumption, publication bias, and various confounding study population characteristics (e.g., benefits observed predominantly in Caucasian populations, moderate drinkers generally have healthier lifestyles, systematic exclusion of unhealthy drinkers).[340]

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
ARPS	Includes items in the following: domains: • presence of medical and psychiatric conditions (14 items); • symptoms of disease (12 items); • smoking behavior (1 item); • medication use (17 items), • physical function and health status (6 items); • quantity and frequency of alcohol use (2 items); • episodic heavy drinking (2 items); • symptoms of alcohol abuse and dependence (4 items); • driving after drinking (1 item), and • gender (1 item).	60 16 min	Developed for older adults; Complex scoring algorithm; Classifies as harmful, hazardous, or nonhazardous
ASSIST	Instrument is a brief interview about alcohol, tobacco products, and other drugs; alcoholic beverages (beer, wine, spirits, etc.) are a subset of each questionnaire item, which each lists a series of substances for potential abuse screening. Lifetime use (Response Choices: No=0; Yes=3) Use in past 3 months (Response Choices: Never=0; Once or Twice=2; Monthly=3; Weekly=4; Daily or Almost Daily=6) During the past 3 months, strong desire or urge to use (Response Choices: Never=0; Once or Twice=3; Monthly=4; Weekly=5; Daily or Almost Daily=6) During the past 3 months, how often use led to health, social, legal or financial problems (Response Choices: Never=0; Once or Twice=4; Monthly=5; Weekly=6; Daily or Almost Daily=7) During the past 3 months, how often failed to do what was normally expected because of use (Response Choices: Never=0; Once or Twice=5; Monthly=6; Weekly=7; Daily or Almost Daily=8) Friend or relative or anyone else expressed concern about use (Response choices: No, Never=0; Yes, in the past 3 months=6; Yes, but not in the past 3 months=3) Ever tried and failed to control, cut down or stop using (Response choices: No, Never=0; Yes, in the past 3 months=6; Yes, but not in the past 3 months=3) Ever used any drug by injection Response choices: No, Never=0; Yes, in the past 3 months=2; Yes, but not in the past 3 months=1)	8 2-4 min	Add up the scores received for questions 2 through 7 inclusive. Does not include the results from either Q1 or Q8. Score 0-10: no intervention; risk level low Score 11-26: receive brief intervention; risk level moderate Score 27+ more intensive treatment; risk level high. Further assessment and more intensive treatment may be provided by the health professional(s) within primary care setting, or, by a specialist drug and alcohol treatment service when available.

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
AUDIT	1. How often do you have a drink containing alcohol? 0. NEVER 1. MONTHLY OR LESS 2. TWO TO FOUR TIMES A MONTH 3. TWO TO THREE TIMES A WEEK 4. FOUR OR MORE TIMES A WEEK 2. How many drinks containing alcohol do you have on a typical day when you are drinking? 0. 1 OR 2 1. 3 or 4 2. 5 OR 6 3. 7 TO 9 4. 10 OR MORE 3. How often do you have six* or more drinks on one occasion? 0. NEVER 1. LESS THAN MONTHLY 2. MONTHLY 3. WEEKLY 4. DAILY OR ALMOST DAILY 4. How often during the last year have you found that you were not able to stop drinking once you had started? *(same options as #3)* 5. How often during the last year have you failed to do what was normally expected from you because of drinking? *(same options as #3)* 6. How often during the last year have you needed a first drink in the morning to get yourself going after a heavy drinking session? *(same options as #3)* 7. How often during the last year have you had a feeling of guilt or remorse after drinking? *(same options as #3)* 8. How often during the last year have you been unable to remember what happened the night before because you have been drinking? *(same options as #3)* 9. Have you or someone else been injured as a result of your drinking? 0. NO 1. YES, BUT NOT IN THE LAST YEAR 2. YES, DURING THE LAST YEAR 10. Has a relative or friend or a doctor or other health worker been concerned about your drinking or suggested you cut down? *(same options as #9)* *The U.S. version asks about five or more drinks, reflecting standard drink sizes in the United States.	10 2-5 min	Scoring: ≥8 considered a positive screen for hazardous or harmful drinking. <u>In general:</u> Scores between 8 and 15 are most appropriate for simple advice focused on the reduction of hazardous drinking; Scores between 16 and 19 suggest brief counseling and continued monitoring; Scores of 20 and above clearly warrant further diagnostic evaluation for alcohol dependence.

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
USAUDIT	1. How often do you have a drink containing alcohol? 0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. 2-3 times a week 5. 4-6 times a week 6. Daily 2. How many drinks containing alcohol do you have on a typical day you are drinking? 0. 1 drink 1. 2 drinks 2. 3 drinks 3. 4 drinks 4. 5-6 drinks 5. 7-9 drinks 6. 10 or more drinks 3. How often do you have X (5 for men; 4 for women & men over age 65) or more drinks on one occasion? *(same options as #1)* 4. How often during the last year have you found that you were not able to stop drinking once you had started? 0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily 5. How often during the past year have you failed to do what was expected of you because of drinking? *(same options as #4)* 6. How often during the past year have you needed a drink first thing in the morning to get yourself going after a heavy drinking session? *(same options as #4)* 7. How often during the past year have you had a feeling of guilt or remorse after drinking? *(same options as #4)* 8. How often during the past year have you been unable to remember what happened the night before because you had been drinking? *(same options as #4)* 9. Have you or someone else been injured because of your drinking? 0. No 2. Yes, but not in the past year 4. Yes, during the past year 10. Has a relative, friend, doctor, or other health care worker been concerned about your drinking and suggested you cut down? *(same options as #9)*	10 2-5 min	Scores of 7 for women (and men ages 66 and older) and 8 for men ages 65 and younger represent the thresholds beyond which drinking begins to entail health risks as endorsed by NIAAA. A score of 1 or more by pregnant women are grounds for discussing health risks. <u>In general:</u> Scores between 7/8-15 (M/F) are most appropriate for feedback and brief intervention; Scores between 16-24 are most appropriate for feedback, monitoring, and brief outpatient treatment; Scores 25 or higher warrant referral to evaluation and treatment.

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
AUDIT-C	1. How often do you have a drink containing alcohol? 0. Never 1. Monthly or less 2. Two to four times a month 3. Two to three times a week 4. Four or more times a week 2. How many drinks containing alcohol do you have on a typical day when you are drinking? 0. 1 or 2 1. 3 or 4 2. 5 or 6 3. 7 to 9 4. 10 or more 3. How often do you have six* or more drinks on one occasion? 0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. Daily or almost daily	3 1-2 min	In men, ≥4 points is considered positive for alcohol misuse; in women, ≥3 points is considered positive.
USAUDIT-C	1. How often do you have a drink containing alcohol? 0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. 2-3 times a week 5. 4-6 times a week 6. Daily 2. How many drinks containing alcohol do you have on a typical day you are drinking? 0. 1 drink 1. 2 drinks 2. 3 drinks 3. 4 drinks 4. 5-6 drinks 5. 7-9 drinks 6. 10 or more drinks 3. How often do you have X (5 for men; 4 for women and men over age 65) or more drinks on one occasion? 0. Never 1. Less than monthly 2. Monthly 3. Weekly 4. 2-3 times a week	3 1-2 min	A total of 7 or more for women and men over age 65, and 8 or more for younger males is a positive risk indicator.

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
	5. 4-6 times a week 6. Daily		
CAGE	C: have you ever felt you should cut down on your drinking? A: have people annoyed you by criticizing your drinking? G: have you ever felt bad or guilty about your drinking? E: eye-opener: have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover?	4 1 min	Score 1 point for each 'yes' response; range 0–4. Positive score ≥2.
CARET	1. How often do you drink and how many drinks do you consume? 2. Have you driven within 2 hours of drinking ≥ 3 drinks? 3. Have people been concerned about your alcohol use in the last 12 months? 4. Have people been concerned about your alcohol use more than 12 months ago? 5. Are you currently taking medications that may cause bleeding, dizziness, or sedation at least 3-4 times per week? 6. Are you currently taking medications used for gastrointestinal reflux, ulcer disease, depression or hypertension at least 3-4 times per week? 7. In the past 12 months have you been diagnosed with liver disease, pancreatitis, gout, or depression? 8. In the past 12 months have you been diagnosed with high blood pressure or diabetes? 9. Do you sometimes have problems with sleeping, falling, memory, heartburn, stomach pain, nausea, vomiting, or feeling sad/blue? 10. Have you often had problems with sleeping, falling, memory, heartburn, stomach pain, nausea, vomiting, or feeling sad/blue?	10 2 min	Uses a complex algorithm to identify patients deemed "at risk"
LAST	1. Are you always able to stop drinking when you want to? 2. Have you ever felt you should cut down on your drinking? 3. Have you ever felt bad or guilty about your drinking? 4. Does your wife, husband, a parent, or other near relative ever worry or complain about your drinking? 5. Have you ever gotten into trouble at work because of drinking? 6. Have you ever been told you have liver trouble? Cirrhosis? 7. Have you ever been in a hospital because of drinking?	7 1-2 mins	Score 1 point for answer of "no" on question 1; score 1 point for each 'yes on questions 2-7.' Two or more points are indicative of alcohol dependence or abuse

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
MAST†	All items are yes/no questions 1. Do you feel you are a normal drinker? ("normal" - drink as much or less than most other people)? 2. Have you ever awakened the morning after some drinking the night before and found that you could not remember a part of the evening? 3. Does any near relative or close friend ever worry or complain about your drinking? 4. Can you stop drinking without difficulty after one or two drinks? 5. Do you ever feel guilty about your drinking? 6. Have you ever attended a meeting of Alcoholics Anonymous (AA)? 7. Have you ever gotten into physical fights when drinking? 8. Has drinking ever created problems between you and a near relative or close friend? 9. Has any family member or close friend gone to anyone for help about your drinking? 10. Have you ever lost friends because of your drinking? 11. Have you ever gotten into trouble at work because of drinking? 12. Have you ever lost a job because of drinking? 13. Have you ever neglected your obligations, your family, or your work for two or more days in a row because you were drinking? 14. Do you drink before noon fairly often? 15. Have you ever been told you have liver trouble such as cirrhosis? 16. After heavy drinking have you ever had delirium tremens (D.T.'s), severe shaking, visual or auditory (hearing) hallucinations? 17. Have you ever gone to anyone for help about your drinking? 18. Have you ever been hospitalized because of drinking? 19. Has your drinking ever resulted in your being hospitalized in a psychiatric ward? 20. Have you ever gone to any doctor, social worker, clergyman or mental health clinic for help with any emotional problem in which drinking was part of the problem? 21. Have you been arrested more than once for driving under the influence of alcohol? 22. Have you ever been arrested, even for a few hours, because of other behavior while drinking?	22 8-15 min	This quiz is scored by allocating 1 point to each 'yes' answer -- except for questions 1 and 4, where 1 point is allocated for each 'no' answer -- and totaling the responses. ≥5 is a positive screen for possible alcoholism

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
MAST-G	All items are yes/no questions 1. After drinking have you ever noticed an increase in your heart rate or beating in your chest? 2. When talking to others, do you ever underestimate how much you actually drank? 3. Does alcohol make you sleepy so that you often fall asleep in your chair? 4. After a few drinks, have you sometimes not eaten or been able to skip a meal because you didn't feel hungry? 5. Does having a few drinks help you decrease your shakiness or tremors? 6. Does alcohol sometimes make it hard for you to remember parts of the day or night? 7. Do you have rules for yourself that you won't drink before a certain time of the day? 8. Have you lost interest in hobbies or activities you used to enjoy? 9. When you wake up in the morning, do you ever have trouble remembering part of the night before? 10. Does having a drink help you sleep? 11. Do you hide your alcohol bottles from family members? 12. After a social gathering, have you ever felt embarrassed because you drank too much? 13. Have you ever been concerned that drinking might be harmful to your health? 14. Do you like to end an evening with a night cap? 15. Did you find your drinking increased after someone close to you died? 16. In general, would you prefer to have a few drinks at home rather than go out to social events? 17. Are you drinking more now than in the past? 18. Do you usually take a drink to relax or calm your nerves? 19. Do you drink to take your mind off your problems? 20. Have you ever increased your drinking after experiencing a loss in your life? 21. Do you sometimes drive when you have had too much to drink? 22. Has a doctor or nurse ever said they were worried or concerned about your drinking? 23. Have you ever made rules to manage your drinking? 24. When you feel lonely, does having a drink help?	24 10 min	This quiz is scored by allocating 1 point to each 'yes' answer; ≥5 is a positive screen for possible alcoholism
NET	N: normal drinker: do you feel you are a normal drinker? E: eye-opener question from CAGE T: tolerance: how many drinks does it take to make you feel high? (>2 indicates tolerance)	3 1 min	Score 1 point each for not normal or eye openers and 2 points for tolerance; range 0–4
NIAAA Youth Guide Screening Questions	Do you have any friends who drank beer, wine, or any drink containing alcohol in the past year? (Ages 9-14 years, this question first. Ages 14-18 users, this question second) In the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?‡	2 1 min	Identify lower, moderate, or highest risk level using an age-specific chart

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
shARPS	Includes items in the following: domains: • presence of medical and psychiatric conditions (8 items); • symptoms of disease (7 items); • medication use (11 items), • physical function and health status (1 item); • quantity and frequency of alcohol use (2 items); • episodic heavy drinking (1 item); • symptoms of alcohol abuse and dependence (1 items); and • driving after drinking (1 item)	32 2-5 min	Developed for older adults Complex scoring algorithm Classifies as harmful/hazardous, or nonhazardous
Single question: 12 months (NIAAA-recommended)	"How many times in the past year have you had X or more drinks in a day?" (X = 5 for men and 4 for women).	1 1 min	≥1 is a positive screen
Single question: 3 months (often called SASQ)	"When was the last time you had more than X drinks in 1 day?" where X was 4 for women and X was 5 for men Alternate wording: “On any single occasion during the past 3 months, have you had more than 5 drinks containing alcohol?”	1 1 min	Positive if answer is within past 3 months. Positive if answer is yes.
SMAST	1. Do you feel you are a normal drinker? 2. Do your spouse, parents or other close relative worry or complain about your drinking? 3. Do you ever feel guilty about your drinking? 4. Do friends or relatives think you are a normal drinker? 5. Are you able to stop drinking when you want to? 6. Have you ever attended a meeting of Alcoholics Anonymous? 7. Has your drinking ever caused problem between you, a spouse, parents or close relative? 8. Have you ever got into trouble at work because of drinking? 9. Have you ever neglected your obligations your family or your work for 2 or more days in a row because you were drinking? 10. Have you ever gone to anyone for help about your drinking? 11. Have you ever been in a hospital because of drinking? 12. Have you ever been arrested for drunk driving or driving after drinking? 13. Have you ever been arrested, however short a time, because of drinking?	13 5 min	This quiz is scored by allocating 1 point to each 'yes' answer ≥2 is a positive screen for possible alcoholism

Appendix C. Screening Instruments to Identify Unhealthy Alcohol Use*

Instrument name	Description	No. items/questions Time to administer	Scoring notes
SMAST-G	1. When talking to others, do you ever underestimate how much you actually drank? 2. After a few drinks, have you sometimes not eaten or been able to skip a meal because you didn't feel hungry? 3. Does having a few drinks help you decrease your shakiness or tremors? 4. Does alcohol sometimes make it hard for you to remember parts of the day or night? 5. Do you usually take a drink to relax or calm your nerves? 6. Do you drink to take your mind off your problems? 7. Have you ever increased your drinking after experiencing a loss in your life? 8. Has a doctor or nurse ever said they were worried or concerned about your drinking? 9. Have you ever made rules to manage your drinking? 10. When you feel lonely, does having a drink help?	10 NR	This quiz is scored by allocating 1 point to each 'yes' answer ≥2 is a positive screen for possible alcoholism
T-ACE	T: tolerance: how many drinks does it take to make you feel high? (>2 indicates tolerance) A: have people annoyed you by criticizing your drinking? C: have you ever felt you should cut down on your drinking? E: eye-opener: have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover?	4 1 min	Score 2 points for tolerance; 1 point for others; range 0–5; threshold for positive score ≥2
TWEAK	T: tolerance: how many drinks can you hold ('hold' version >5 indicates tolerance) or how many drinks can take before you begin to feel the effects ('high' version >2 indicates tolerance) W: have close friends or relatives worried or complained about your drinking in the last year? E: eye-openers: do you sometimes take a drink in the morning when you first get up? A: amnesia: has a friend or family member ever told you about things you said or did while you were drinking that you could not remember? K: kut down: do you sometimes feel the need to cut down on your drinking?	5 <2 min	Score 2 points each for first 2 items and 1 point each for last 3; range 0–7 positive score ≥2

* Table source: Jonas et al., 2012.[83]

† The original MAST included 25 questions and used a more complex scoring method; the version presented here represents the revised version used in practice today.

‡ This question is used in the Brief Screener for Tobacco, Alcohol, and other Drugs (BSTAD) to screen for alcohol use.

Appendix D. Recommendations of Others

Organization	Year	Recommendation
American Academy of Pediatrics (AAP)[81, 341, 342]	2016	• Pediatricians should increase their capacity in substance use detection, assessment, and intervention. • Pediatricians should become familiar with adolescent SBIRT practices and their potential to be incorporated into universal screening and comprehensive care of adolescents in the medical home.
	2011 (Reaffirmed 2014)	• Providers should regularly screen all adolescent patients for alcohol use with validated screening tools and respond to screening results with the appropriate brief intervention.
	2001	• Pediatricians should strongly advise against the use of alcohol and should assess their patients' current use of alcohol using a nonjudgmental approach. • Pediatricians should discuss the hazards of alcohol and other drug use with their patients as a routine part of risk behavior assessment. • Pediatricians should be able recognize early signs and symptoms of alcohol abuse so they can properly evaluate, manage, and refer patients for further assessment and treatment as indicated.
U.S. Department of Veterans Affairs (VA)[76]	2015	• For patients in general medical and mental health care settings, screening for unhealthy alcohol annually using the three-item Alcohol Use Disorders Identification Test-Consumption (AUDIT-C) or Single Item Alcohol Screening Questionnaire (SASQ) is recommended. • For patients without documented alcohol use disorder who screen positive for unhealthy alcohol use, physicians should provide a single, initial brief intervention regarding alcohol-related risks and advice to abstain or drink within nationally established age and gender-specific limits for daily and weekly consumption. • For patients with a diagnosis of a substance use disorder, physicians should offer referral for specialty substance use disorder care based on willingness to engage in specialty treatment.
Surgeon General of the United States[77]	2014	• Clinicians should identify alcohol abuse disorders early and provide brief intervention, referral and treatment. • Clinicians should identify and screen patients for excessive drinking using a Screening, Brief Intervention, and Referral to Treatment (SBIRT) approach, implement provider reminder systems for SBIRT (e.g., electronic medical record clinical reminders) and evaluate the effectiveness of alternative methods for providing SBIRT (e.g., by phone or via the internet).
American Congress of Obstetricians and Gynecologists (ACOG)[82]	2011 (Reaffirmed 2014)	• All women should be screened for alcohol use both before pregnancy and in their first trimester of pregnancy, using validated tools such as TACE. • If unhealthy alcohol use is identified, brief counseling should be provided with referral to treatment if deemed necessary.
National Institute for Health and Clinical Excellence (NICE)[343]	2011	• Health and social care staff should receive alcohol awareness training that promotes respectful, non-judgmental care of people who misuse alcohol. • Health and social care staff opportunistically carry out screening and brief interventions for hazardous and harmful drinking as an integral part of practice. • Adults who misuse alcohol are offered evidence-based psychological interventions, and those with alcohol dependence that is moderate or severe can in addition access relapse prevention medication in accordance with NICE guidance. • Children and young people accessing specialist services for alcohol use are offered individual cognitive behavioural therapy, or if they have significant comorbidities or limited social support, a multicomponent program of care including family or systems therapy.

Appendix D. Recommendations of Others

Organization	Year	Recommendation
National Institute on Alcohol Abuse and Alcoholism (NIAAA)[78]	2007	• Physicians should screen adult patients for at-risk drinking and provide brief counselling for at-risk drinkers. • Pharmacotherapy with medical management is recommended for treatment of alcohol dependence. • Patients with alcohol dependence should be referred for specialized alcohol counselling. • Patients with chronic alcohol dependence and serious medical complications should receive ongoing care management.
American Society of Addiction Medicine (ASAM)[79]	1997	• Primary care providers should routinely screen patients about alcohol use problems, screen for risk factors for development of alcohol dependence, and provide appropriate interventions and services.

Abbreviations: AAP = American Academy of Pediatrics; ACOG = American College of Obstetricians and Gynecologists; ASAM = American Society of Addiction Medicine; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NICE= National Institute for Health and Clinical Excellence; SBIRT = Brief Intervention and Referral to Treatment; TACE = Tolerance, Annoy, Cut down, Eye-opener; VA = U.S. Department of Veterans Affairs; WHO = World Health Organization.

Appendix E. Included Studies

Below is a list of included studies and their ancillary publications (indented below main results publication):

KQ1, KQ3:

No included studies

KQ2:

Aalto M, Alho H, Halme JT, et al. AUDIT and its abbreviated versions in detecting heavy and binge drinking in a general population survey. Drug Alcohol Depend. 2009;103(1-2):25-9. PMID: 19395203. http://dx.doi.org/10.1016/j.drugalcdep.2009.02.013

Aalto M, Alho H, Halme JT, et al. The Alcohol Use Disorders Identification Test (AUDIT) and its derivatives in screening for heavy drinking among the elderly. Int J Geriatr Psychiatry. 2011;26(9):881-5. PMID: 20661878. http://dx.doi.org/10.1002/gps.2498

Aertgeerts B, Buntinx F, Bande-Knops J, et al. The value of CAGE, CUGE, and AUDIT in screening for alcohol abuse and dependence among college freshmen. Alcohol Clin Exp Res. 2000;24(1):53-7. PMID: 10656193. http://dx.doi.org/10.1111/j.1530-0277.2000.tb04553.x

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Clark DB, Martin CS, Chung T, et al. Screening for Underage Drinking and Diagnostic and Statistical Manual of Mental Disorders, 5th Edition Alcohol Use Disorder in Rural Primary Care Practice. J Pediatr. 2016;173:214-20. PMID: 27059911. http://dx.doi.org/10.1016/j.jpeds.2016.02.047

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Cook RL, Chung T, Kelly TM, et al. Alcohol screening in young persons attending a sexually transmitted disease clinic. Comparison of AUDIT, CRAFFT, and CAGE instruments. J Gen Intern Med. 2005;20(1):1-6. PMID: 15693920. http://dx.doi.org/10.1111/j.1525-1497.2005.40052.x

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D'Amico EJ, Parast L, Meredith LS, et al. Screening in Primary Care: What Is the Best Way to Identify At-Risk Youth for Substance Use? Pediatrics. 2016;138(6). PMID: 27940696. http://dx.doi.org/10.1542/peds.2016-1717

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Appendix F. Excluded Studies

Reason for Exclusion*	
E1	**Study Aim:** Not applicable/relevant to key question
E2a	**Setting:** Not in very high human development index country*
E2b	**Setting:** Screening and/or intervention is not conducted in, recruited from, or feasible for primary care
E2c	**Setting:** Conducted in emergency department or urgent care setting
E3a	**Population:** • For screening, participants selected on the basis of alcohol or drug use or a related behavior or condition • For interventions: Not among a screen-detected population (i.e., <50% of enrolled sample is recruited via population-based screening) or among those with addiction or dependence
E3b	**Population:** Otherwise out-of-scope (e.g., psychotic disorder, persons on chronic opioid therapy, court-mandated, incarcerated)
E3c	**Population:** Children <12 years
E4	**Outcome**: No measure of alcohol use (only a composite substance use index) or no measure related to sensitivity and specificity for screening accuracy
E5a	**Screening tool (KQ1, 2, 3):** Assessment for drug or alcohol use does NOT include a brief standardized instrument or set of questions that is conducted in person or via telephone, mail, or electronically
E5b	**Screening tool accuracy (KQ2):** Not an included instrument (NIAAA one- or two-item screener or comparable, BSTAD, AUDIT and AUDIT-C, ASSIST, CARET, TWEAK, and T-ACE).
E5c	**Intervention:** Not an included intervention (e.g., medication, *only* contingency management, vocational rehabilitation, financial incentive)
E5e	**Intervention:** Prevention
E6	**Comparator:** Not an included comparator (e.g., screening results given to control providers [KQ1,3], no reference standard [KQ2], active intervention [KQ4,5])
E8	**Followup: KQ1, 4:** Less than 6 months post-baseline (except among pregnant women)
E9	**Study design:** KQ1, 3, 4, 5=RCTs and CCTs, KQ2=screening accuracy, KQ5=large cohort or case control studies for medication trials
E10	**Study Quality:** Poor

* Assigned at full-text phase.

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3. Abar CC, Hernandez L, Rodriguez AM, et al. Trajectories of Adolescent Alcohol Use in the Year Following a Brief Alcohol Intervention. Journal of Studies on Alcohol & Drugs. 2015;76(5):710-20. PMID: 26402351. **KQ4E3a, KQ5E3a.**
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5. Adams WL, Barry KL, Fleming MF. Screening for problem drinking in older primary care patients. JAMA. 1996;276(24):1964-7. PMID: 8971065. **KQ2E5b.**
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Appendix F. Excluded Studies

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Appendix F. Excluded Studies

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Adolescents

Alcohol Dependence

Single-Item

Two studies assessed the accuracy of single-item screeners for alcohol dependence for a variety of age- and sex-specific cutoffs (**Table 3**). Frequency of alcohol use was used in two studies, with sensitivity ranging from 0.81 to 1.00 and specificity ranging from 0.71 to 0.97. A frequency of heavy episodic drinking screener (number of days they had 5 or more drinks per occasion in the past year) was used in one study to screen for dependence for a variety of age and sex groups, reporting sensitivity ranging from 0.42 to 0.83 and specificity ranging from 0.75 to 0.99. The lower sensitivity corresponded with younger age groups (males age 12—13 years, females age 12—15 years). One study[101] used typical quantity of alcohol (drinks per drinking day) to screen for dependence among various age and sex groups, reporting sensitivity ranging from 0.68 to 1.00 and specificity ranging from 0.68 to 0.94. Sensitivity was higher for the younger age groups (sensitivity of 1.0 for males and females age 12—14 years).

AUDIT-C

No studies focused on adolescents used the AUDIT-C to screen for alcohol dependence.

AUDIT

One study[119] reported accuracy at a cutoff of ≥8 , finding a sensitivity of 0.75 (95% CI, 0.46 to 1.0) and specificity of 0.94 (95% CI, 0.92 to 0.96) (**Table 3**). Optimal cutoffs were lower (≥3[119] and ≥7[131]) for two studies (sensitivity 1.00 [95% CI, 0.73 to 1.00] and 0.64 [95% CI, 0.32 to 0.88]; specificity 0.73 [95% CI, 0.70 to 0.77] and 0.75 [95% CI, 0.56 to 0.88], respectively). One study[119] conducted with a U.S. primary care sample also reported the accuracy of the AUDIT at a cutoff of ≥5, with sensitivity of 0.83 (95% CI, 0.57 to 1.0) and specificity of 0.85 (95% CI, 0.82 to 0.88) (**Table 3**).

ASSIST

No studies focused on adolescents used the ASSIST to screen for alcohol dependence.

Young Adults

Alcohol Dependence

Single-Item

No studies focused on young adults used a single-item test to screen for alcohol dependence.

AUDIT-C

One study[127] assessed the accuracy of the AUDIT-C to screen for alcohol dependence (**Table 7**). Black and white females had high sensitivity (1.0 and 0.99, respectively, 95% CI, NR for this study) but low specificity (0.57 and 0.23, respectively) at a cutoff of ≥3. Similarly, at a cutoff of ≥4, black and white males had high sensitivity (0.84 and 0.97) and low specificity (0.51 and 0.25). The optimal cutoffs for four sex and race subgroups ranged from ≥4 to ≥8 (sensitivity 0.81 to 1.00; specificity 0.62 to 0.76).

AUDIT

Two studies[95, 127] reported the accuracy of the AUDIT to screen for DSM-IV dependence (**Table 7**). Only one reported the accuracy for a cutoff of ≥8, with a sensitivity of 0.93 (95% CI, 0.88, 0.96) and specificity of 0.60 (95% CI, 0.57, 0.62).[127] This study examined sex and race differences, so the optimal cutoff ranged from ≥7 to ≥13 for various race/sex groups. At the optimal cutoffs in two studies, sensitivity ranged from 0.75 to 0.86 and specificity ranged from 0.77 to 0.92.

ASSIST

No studies focused on young adults used the ASSIST to screen for alcohol dependence.

General Adults

Alcohol Dependence

Single-Item

Four studies[96, 106, 125, 133] assessed the accuracy of single-item screening tests to identify alcohol dependence (**Table 11**). Three studies used a 5/4+ drinks screening test with sensitivity ranging from 0.88 to 0.92 and specificity ranging from 0.82 to 0.84 at the optimal cutoffs, excluding subgroup analyses. One study[125] among HIV patients and matched controls in the VA used a 6+ drinks screening test with sensitivity of 0.50 (95% CI, 0.38 to 0.62) and specificity of 0.91 (95% CI, 0.89 to 0.93) at the optimal cutoff; sensitivity was low in both the HIV+ patients (0.46 [95% CI, 0.32 to 0.63]) and the controls (0.52 [95% CI, 0.36 to 0.70]) in this study.

AUDIT-C

Six studies[106, 107, 125, 129, 132, 133] examined the accuracy of the AUDIT-C to screen for alcohol dependence (**Table 11**). At a cutoff of ≥3 in five studies,[106, 107, 125, 129, 133] sensitivity ranged from 0.74 to 1.00 and specificity ranged from 0.40 to 0.73. Three of the four studies reported sensitivity of 0.95 or higher; the fourth was the study that recruited HIV patients and matched controls from the VA (sensitivity 0.74 [95% CI, 0.62, 0.83]).[125] At a cutoff of ≥4 in three studies,[106, 107, 129] sensitivity ranged from 0.88 to 0.96 and specificity ranged from 0.62 to 0.80 outside of VA settings, but again sensitivity was lower in VA patients; the study with VA HIV patients and matched controls had sensitivity of 0.69 (95% CI, 0.57, 0.79) and corresponding

specificity of 0.82 (95% CI, 0.79 to 0.84).[125] The optimal cutoffs ranged from ≥3 to ≥5. At the optimal cutoffs for five studies,[106, 107, 129, 132, 133] sensitivity ranged from 0.80 to 0.96 and specificity ranged from 0.65 to 0.87. The study in VA HIV patients and matched controls had lower sensitivity at 0.74 (95% CI, 0.62 to 0.83) and specificity of 0.73 (95% CI, to 0.70 to 0.76) at their optimal cutoff of ≥3.[125]

AUDIT

Five studies reported the accuracy of the AUDIT at a cutoff of ≥8 (**Table 12**). Three of these studies reported sensitivity ranging from 0.74 to 0.80 and specificity ranging from 0.85 to 0.94. Two studies, one reporting accuracy for a female subgroup only[132] and another recruiting HIV patients and matched controls from the VA,[125] reported lower sensitivity at 0.39 (95% CI, 0.25 to 0.56) to 0.56 (95% CI, 0.44 to 0.68), respectively, and corresponding specificity of 0.96 (95% CI, 0.94 to 0.98) and 0.92 (95% CI, 0.89 to 0.93). There was a wide range in optimal cutoffs (≥4 to ≥13). At the optimal cutoffs, sensitivity ranged from 0.67 to 0.96 and specificity ranged from 0.70 to 0.98.

ASSIST

No studies focused on general adults used the ASSIST to screen for alcohol dependence.

Older Adults

Alcohol Dependence

ASSIST

No studies focused on older adults used a single-item screening test to screen for alcohol dependence.

AUDIT-C

One study reported accuracy among adults age 65 years or older who had drunk alcohol in the past year. At the optimal cutoff of ≥4, sensitivity was 0.88 (95% C, 0.67 to 0.95) and specificity was 0.73 (95% C, 0.71 to 0.74) (**Table 15**).

ASSIST

No studies focused on older adults used the ASSIST to screen for unhealthy alcohol use.

ASSIST

No studies focused on older adults used the ASSIST to screen for alcohol dependence.

CARET

No studies focused on older adults used the ASSIST to screen for alcohol dependence.

Pregnant Women

Alcohol Dependence

Single-Item

No studies focused on pregnant women used a single-item screening test to screen for alcohol dependence.

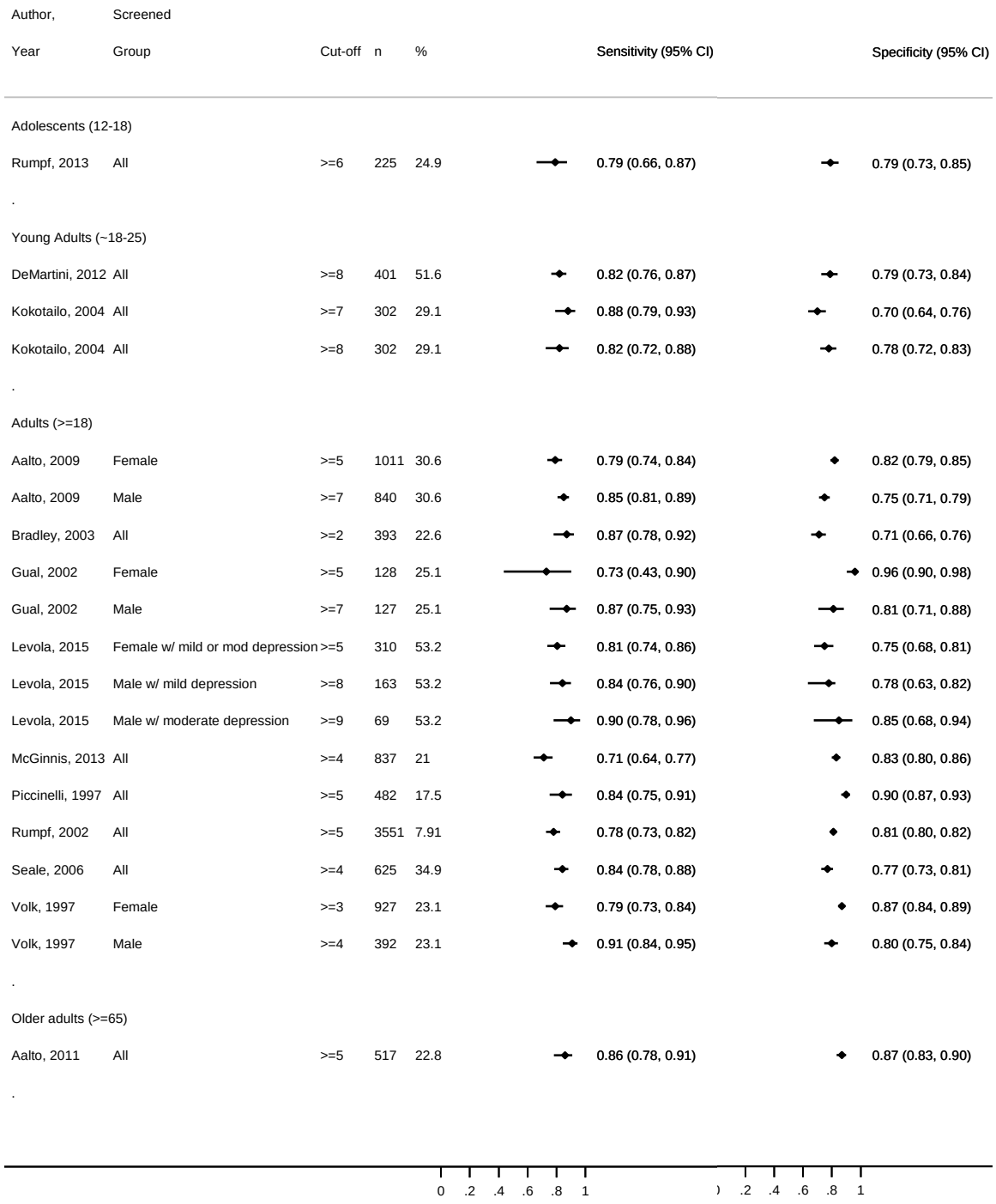
AUDIT-C

The study[106] in a community sample of past-year alcohol users reported the accuracy of the AUDIT-C to screen for dependence in pregnant women who drank alcohol in the past year. At a cutoff of ≥3, sensitivity was 1.0 (95% CI, 0.70 to 1.00) and specificity was 0.70 (95% CI, 0.64 to 0.76). At the optimal cutoff of ≥4, sensitivity was 0.98 (95% CI, 0.70 to 1.00) and specificity was 0.86 (95% CI, 0.81 to 0.90) (**Table 18**).

Other Tools

No studies focused on pregnant women used the AUDIT, ASSIST, TWEAK, or T-ACE to screen for alcohol dependence.

Appendix H Figure 1. Sensitivity and Specificity of the AUDIT at the Optimal* Cutoff to Detect Unhealthy Alcohol Use

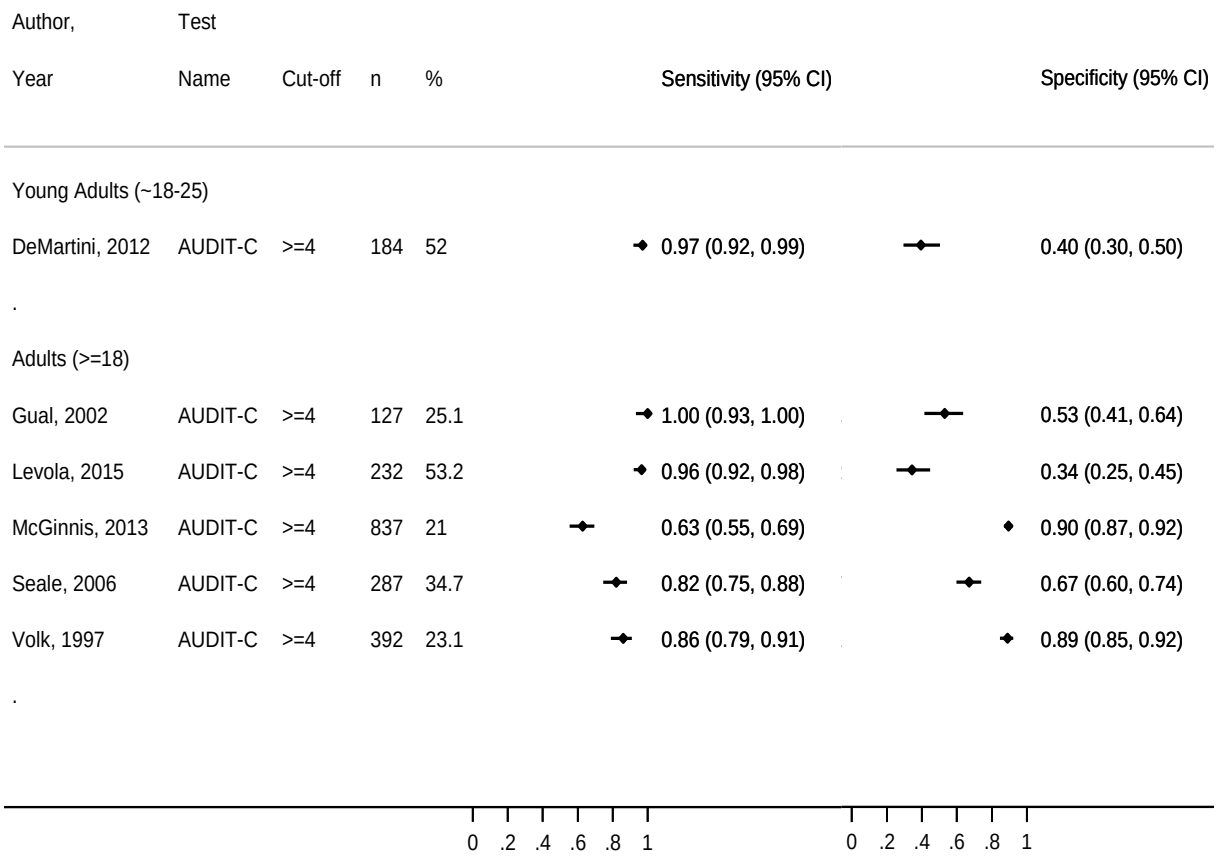


*** Optimal cutoffs could vary by study and were selected as either the optimal cutoff determined by the authors or the reviewers.**

Note: Degernhardt et al.[108] did not provide confidence intervals and is not in the figure (adult males, cutoff ≥11: sensitivity =0.784, specificity=0.755; adult females, cutoff ≥9: sensitivity=0.681, specificity=0.864.

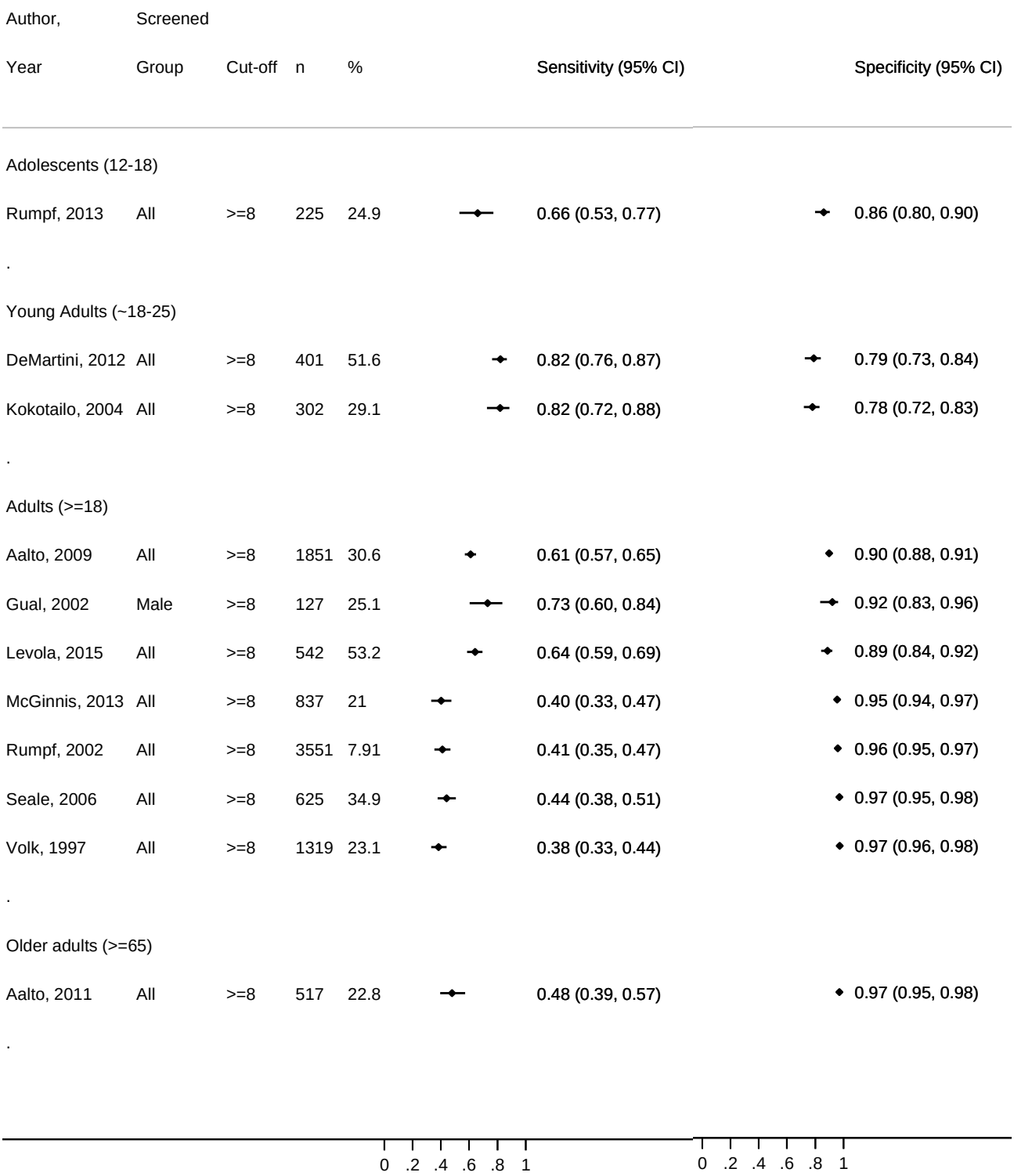
Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; n = number of participants analyzed.

Appendix H Figure 2. Sensitivity and Specificity of the AUDIT-C at Cutoff of ≥4 to Detect Unhealthy Alcohol Use Among Males



Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; n = number of participants analyzed.

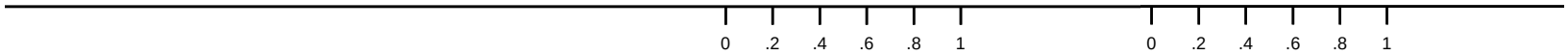
Appendix H Figure 3. Sensitivity and Specificity of the AUDIT at Cutoff of ≥8 to Detect Unhealthy Alcohol Use Among Adolescents, Young Adults, Adults, and Older Adults



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; n = number of participants analyzed

Appendix H Figure 4. Sensitivity and Specificity of the AUDIT at Cutoffs of ≥3, 4, and 5 in U.S. Primary Care

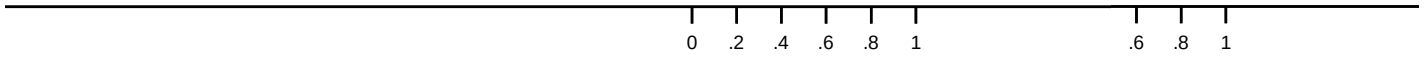
Target Population	Condition Group	Author, Year	Screened Group	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Cutoff >=3							
Adolescents (12-18)	Use Disorder	Knight, 2003	All	538	7.6	0.88 (0.76, 0.97)	0.77 (0.73, 0.80)
Adults (>=18)	Unhealthy use	Seale, 2006	Female	338	34.7	0.86 (0.77, 0.91)	0.74 (0.68, 0.79)
Adults (>=18)	Unhealthy use	Volk, 1997	All	1320	23.1	0.86 (0.82, 0.90)	0.83 (0.80, 0.85)
.							
Cutoff >=4							
Adults (>=18)	Unhealthy use	McGinnis, 2013	All	837	21	0.71 (0.64, 0.77)	0.83 (0.80, 0.86)
Adults (>=18)	Unhealthy use	Seale, 2006	All	625	34.9	0.84 (0.78, 0.88)	0.77 (0.73, 0.81)
Adults (>=18)	Unhealthy use	Volk, 1997	All	1320	23.1	0.76 (0.71, 0.80)	0.90 (0.88, 0.91)
Adults (>=18)	Use Disorder	Seale, 2006	All	625	24.2	0.83 (0.76, 0.88)	0.67 (0.63, 0.71)
.							
Cutoff >=5							
Adolescents (12-18)	Use Disorder	Knight, 2003	All	538	7.6	0.73 (0.58, 0.87)	0.88 (0.85, 0.91)
Adults (>=18)	Unhealthy use	McGinnis, 2013	All	837	21	0.64 (0.57, 0.71)	0.89 (0.86, 0.91)
Adults (>=18)	Unhealthy use	Seale, 2006	All	625	34.9	0.71 (0.65, 0.77)	0.87 (0.83, 0.90)
Adults (>=18)	Unhealthy use	Volk, 1997	All	1320	23.1	0.65 (0.59, 0.70)	0.94 (0.92, 0.95)
Adults (>=18)	Use Disorder	Seale, 2006	All	625	24.2	0.72 (0.65, 0.79)	0.79 (0.75, 0.82)
Adults (>=18)	Use Disorder	Volk, 1997	All	1333	11.3	0.80 (0.73, 0.86)	0.88 (0.86, 0.90)
.							



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; n = number of participants analyzed

Appendix H Figure 5. Sensitivity and Specificity of the Single-Item Test at the Optimal Cutoff to Detect Those Who Exceeded Various Drinking Limits Among Adolescents and Adults

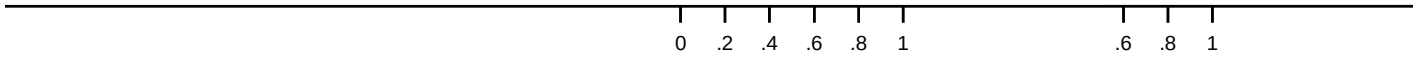
Screening Test	Cut-off	Author, Year	Screened Group	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Adults (>=18)							
5/4+ drinks	>=1/year	McNeely, 2015	All	459	19.2	0.86 (0.77, 0.93)	0.79 (0.74, 0.83)
5/4+ drinks	>=1/3 months	Seale, 2006	All	623	25.2	0.93 (0.88, 0.96)	0.72 (0.68, 0.76)
5/4+ drinks	>=1/year	Smith, 2009	All	286	28.7	0.84 (0.75, 0.91)	0.78 (0.72, 0.84)
6+ drinks	>=12/year	Aalto, 2009	Female	1011	5.0	0.75 (0.61, 0.84)	0.87 (0.85, 0.89)
6+ drinks	>=52/year	Aalto, 2009	Male	840	10.6	0.76 (0.67, 0.84)	0.88 (0.85, 0.90)
6+ drinks	>=1	Gomez, 2005	All	500	9.2	0.83 (0.71, 0.91)	0.91 (0.88, 0.93)
6+ drinks	>=1/year	McGinnis, 2013	All	837	13.0	0.48 (0.39, 0.57)	0.94 (0.92, 0.95)
Quant x Freq	>=4	Aalto, 2009	Female	1011	5.0	0.90 (0.79, 0.96)	0.83 (0.81, 0.85)
Quant x Freq	>=5	Aalto, 2009	Male	840	10.6	0.82 (0.73, 0.89)	0.79 (0.76, 0.82)
.							
Adolescents (12-18)							
NIAAA Youth Screen	Mod/high risk	D'Amico, 2016	All	1573	22.1	0.56 (0.51, 0.61)	0.92 (0.90, 0.93)
.							



Abbreviations: CI = confidence interval; n = number of participants

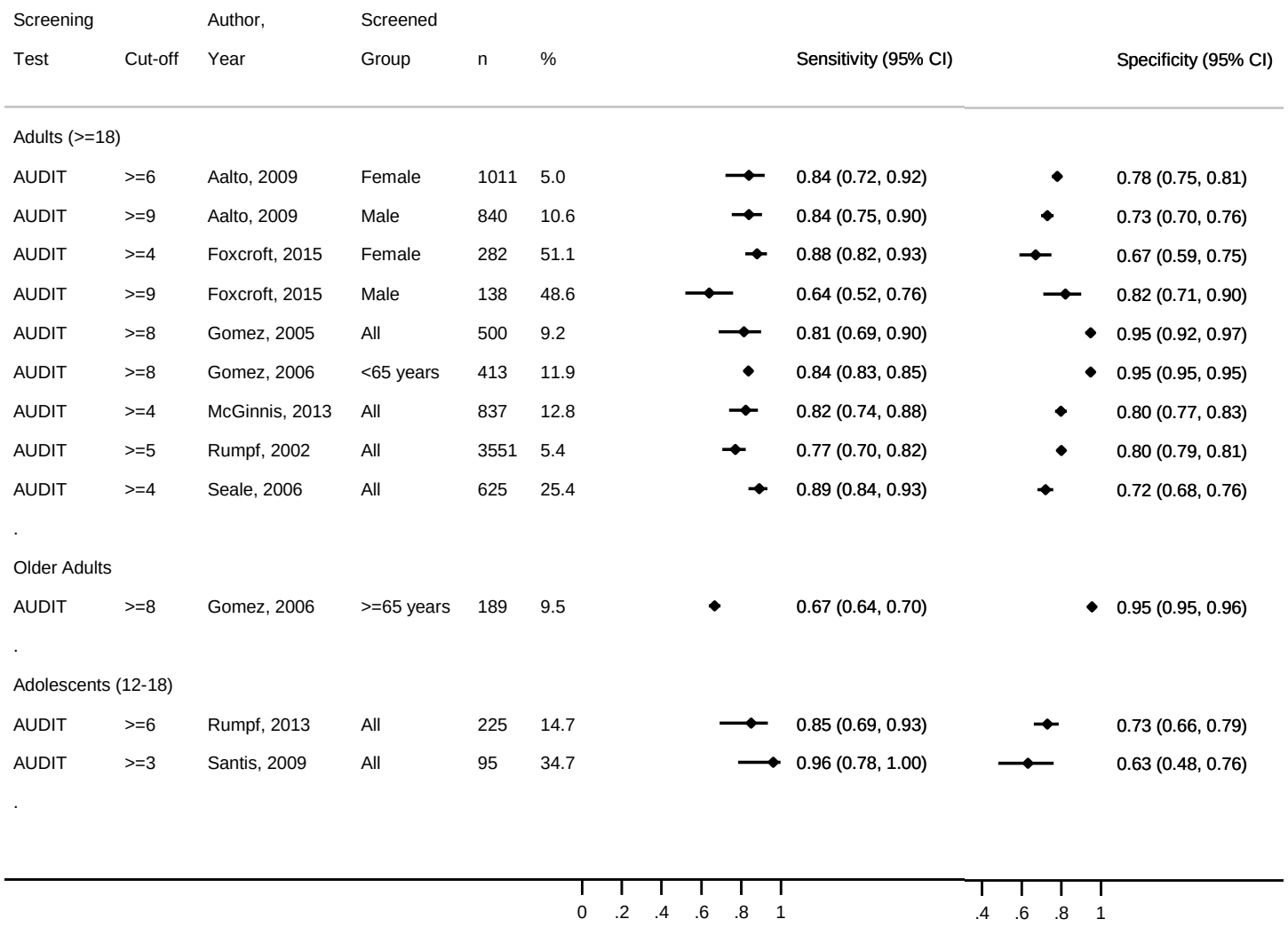
Appendix H Figure 6. Sensitivity and Specificity of the AUDIT-C at the Optimal Cutoff to Detect Those Who Exceeded Various Drinking Limits Among Adults and Older Adults

Screening Test	Cut-off	Author, Year	Screened Group	n	%	Sensitivity (95% CI)	Specificity (95% CI)
Adults (>=18)							
AUDIT-C	>=3	Gomez, 2005	All	500	9.2	1.00 (0.92, 1.00)	0.79 (0.75, 0.82)
AUDIT-C	>=3	Gomez, 2006	<65 years	413	11.9	1.00 (0.99, 1.00)	0.79 (0.78, 0.79)
AUDIT-C	>=3	McGinnis, 2013	All	837	12.8	0.86 (0.78, 0.91)	0.77 (0.74, 0.80)
AUDIT-C	>=3	Smith, 2009	All	286	28.7	0.74 (0.64, 0.83)	0.81 (0.76, 0.86)
AUDIT-C	>=4	Dawson, 2005	All	42842	16.0	0.93 (0.92, 0.93)	0.92 (0.92, 0.92)
AUDIT-C	>=4	Seale, 2006	All	625	25.4	0.85 (0.79, 0.90)	0.77 (0.73, 0.81)
AUDIT-C	>=5	Rumpf, 2002	All	3551	5.4	0.74 (0.67, 0.80)	0.83 (0.82, 0.84)
.							
Older Adults (>=65)							
AUDIT-C	>=3	Gomez, 2006	>=65 years	189	9.5	1.00 (0.97, 1.00)	0.81 (0.80, 0.81)
AUDIT-C	>=4	Dawson, 2005	>=65 past year drinkers	3349	15.9	0.93 (0.91, 0.95)	0.85 (0.84, 0.86)
.							
Adolescents (12-18)							
AUDIT-C	>=5	Rumpf, 2013	All	225	14.7	0.85 (0.69, 0.93)	0.77 (0.71, 0.82)
.							



Abbreviations: AUDIT-C = Alcohol Use Disorders Identification Test, Consumption; CI = confidence interval; n = number of participants analyzed

Appendix H Figure 7. Sensitivity and Specificity of the AUDIT at the Optimal Cutoff to Detect Those Who Exceeded Various Drinking Limits Among Adolescents, Adults, and Older Adults



Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CI = confidence interval; n = number of participants analyzed

Appendix I Table 1. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adolescents (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Referent standard	n	Screened group	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥8	Rumpf, 2013[130]	DSM-IV abuse or dependence, or ≥50/40 [M/F] g ethanol ≥1/month	24.9	M-CIDI	225	All adolescents	0.66 (0.53, 0.77)	0.86 (0.80, 0.90)
	≥6*	Rumpf, 2013[130]	DSM-IV abuse or dependence, or ≥50/40 [M/F] g ethanol ≥1/month	24.9	M-CIDI	225	All adolescents	0.79 (0.66, 0.87)	0.79 (0.73, 0.85)
AUDIT-C	≥4	Rumpf, 2013[130]	DSM-IV abuse or dependence, or ≥50/40 [M/F] g ethanol ≥1/month	24.9	M-CIDI	225	All adolescents	0.88 (0.76, 0.94)	0.64 (0.56, 0.71)
	≥5*	Rumpf, 2013[130]	DSM-IV abuse or dependence, or ≥50/40 [M/F] g ethanol ≥1/month	24.9	M-CIDI	225	All adolescents	0.73 (0.60, 0.83)	0.81 (0.74, 0.86)

* Optimal cutoff.

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; M-CIDI = Munich Composite International Diagnostic Interview; n = number.

Appendix I Table 2. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adolescents (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Referent standard	n	Screened group	Sensitivity (95% CI)	Specificity (95% CI)
Frequency	Moderate risk*	Clark, 2016[102]	DSM-5 Use Disorder	6.5†	NSDUH	NR	Age 12-18 years	0.92 (NR)‡	0.84 (NR)‡
	≥3 days*	Clark, 2016[102]	DSM-5 Use Disorder	6.5†	NSDUH	942	Age 12-17 years	0.91 (0.80, 0.96)	0.92 (0.90, 0.94
	≥Monthly*	Harris, 2016[116]	DSM-IV Abuse or dependence	2.9	ADI	136	All adolescents	1.00 (0.51, 1.00)	0.95 (0.89, 0.97)
Quantity	≥2 drinks*	Clark, 2016[102]	DSM-5 Use Disorder	6.5†	NSDUH	942	Age 12-17 years	0.94 (0.85, 0.98)	0.93 (0.92, 0.95)
Quantity x Frequency	≥3 drinks/year*	Clark, 2016[102]	DSM-5 Use Disorder	6.5†	NSDUH	942	Age 12-17 years	1.00 (0.93, 1.00)	0.91 (0.89, 0.92)
Youth Screen§	≥2 days*	Kelly, 2014[118]	DSM-5 Use Disorder	4.6	CIDI-2	525	All adolescents	0.96 (0.83, 1.0)	0.85 (0.82, 0.88)
	Moderate/high risk*	D'Amico, 2016[105]	DSM-5 Use Disorder	3.9	DISC-IV	1573	All adolescents	0.87 (0.76, 0.94)	0.84 (0.82, 0.86)
	≥13*	Levy, 2016[123]	DSM-5 Use Disorder	2.1	DISC-IV	388	All adolescents	1.00 (0.68, 1.00)	0.94 (0.92, 0.97)
AUDIT-C	≥4	Rumpf, 2013[130]	DSM-5 Use Disorder	20.0	M-CIDI	225	All adolescents	0.89 (0.77, 0.95)	0.66 (0.59, 0.73)
	≥5*	Rumpf, 2013[130]	DSM-5 Use Disorder	20.0	M-CIDI	225	All adolescents	0.76 (0.61, 0.86)	0.78 (0.71, 0.83)
AUDIT	≥8	Knight, 2003[119]	DSM-IV Abuse or dependence	7.6	ADI	538	All adolescents	0.54 (0.38, 0.69)	0.97 (0.95, 0.98)
	≥8	Rumpf, 2013[130]	DSM-IV Abuse or dependence	20.0	M-CIDI	225	All adolescents	0.71 (0.57, 0.82)	0.84 (0.78, 0.89)
	≥8	D'Amico, 2016[105]	DSM-5 Use Disorder	3.9	DISC-IV	1569	All adolescents	0.70 (0.57, 0.81)	0.94 (0.93, 0.96)
	≥5	Knight, 2003[119]	DSM-IV Abuse or dependence	7.6	ADI	538	All adolescents	0.73 (0.58, 0.87)	0.88 (0.85, 0.91)
	≥3*	Knight, 2003[119]	DSM-IV Abuse or dependence	7.6	ADI	538	All adolescents	0.88 (0.76, 0.97)	0.77 (0.73, 0.80)
	≥6*	Rumpf, 2013[130]	DSM-IV Abuse or dependence	20.0	M-CIDI	225	All adolescents	0.84 (0.71, 0.92)	0.77 (0.71, 0.83)
ASSIST	≥2*	Gryczynski, 2015[114]	DSM-5 Use Disorder	4.6	CIDI-2	525	All adolescents	1.00 (0.86, 1.00)	0.79 (0.75, 0.82)

* Optimal cutoff.
† Prevalence for the entire study sample, not for each subgroup.
‡ CI could not be calculated.
§ Includes NIAAA screening guide screening questions for youth and the Brief Screener for Tobacco, Alcohol, and Other Drugs (BSTAD).

Abbreviations: ADI = Adolescent Diagnostic Interview; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI-2 = Composite International Diagnostic Interview, Second Edition; DISC-IV = Diagnostic Interview Schedule for Children, Fourth Edition; DSM-5 = Diagnostic and Statistical Manual, Fifth Edition; M-CIDI = Munich Composite International Diagnostic Interview; n = number of participants; NR = not reported; NSDUH = National Survey on Drug Use and Health.

Appendix I Table 3. Results of Test Accuracy Studies to Detect Adolescents Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Referent standard	n	Screened group	Sensitivity (95% CI)	Specificity (95% CI)
Frequency	Moderate risk	Clark, 2016[102]	DSM-5 Moderate Use Disorder	NR	NSDUH	1193	12-18 years	1.00 (NR†)	0.81 (NR†)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	0.2	NSDUH	11478	Females 12 years	1.00 (0.86, 1.00)	0.97 (0.97, 0.97)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	0.3	NSDUH	11822	Males 12 years	1.00 (0.90, 1.00)	0.97 (0.97, 0.97)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	0.7	NSDUH	12164	Females 13 years	0.99 (0.94, 1.00)	0.92 (0.92, 0.92)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	0.5	NSDUH	12796	Males 13 years	1.00 (0.94, 1.00)	0.93 (0.93, 0.93)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	1.5	NSDUH	12135	Females 14 years	0.99 (0.96, 1.00)	0.85 (0.84, 0.86)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	1.1	NSDUH	12696	Males 14 years	0.99 (0.96, 1.00)	0.87 (0.86, 0.88)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	3.3	NSDUH	12161	Females 15 years	0.99 (0.97, 1.00)	0.77 (0.76, 0.78)
	≥6 days*	Chung, 2012[101]	DSM-IV Dependence	1.9	NSDUH	12590	Males 15 years	1.00 (0.98, 1.00)	0.78 (0.77, 0.79)
	≥12 days*	Chung, 2012[101]	DSM-IV Dependence	3.5	NSDUH	11942	Females 16 years	0.95 (0.92, 0.97)	0.74 (0.73, 0.75)
	≥12 days*	Chung, 2012[101]	DSM-IV Dependence	3.1	NSDUH	12481	Males 16 years	0.97 (0.95, 0.98)	0.74 (0.73, 0.75)
	≥24 days*	Chung, 2012[101]	DSM-IV Dependence	4.4	NSDUH	11554	Females 17 years	0.87 (0.84, 0.90)	0.75 (0.74, 0.76)
	≥24 days*	Chung, 2012[101]	DSM-IV Dependence	4.6	NSDUH	11966	Males 17 years	0.94 (0.92, 0.96)	0.71 (0.70, 0.72)
	≥52 days*	Chung, 2012[101]	DSM-IV Dependence	4.9	NSDUH	10069	Females 18 years	0.81 (0.77, 0.84)	0.81 (0.80, 0.82)
	≥52 days*	Chung, 2012[101]	DSM-IV Dependence	5.6	NSDUH	10311	Males 18 years	0.85 (0.82, 0.88)	0.75 (0.74, 0.76)
5+ drinks	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	0.2	NSDUH	11478	Females 12 years	0.44 (0.26, 0.63)	0.99 (0.99, 0.99)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	0.3	NSDUH	11822	Males 12 years	0.65 (0.49, 0.79)	0.99 (0.99, 0.99)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	0.7	NSDUH	12164	Females 13 years	0.51 (0.40, 0.61)	0.97 (0.97, 0.97)

Appendix I Table 3. Results of Test Accuracy Studies to Detect Adolescents Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Referent standard	n	Screened group	Sensitivity (95% CI)	Specificity (95% CI)
5+ drinks	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	0.5	NSDUH	12796	Males 13 years	0.42 (0.31, 0.54)	0.98 (0.98, 0.98)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	1.5	NSDUH	12135	Females 14 years	0.59 (0.52, 0.66)	0.94 (0.94, 0.94)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	1.1	NSDUH	12696	Males 14 years	0.71 (0.63, 0.78)	0.95 (0.95, 0.95)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	3.3	NSDUH	12161	Females 15 years	0.66 (0.61, 0.71)	0.90 (0.89, 0.91)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	1.9	NSDUH	12590	Males 15 years	0.72 (0.66, 0.77)	0.90 (0.89, 0.91)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	3.5	NSDUH	11942	Females 16 years	0.71 (0.67, 0.75)	0.86 (0.85, 0.87)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	3.1	NSDUH	12481	Males 16 years	0.76 (0.71, 0.80)	0.83 (0.82, 0.84)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	4.4	NSDUH	11554	Females 17 years	0.76 (0.72, 0.79)	0.82 (0.81, 0.83)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	4.6	NSDUH	11966	Males 17 years	0.81 (0.78, 0.84)	0.75 (0.74, 0.76)
	≥2 days*	Chung, 2012[101]	DSM-IV Dependence	4.9	NSDUH	10069	Females 18 years	0.83 (0.79, 0.86)	0.76 (0.75, 0.77)
	≥1 day*	Chung, 2012[101]	DSM-IV Dependence	5.6	NSDUH	10311	Males 18 years	0.77 (0.73, 0.80)	0.76 (0.75, 0.77)
Quantity	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	0.2	NSDUH	11478	Females 12 years	1.00 (0.86, 1.00)	0.94 (0.94, 0.94)
	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	0.3	NSDUH	11822	Males 12 years	1.00 (0.90, 1.00)	0.94 (0.94, 0.94)
	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	0.7	NSDUH	12164	Females 13 years	1.00 (0.96, 1.00)	0.85 (0.84, 0.86)
	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	0.5	NSDUH	12796	Males 13 years	1.00 (0.94, 1.00)	0.87 (0.86, 0.88)
Quantity	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	1.5	NSDUH	12135	Females 14 years	1.00 (0.98, 1.00)	0.73 (0.72, 0.74)
	≥1 drink*	Chung, 2012[101]	DSM-IV Dependence	1.1	NSDUH	12696	Males 14 years	1.00 (0.97, 1.00)	0.77 (0.76, 0.78)
	≥2 drinks*	Chung, 2012[101]	DSM-IV Dependence	3.3	NSDUH	12161	Females 15 years	0.68 (0.63, 0.72)	0.88 (0.87, 0.89)
	≥2 drinks*	Chung, 2012[101]	DSM-IV Dependence	1.9	NSDUH	12590	Males 15 years	0.70 (0.64, 0.75)	0.89 (0.88, 0.90)
	≥2 drinks*	Chung, 2012[101]	DSM-IV Dependence	3.5	NSDUH	11942	Females 16 years	0.74 (0.70, 0.78)	0.82 (0.81, 0.83)
	≥2 drinks*	Chung, 2012[101]	DSM-IV Dependence	3.1	NSDUH	12481	Males 16 years	0.78 (0.74, 0.82)	0.82 (0.81, 0.83)

Appendix I Table 3. Results of Test Accuracy Studies to Detect Adolescents Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Referent standard	n	Screened group	Sensitivity (95% CI)	Specificity (95% CI)
	≥2 drinks*	Chung, 2012[101]	DSM-IV Dependence	4.4	NSDUH	11554	Females 17 years	0.79 (0.75, 0.82)	0.77 (0.76, 0.78)
	≥3 drinks*	Chung, 2012[101]	DSM-IV Dependence	4.6	NSDUH	11966	Males 17 years	0.75 (0.71, 0.79)	0.77 (0.76, 0.78)
	≥3 drinks*	Chung, 2012[101]	DSM-IV Dependence	4.9	NSDUH	10069	Females 18 years	0.80 (0.76, 0.83)	0.76 (0.75, 0.77)
	≥3 drinks*	Chung, 2012[101]	DSM-IV Dependence	5.6	NSDUH	10311	Males 18 years	0.81 (0.78, 0.84)	0.68 (0.67, 0.69)
AUDIT	≥3*	Knight, 2003[119]	DSM-IV Dependence	2.2	ADI	538	All adolescents	1.00 (0.76, 1.00)	0.73 (0.70, 0.77)
	≥5	Knight, 2003[119]	DSM-IV Dependence	2.2	ADI	538	All adolescents	0.83 (0.57, 1.0)	0.85 (0.82, 0.88)
	≥7*	Santis, 2009[131]	Dependence (DSM-IV assumed)	25.6	CIDI	58	All adolescents	0.64 (0.32, 0.88)	0.75 (0.56, 0.88)
	≥8	Knight, 2003[119]	DSM-IV Dependence	2.2	ADI	538	All adolescents	0.75 (0.46, 1.0)	0.94 (0.92, 0.96)

* Optimal cutoff.
† CI could not be calculated.

Abbreviations: ADI = Adolescent Diagnostic Interview; CI = confidence interval; CIDI = Composite International Diagnostic Interview; DSM-5= Diagnostic and Statistical Manual, Fifth Edition; DSM-IV = Diagnostic and Statistical Manual, Fourth; n = number.

Appendix I Table 4. Results of Test Accuracy Studies to Detect Adolescents Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	n	Screened group	Sensitivity (95% CI‡)	Specificity (95% CI‡)
AUDIT	≥8	D'Amico, 2016[105]	NA	≥5 drinks/ occasion, past year	22.1	DISC-IV	1569	All adolescents	0.33 (0.28, 0.39)	0.99 (0.98, 0.99)
	≥8	Rumpf, 2013[130]	NA	50/40 [M/F] g ≥1/month	14.7	M-CIDI	225	All adolescents	0.82 (0.66, 0.91)	0.83 (0.77, 0.87)
	≥3*	Santis, 2009[131]	NA	>20 g of alcohol per day, 5 days a week	34.7	CIDI-SAM	95	All adolescents	0.962 (0.78, 1.00)	0.633 (0.483, 0.762)
	≥6*	Rumpf, 2013[130]	NA	50/40 [M/F] g ≥1/month	14.7	M-CIDI	225	All adolescents	0.85 (0.69, 0.93)	0.73 (0.66, 0.79)
AUDIT-C	≥4	Rumpf, 2013[130]	NA	50/40 [M/F] g ≥1/month	14.7	M-CIDI	225	All adolescents	0.94 (0.80, 0.98)	0.59 (0.52, 0.66)
	≥5*	Rumpf, 2013[130]	NA	50/40 [M/F] g ≥1/month	14.7	M-CIDI	225	All adolescents	0.85 (0.69, 0.93)	0.77 (0.71, 0.82)
Youth Screen†	Moderate or high risk*	D'Amico, 2016[105]	NA	≥5 drinks/ occasion, past year	22.1	DISC-IV	1573	All adolescents	0.56 (0.51, 0.61)	0.92 (0.90, 0.93)

* Optimal cutoff
† Includes NIAAA screening guide screening questions for youth and the Brief Screener for Tobacco, Alcohol, and Other Drugs (BSTAD)
‡ Only confidence intervals reported by the authors included in this table

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI-SAM = Composite International Diagnostic Interview Substance Abuse Module; DISC-IV = Diagnostic Interview Schedule for Children, Fourth Edition; M-CIDI = Munich Composite International Diagnostic Interview; n = number; NA = not applicable

Appendix I Table 5. Results of Test Accuracy Studies to Detect Other Alcohol Use Conditions Among Adolescents (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Condition	Condition, %	Reference standard	n	Screened group	Sensitivity (95% CI‡)	Specificity (95% CI‡)
ASSIST	≥2*	Gryczynski, 2015[114]	DSM-5	≥1 DSM-5 criteria	9.3	CIDI-2 SAM	525	All adolescents	0.898	0.821
AUDIT	≥5	Knight, 2003[119]	NA	≥1 alcohol-related problem	28.4	ADI	538	All adolescents	0.50 (0.43, 0.58)	0.97 (0.95, 0.99)
	≥3	Knight, 2003[119]	NA	≥1 alcohol-related problem	28.4	ADI	538	All adolescents	0.72 (0.65, 0.79)	0.89 (0.86, 0.92)
	≥8	Knight, 2003[119]	NA	≥1 alcohol-related problem	28.4	ADI	538	All adolescents	0.24 (0.18, 0.31)	1.0 (0.99, 1.0)
	≥8	D'Amico, 2016[105]	NA	Use, past year	41.7	DISC-IV	1569	All adolescents	0.19 (0.16, 0.22)	0.99 (0.98, 1.00)
	≥2*	Knight, 2003[119]	NA	≥1 alcohol-related problem	28.4	ADI	538	All adolescents	0.88 (0.83, 0.93)	0.81 (0.77, 0.85)
	≥5*	Santis, 2009[131]	NR	Harmful Use (NOS)	27.9	CIDI-SAM	58	All adolescents	0.750 (0.43, 0.93)	0.645 (0.454, 0.802)
Youth Screen†	Moderate or high risk*	D'Amico, 2016[105]	NA	Use, past year	41.7	DISC-IV	1573	All adolescents	0.40 (0.37, 0.44)	0.97 (0.95, 0.98)
	≥6*	Levy, 2016[123]	DSM-5	≥1 DSM-5 criterion	2.1	DISC-IV	388	All adolescents	1.00	0.91 (0.88, 0.94)
	≥1*	Levy, 2016[123]	DSM-5	Use, past year	26.3	DISC-IV	388	All adolescents	0.83 (0.76, 0.90)	0.94 (0.91, 0.97)
Frequency	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.5	NSDUH	11478	Females age 12	1.00	0.95
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.3	NSDUH	11822	Males age 12	1.00	0.94
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	4.4	NSDUH	12164	Females age 13	1.00	0.87
Frequency	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	3.4	NSDUH	12796	Males age 13	1.00	0.88
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	8.5	NSDUH	12135	Females age 14	1.00	0.77
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	6.8	NSDUH	12696	Males age 14	1.00	0.80
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	15.3	NSDUH	12161	Females age 15	1.00	0.66
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	12.8	NSDUH	12590	Males age 15	1.00	0.70
	≥6 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.7	NSDUH	11942	Females age 16	1.00	0.83

Appendix I Table 5. Results of Test Accuracy Studies to Detect Other Alcohol Use Conditions Among Adolescents (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Condition	Condition, %	Reference standard	n	Screened group	Sensitivity (95% CI‡)	Specificity (95% CI‡)
	≥6 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.3	NSDUH	12481	Males age 16	0.99	0.83
	≥6 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	22.9	NSDUH	11554	Females age 17	1.00	0.78
	≥6 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	25.0	NSDUH	11966	Males age 17	1.00	0.77
	≥12 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	26.1	NSDUH	10069	Females age 18	0.93	0.77
	≥12 days*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	32.0	NSDUH	10311	Males age 18	0.94	0.74
	High risk	Clark, 2016[102]	DSM-5	Severe Use Disorder	NR	NSDUH	NR	12-18 years	0.91	0.93
	Moderate risk	Clark, 2016[102]	DSM-5	Severe Use Disorder	NR	NSDUH	NR	12-18 years	1.00	0.80
	12-month use*	Harris, 2016[116]	NA	Use, past year	21.3	TLFB	136	All adolescents	0.62 (0.44, 0.78)	0.98 (0.93, 1.00)
5+ drinks	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.5	NSDUH	11478	Females 12 years	0.30	0.99
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.3	NSDUH	11822	Males 12 years	0.37	0.99
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	4.4	NSDUH	12164	Females 13 years	0.35	0.99
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	3.4	NSDUH	12796	Males 13 years	0.33	0.99
5+ drinks	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	8.5	NSDUH	12135	Females 14 years	0.45	0.97
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	6.8	NSDUH	12696	Males 14 years	0.47	0.97
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	15.3	NSDUH	12161	Females 15 years	0.52	0.95
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	12.8	NSDUH	12590	Males 15 years	0.55	0.95
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.7	NSDUH	11942	Females 16 years	0.56	0.93
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.3	NSDUH	12481	Males 16 years	0.66	0.92
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	22.9	NSDUH	11554	Females 17 years	0.60	0.91
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	25.0	NSDUH	11966	Males 17 years	0.71	0.88

Appendix I Table 5. Results of Test Accuracy Studies to Detect Other Alcohol Use Conditions Among Adolescents (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Condition	Condition, %	Reference standard	n	Screened group	Sensitivity (95% CI‡)	Specificity (95% CI‡)
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	26.1	NSDUH	10069	Females 18 years	0.67	0.88
	≥1 day*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	32.0	NSDUH	10311	Males 18 years	0.76	0.83
Quantity	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.5	NSDUH	11478	Females 12 years	1.00	0.95
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	1.3	NSDUH	11822	Males 12 years	1.00	0.95
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	4.4	NSDUH	12164	Females 13 years	1.00	0.89
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	3.4	NSDUH	12796	Males 13 years	1.00	0.89
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	8.5	NSDUH	12135	Females 14 years	1.00	0.78
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	6.8	NSDUH	12696	Males 14 years	1.00	0.81
Quantity	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	15.3	NSDUH	12161	Females 15 years	1.00	0.68
	≥1 drink*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	12.8	NSDUH	12590	Males 15 years	1.00	0.72
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.7	NSDUH	11942	Females 16 years	0.64	0.90
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	19.3	NSDUH	12481	Males 16 years	0.67	0.91
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	22.9	NSDUH	11554	Females 17 years	0.68	0.87
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	25.0	NSDUH	11966	Males 17 years	0.73	0.86
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	26.1	NSDUH	10069	Females 18 years	0.77	0.82
	≥2 drinks*	Chung, 2012[101]	DSM-IV	≥1 DSM-IV criteria	32.0	NSDUH	10311	Males 18 years	0.80	0.79

* Optimal cutoff
† Includes NIAAA screening guide screening questions for youth and the Brief Screener for Tobacco, Alcohol, and Other Drugs (BSTAD)
‡ Only confidence intervals reported by the authors included in this table

Abbreviations: ADI = Adolescent Diagnostic Interview; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI-SAM = Composite International Diagnostic Interview Substance Abuse Module; CIDI-2 SAM = Composite International Diagnostic Interview, 2nd edition Substance Abuse Module; DISC-IV = Diagnostic Interview Schedule for Children, Fourth Edition; DSM-IV = Diagnostic and Statistical Manual, Fourth Edition; DSM-5 = Diagnostic and Statistical Manual, Fifth Edition; M-CIDI = Munich Composite International Diagnostic Interview; n = number; NA = not applicable; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NR = not reported; NSDUH = National Survey on Drug Use and Health; pct = percentage; TLFB = Timeline Followback

Appendix I Table 6. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Young Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	n	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥7*	Kokotailo, 2004[120]	≥57/29 [M/F] drinks or ≥4 occasions with ≥5/4 [M/F] drinks/sitting	29.1	TLFB	All young adults	302	0.88 (0.79, 0.93)	0.70 (0.64, 0.76)
	≥8	Kokotailo, 2004[120]	≥57/29 [M/F] drinks or ≥4 occasions with ≥5/4 [M/F] drinks/sitting	29.1	TLFB	All young adults	302	0.82 (0.72, 0.88)	0.78 (0.72, 0.83)
	≥8*	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	51.6	DDQ	All young adults	401	0.82 (0.76, 0.87)	0.79 (0.73, 0.84)
	≥8*	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	47.9	DDQ	Female	217	0.75 (0.66, 0.82)	0.82 (0.75, 0.89)
	≥8*	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	56.0	DDQ	Male	184	0.89 (0.82, 0.94)	0.73 (0.62, 0.81)
AUDIT-C	≥3	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	47.9	DDQ	Female	217	0.98 (0.93, 0.99)	0.47 (0.38, 0.56)
	≥4	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	56.0	DDQ	Male	184	0.97 (0.92, 0.99)	0.40 (0.30, 0.50)
	≥5*	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	47.9	DDQ	Female	217	0.82 (0.73, 0.88)	0.82 (0.74, 0.88)
	≥7*	DeMartini, 2012[109]	14/7 [M/F] or more drinks/week or ≥4 heavy drinking episodes/month	56.0	DDQ	Male	184	0.80 (0.71, 0.86)	0.88 (0.79, 0.93)

* Optimal cutoff

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; DDQ = Daily Drinking Questionnaire; M/F = males/females; n = number; TLFB = Timeline Followback

Appendix I Table 7. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Young Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened Group	n	Sensitivity (95% CI)	Specificity (95% CI)
Frequency	≥12 days*	Clark, 2016[102]	DSM-5 Use disorder	10.0	NSDUH	18-20 years	251	0.88 (0.70, 0.96)	0.80 (0.74, 0.85)
Quantity	≥2 drinks*	Clark, 2016[102]	DSM-5 Use disorder	10.0	NSDUH	18-20 years	251	0.81 (0.61, 0.91)	0.76 (0.70, 0.81)
Quantity x Frequency	≥12 drinks per year*	Clark, 2016[102]	DSM-5 Use disorder	10.0	NSDUH	18-20 years	251	0.92 (0.75, 0.98)	0.75 (0.69, 0.80)
AUDIT	≥6*	Aertgeerts, 2000[95]	DSM-IV Abuse or dependence	14.1	CIDI	All young adults	3564	0.80 (0.77, 0.83)	0.78 (0.76, 0.79)
	≥7*	Kokotailo, 2004[120]	DSM-III-R Abuse or dependence	43.4	CIDI	All young adults	302	0.73 (0.65, 0.80)	0.67 (0.60, 0.74)
	≥8	Kokotailo, 2004[120]	DSM-III-R Abuse or dependence	43.4	CIDI	All young adults	302	0.68 (0.60, 0.75)	0.75 (0.68, 0.81)
	≥8*	Cook, 2004[84]	DSM-IV Abuse or dependence	32.9	SCID	All young adults	358	0.82 (0.74, 0.89)	0.72 (0.65, 0.77)

* Optimal cutoff

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; CI = confidence interval; CIDI = Composite International Diagnostic Interview; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; DSM-III-R = Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; n = number; NSDUH = National Survey on Drug Use and Health; SCID = Structured Clinical Interview for DSM-IV Substance Use Disorders

Appendix I Table 8. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Young Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	n	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥8	Northrup, 2013[127]	DSM-IV Dependence	11.1	SSAGA-II	All young adults	1620	0.93 (0.88, 0.96)	0.60 (0.57, 0.62)
	≥8	Northrup, 2013[127]	DSM-IV Dependence	2.7	SSAGA-II	Black Female	240	0.72 (0.30, 0.90)	0.94 (0.90, 0.96)
	≥8	Northrup, 2013[127]	DSM-IV Dependence	5.9	SSAGA-II	Black Male	105	0.84 (0.44, 0.97)	0.74 (0.64, 0.81)
	≥8	Northrup, 2013[127]	DSM-IV Dependence	11.5	SSAGA-II	White Female	868	0.92 (0.85, 0.96)	0.55 (0.51, 0.58)
	≥8	Northrup, 2013[127]	DSM-IV Dependence	16.7	SSAGA-II	White Male	407	0.97 (0.89, 0.99)	0.44 (0.39, 0.49)
	≥7*	Northrup, 2013[127]	DSM-IV Dependence	2.7	SSAGA-II	Black Female	240	0.86 (0.44, 0.97)	0.91 (0.87, 0.94)
	≥9*	Aertgeerts, 2000[95]	DSM-IV Dependence	3.6	CIDI	All young adults	3546	0.75 (0.67, 0.82)	0.89 (0.88, 0.90)
	≥11*	Northrup, 2013[127]	DSM-IV Dependence	11.5	SSAGA-II	White Female	868	0.79 (0.69, 0.86)	0.78 (0.75, 0.81)
	≥13*	Northrup, 2013[127]	DSM-IV Dependence	5.9	SSAGA-II	Black Male	105	0.82 (0.44, 0.97)	0.92 (0.85, 0.96)
	≥13*	Northrup, 2013[127]	DSM-IV Dependence	16.7	SSAGA-II	White Male	407	0.76 (0.64, 0.85)	0.77 (0.72, 0.81)
AUDIT-C	≥3	Northrup, 2013[127]	DSM-IV Dependence	2.7	SSAGA-II	Black Female	219	1.00 (0.61, 1.00)	0.57 (0.50, 0.63)
	≥3	Northrup, 2013[127]	DSM-IV Dependence	11.5	SSAGA-II	White Female	809	0.99 (0.94, 1.00)	0.23 (0.20, 0.26)
	≥4	Northrup, 2013[127]	DSM-IV Dependence	5.9	SSAGA-II	Black Male	101	0.84 (0.44, 0.97)	0.51 (0.41, 0.60)
	≥4	Northrup, 2013[127]	DSM-IV Dependence	16.7	SSAGA-II	White Male	371	0.97 (0.91, 0.99)	0.25 (0.20, 0.30)
	≥4*	Northrup, 2013[127]	DSM-IV Dependence	2.7	SSAGA-II	Black Female	219	1.00 (0.61, 1.00)	0.76 (0.70, 0.81)
	≥5*	Northrup, 2013[127]	DSM-IV Dependence	5.9	SSAGA-II	Black Male	101	0.84 (0.44, 0.97)	0.66 (0.56, 0.75)
	≥6*	Northrup, 2013[127]	DSM-IV Dependence	11.5	SSAGA-II	White Female	809	0.81 (0.71, 0.87)	0.62 (0.58, 0.65)
	≥8*	Northrup, 2013[127]	DSM-IV Dependence	16.7	SSAGA-II	White Male	371	0.84 (0.73, 0.91)	0.63 (0.58, 0.68)

* Optimal cutoff

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI = Composite International Diagnostic Interview; n = number; SSAGA-II = Semi-Structured Assessment for the Genetics of Alcoholism

Appendix I Table 9. Results of Test Accuracy Studies to Detect Other Alcohol Use Conditions Among Young Adults (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Condition	Condition, %	Reference standard	Screened group	n	Sensitivity (95% CI†)	Specificity (95% CI†)
AUDIT	≥11	Aertgeerts, 2000[95]	DSM-IV	Abuse	10.5	CIDI	All young adults	3564	0.193	0.941
	≥6*	Aertgeerts, 2000[95]	DSM-IV	Abuse	10.5	CIDI	All young adults	3564	0.753	0.749
	≥9	Aertgeerts, 2000[95]	DSM-IV	Abuse	10.5	CIDI	All young adults	3564	0.389	0.901

* Optimal cutoff
† Only confidence intervals reported by the authors included in this table

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; CI = confidence interval; CIDI = Composite International Diagnostic Interview; DSM-IV = Diagnostic and Statistical Manual, Fourth Edition; n = number

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
4+ drinks#	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	32.3	MINI-Plus ASSIST TLFB	All adults	586	0.85 (0.79, 0.90)	0.77 (0.73, 0.81)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	31.4	MINI-Plus ASSIST TLFB	≥HS level	493	0.84 (0.77, 0.89)	0.77 (0.72, 0.81)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	36.6	MINI-Plus ASSIST TLFB	<HS	93	0.91 (0.76, 0.98)	0.80 (0.67, 0.89)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	32.0	MINI-Plus ASSIST TLFB	Non-Hispanic	459	0.84 (0.77, 0.90)	0.78 (0.73, 0.83)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	33.1	MINI-Plus ASSIST TLFB	Hispanic	127	0.88 (0.74, 0.96)	0.72 (0.61, 0.81)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	28.7	MINI-Plus ASSIST TLFB	51-65 years	254	0.89 (0.80, 0.95)	0.81 (0.75, 0.87)
4+ drinks#	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	34.9	MINI-Plus ASSIST TLFB	21-50 years	332	0.83 (0.75, 0.89)	0.74 (0.67, 0.79)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	41.5	MINI-Plus ASSIST TLFB	Male	294	0.87 (0.80, 0.92)	0.80 (0.73, 0.85)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥1 day*	McNeely, 2015[126]	DSM-IV abuse or dependence, or ≥5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week, moderate- or high-risk on the ASSIST, or unhealthy use from MINI	23.0	MINI-Plus ASSIST TLFB	Female	291	0.82 (0.71, 0.90)	0.75 (0.69, 0.81)
5/4+ drinks	≥once a year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	All adults	43093	0.88 (0.87, 0.88)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Female	NR	0.84 (0.83,0.86)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Male	NR	0.90 (0.89, 0.91)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Asian	NR	0.89 (0.84, 0.94)	1.00 (1.00, 1.00)
5/4+ drinks	≥once per year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Blacks	NR	0.77 (0.74, 0.81)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Hispanic	NR	0.93 (0.91, 0.94)	1.00 (1.00, 1.00)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	AI	NR	0.91 (0.87, 0.96)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Whites	NR	0.88 (0.88, 0.89)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	18-34 years	NR	0.95 (0.94, 0.95)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	35-64 years	NR	0.85 (0.84, 0.86)	1.00 (1.00, 1.00)
5/4+ drinks	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	≥65 years	NR	0.64 (0.61, 0.67)	1.00 (1.00, 1.00)
	≥once per year*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, or ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Past-year drinkers	NR	0.88 (0.87, 0.88)	1.00 (1.00, 1.00)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8	MINI-Plus SIP TLFB	All adults	459	0.73 (0.65, 0.80)	0.85 (0.80, 0.88)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	Female	236	0.75 (0.60, 0.86)	0.83 (0.77, 0.88)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	Male	223	0.72 (0.63, 0.81)	0.87 (0.80, 0.93)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	≥HS education	250	0.77 (0.65, 0.86)	0.85 (0.79, 0.90)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	<HS education	209	0.70 (0.58, 0.80)	0.85 (0.77, 0.90)
5/4+ drinks	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	Non-Hispanic	364	0.72 (0.63, 0.80)	0.86 (0.81, 0.90)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	Hispanic	93	0.81 (0.61, 0.93)	0.81 (0.69, 0.89)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus SIP TLFB	21-50 years	267	0.75 (0.65, 0.83)	0.84 (0.78, 0.89)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence, or 5/4 [M/F] drinks/day, 14/7 [M/F] drinks/week, or any use in the past 12 months with at least one self-reported consequence of use	31.8†	MINI-Plus, SIP, TLFB	51-65 years	192	0.70 (0.55, 0.82)	0.85 (0.78, 0.91)
	≥1/3-months*	Seale, 2006[132]	DSM-IV abuse or dependence, or ≥4 drinks/day for women and age	34.9	DIS, TLFB	All adults	623	0.80 (0.74, 0.85)	0.74 (0.69, 0.78)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
			≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65						
	≥1/3-months*	Seale, 2006[132]	DSM-IV abuse or dependence, or ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	29.9	DIS, TLFB	Female	338	0.78 (0.69, 0.85)	0.81 (0.76, 0.85)
	≥1/3-months*	Seale, 2006[132]	DSM-IV abuse or dependence, or ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	40.0	DIS, TLFB	Male	285	0.81 (0.73, 0.87)	0.63 (0.56, 0.70)
5/4+ drinks	≥1/3-months*	Seale, 2006[132]	DSM-IV abuse or dependence, or ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	31.1	DIS, TLFB	Blacks	238	0.80 (0.69, 0.87)	0.68 (0.61, 0.75)
	≥1/3-months*	Seale, 2006[132]	DSM-IV abuse or dependence, or ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	37.4	DIS, TLFB	Whites	377	0.79 (0.72, 0.85)	0.78 (0.72, 0.83)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	All adults	286	0.82 (0.73, 0.89)	0.79 (0.73, 0.84)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	≥HS level	205	0.79 (0.67, 0.87)	0.80 (0.73, 0.86)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	<HS	81	0.89 (0.72, 0.96)	0.78 (0.65, 0.87)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	Hispanic	46	0.93 (0.70, 0.99)	0.71 (0.53, 0.84)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	Non-Hispanic White	45	0.79 (0.52, 0.92)	0.87 (0.71, 0.95)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	Non-Hispanic Black	176	0.79 (0.67, 0.88)	0.79 (0.71, 0.85)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	Female	155	0.81 (0.64, 0.91)	0.84 (0.76, 0.89)
	≥1/year*	Smith, 2009[133]	>7/14 [F/M] drinks per week or >3/4 [F/M] drinks per occasion), problem use, or current disorder.	30.8†	TLFB, CIDI, SIP	Male	131	0.82 (0.71, 0.90)	0.72 (0.61, 0.89)
6+ drinks**	≥12/year*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	30.6	TLFB	All adults	1851	0.68 (0.64, 0.72)	0.87 (0.85, 0.89)
	≥12/year*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	24.7	TLFB	Female	1011	0.50 (0.44, 0.56)	0.95 (0.93, 0.96)
	≥12/year*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	37.6	TLFB	Male	840	0.83 (0.78, 0.87)	0.76 (0.72, 0.79)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	53.2	TLFB	All adults (w/mild or mod depression)	542	0.65 (0.60, 0.70)‡	0.89 (0.85, 0.92)‡
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	50.2	TLFB	Female w/mild depression	219	0.49 (0.40, 0.58)	0.94 (0.89, 0.97)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female w/mod depression	91	0.46 (0.32, 0.60)	0.96 (0.86, 0.99)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	61.3	TLFB	Male w/mild depression	163	0.82 (0.73, 0.88)	0.79 (0.68, 0.88)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	60.9	TLFB	Male w/mod depression	69	0.88 (0.75, 0.95)	0.78 (0.59, 0.89)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	61.2	TLFB	Male w/mild or mod depression	232	0.84 (0.77, 0.89)	0.79 (0.69, 0.86)
	≥2*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol /week or >60/40 g [M/F] on one occasion in past 28 days)	49.7	TLFB	Female w/mild or mod depression	310	0.48 (0.40, 0.56)	0.95 (0.90, 0.97)
6+ drinks**	Ever*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	21.0	CIDI-SAM, TLFB	Male[§]	837	0.65 (0.58, 0.72)	0.87 (0.84, 0.89)
	Ever*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	20.1	CIDI-SAM, TLFB	Male, HIV-	393	0.70 (0.59, 0.79)	0.86 (0.82, 0.89)
	Ever*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	22.1	CIDI-SAM, TLFB	Male, HIV+	444	0.61 (0.51, 0.70)	0.88 (0.84, 0.91)
Quant x Freq	≥3*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days), where one drink is 12g of alcohol	24.7	TLFB	Female	1011	0.88 (0.83, 0.91)	0.91 (0.89, 0.93)
	≥4*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days), where one drink is 12g of alcohol	37.6	TLFB	Male	840	0.86 (0.82, 0.89)	0.68 (0.64, 0.72)
Maximum drinks per occasion	≥4*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	All adults	43093	0.90 (0.89, 0.91)	0.96 (0.96, 0.97)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Asian	NR	0.90 (0.86, 0.95)	0.97 (0.95, 0.99)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or	NR	AUDADIS-IV	Blacks	NR	0.93 (0.91, 0.95)	0.89 (0.88, 0.90)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
			usual/maximum quantity of drinks was ≥5/4 [M/F] in past year						
Maximum drinks per occasion	≥4*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Hispanic	NR	0.94 (0.92, 0.95)	0.96 (0.96 0.97)
	≥4*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	AI	NR	0.92 (0.88, 0.96)	0.97 (0.96, 0.99)
	≥4*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Whites	NR	0.90 (0.89, 0.91)	0.96 (0.96, 0.96)
	≥4*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Female	NR	0.84 (0.83, 0.86)	1.00 (1.00, 1.00)
	≥5*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	Male	NR	0.89 (0.89, 0.90)	1.00 (1.00, 1.00)
	≥4*	Dawson, 2005 106, 139	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	18-34 years	NR	0.96 (0.95, 0.96)	0.96 (0.95, 0.96)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
Maximum drinks per occasion	≥4*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	35-64 years	NR	0.88 (0.87, 0.89)	0.96 (0.95, 0.96)
	≥2*	Dawson, 2005 [106, 139]	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	≥65 years	NR	0.97 (0.96, 0.99)	0.82 (0.81, 0.83)
AUDIT-C	≥2*	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.1	AUDADIS-IV	Female	927	0.89 (0.84, 0.93)	0.78 (0.75, 0.81)
	≥3	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	24.7	TLFB	Female	1011	0.97 (0.94, 0.99)	0.44 (0.41, 0.48)
	≥3	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	25.1	ISCA	Female	128	0.91 (0.62, 0.98)	0.52 (0.43, 0.61)
	≥3	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	49.7	TLFB	Female w/ mild or mod depression	310	0.97 (0.94, 0.99)	0.28 (0.21, 0.35)
	≥3	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female w/mod depression	91	0.98 (0.88, 1.0)	0.23 (0.14, 0.37)
	≥3	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	50.2	TLFB	Female w/ mild depression	219	0.97 (0.92, 0.99)	0.29 (0.22, 0.38)
	≥3	Rumpf, 2002[129]	Meets any criterion for at-risk drinking, alcohol dependence (DSM-IV) and/or alcohol misuse	7.9	M-CIDI	All adults	3551	0.99 (0.97, 1.00)	0.43 (0.41, 0.45)
AUDIT-C	≥3	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	34.9	DIS, TLFB	All adults	625	0.88 (0.83, 0.92)	0.64 (0.59, 0.68)
	≥3*	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65	34.7	DIS, TLFB	Female	338	0.82 (0.73, 0.88)	0.76 (0.70, 0.81)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
			years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65						
	≥3*	Smith, 2009[133]	Includes hazardous consumption amounts (risky consumption), problem use, or current disorder.	30.8	TLFB, CIDI, SIP	All adults	286	0.74 (0.64, 0.82)	0.83 (0.77, 0.87)
	≥3	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.1	AUDADIS-IV	Female	927	0.73 (0.66, 0.79)	0.91 (0.89, 0.93)
	≥3	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.5	AUDADIS-IV	White Female	339	0.70 (0.58, 0.79)	0.91 (0.87, 0.94)
	≥3	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	15.7	AUDADIS-IV	Black Female	332	0.67 (0.54, 0.78)	0.92 (0.88, 0.95)
	≥3	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.4	AUDADIS-IV	Hispanic Female	235	0.85 (0.74, 0.92)	0.88 (0.82, 0.92)
	≥4*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	24.7	TLFB	Female	1011	0.89 (0.85, 0.93)	0.72 (0.69, 0.75)
	≥4	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	25.1	ISCA	All adults	255	0.98 (0.92, 1.00)	0.62 (0.55, 0.69)
	≥4*	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	8.6	ISCA	Female	128	0.91 (0.62, 0.98)	0.68 (0.59, 0.76)
AUDIT-C	≥4	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	41.7	ISCA	Male	127	1.00 (0.93, 1.00)	0.53 (0.41, 0.64)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	53.2	TLFB	All adults w/mild or mod depression	542	0.92 (0.88, 0.94)	0.66 (0.60, 0.71)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	61.2	TLFB	Male w/ mild or mod depression	232	0.96 (0.92, 0.98)	0.34 (0.25, 0.45)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	61.3	TLFB	Male w/ mild depression	163	0.97 (0.92, 0.99)	0.37 (0.26, 0.49)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	60.9	TLFB	Male w/mod depression	69	0.95 (0.84, 0.99)	0.30 (0.16, 0.48)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	49.7	TLFB	Female w/ mild or mod depression	310	0.88 (0.82, 0.92)	0.84 (0.77, 0.89)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	50.2	TLFB	Female w/mild depression	219	0.86 (0.79, 0.92)	0.94 (0.89, 0.97)
	≥4*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female w/mod depression	91	0.91 (0.79, 0.96)	0.60 (0.45, 0.72)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	21	CIDI-SAM TLFB	Male‡	837	0.63 (0.55, 0.69)	0.90 (0.87, 0.92)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	22.1	CIDI-SAM and TLFB	Male, HIV+	444	0.61 (0.51, 0.70)	0.90 (0.86, 0.93)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	20.1	CIDI-SAM and TLFB	Male, HIV-	393	0.65 (0.54, 0.74)	0.89 (0.85, 0.92)
	≥4	Rumpf, 2002[129]	Meets any criterion for at-risk drinking, alcohol dependence (DSM-IV) and/or alcohol misuse	7.9	M-CIDI	All adults	3551	0.93 (0.89, 0.95)	0.66 (0.64, 0.68)
AUDIT-C	≥4*	Seale, 2006[132]	Alcohol abuse or dependence in the past year per DSM-IV or at-risk drinking according to NIAAA recommended limits in the past month per TLFB	34.9	DIS TLFB	All adults	625	0.76 (0.70, 0.81)	0.80 (0.76, 0.84)
	≥4	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	41.5	DIS TLFB	Male	287	0.82 (0.75, 0.88)	0.67 (0.60, 0.74)
	≥4	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	34.4	AUDADIS-IV	White Male	163	0.95 (0.85, 0.98)	0.89 (0.81, 0.93)
	≥4	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.2	AUDADIS-IV	Black Male	125	0.76 (0.58, 0.88)	0.93 (0.86, 0.96)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥4	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	40.8	AUDADIS-IV	Hispanic Male	98	0.85 (0.71, 0.93)	0.84 (0.73, 0.92)
	≥4*	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	32.6	AUDADIS-IV	Male	392	0.86 (0.79, 0.91)	0.89 (0.85, 0.92)
	≥5*	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	41.7	ISCA	Male	127	0.92 (0.82, 0.97)	0.74 (0.63, 0.83)
	≥5	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female w/mod depression	91	0.64 (0.49, 0.76)	0.92 (0.80, 0.97)
	≥5*	Rumpf, 2002[129]	Meets any criterion for at-risk drinking, alcohol dependence (DSM-IV) and/or alcohol misuse	7.9	M-CIDI	All adults	3551	0.74 (0.69, 0.79)	0.85 (0.84, 0.86)
	≥5*	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	41.5	DIS, TLFB	Male	287	0.64 (0.55, 0.72)	0.83 (0.76, 0.88)
AUDIT-C	≥6*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	37.6	TLFB	Male	840	0.82 (0.77, 0.86)	0.79 (0.75, 0.82)
AUDIT	≥3	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.1	AUDADIS-IV	All adults	1320	0.86 (0.82, 0.90)	0.83 (0.80, 0.85)
	≥3	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	29.0	DIS, TLFB	Female	338	0.86 (0.77, 0.91)	0.74 (0.68, 0.79)
	≥3*	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.1	AUDADIS-IV	Female	927	0.79 (0.73, 0.84)	0.87 (0.84, 0.89)
	≥4	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.1	AUDADIS-IV	Female	927	0.65 (0.58, 0.72)	0.93 (0.91, 0.95)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥4	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.1	AUDADIS-IV	All adults	1320	0.76 (0.71, 0.80)	0.90 (0.88, 0.91)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	21.0	CIDI-SAM, TLFB	Male[§]	837	0.71 (0.64, 0.77)	0.83 (0.80, 0.86)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	22.1	CIDI-SAM, TLFB	Male, HIV+	444	0.69 (0.60, 0.78)	0.82 (0.78, 0.86)
	≥4*	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	20.1	CIDI-SAM, TLFB	Male, HIV-	393	0.74 (0.63, 0.82)	0.84 (0.80, 0.88)
	≥4*	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, ≥14 drinks/week for men under 65	34.9	DIS, TLFB	All adults	625	0.84 (0.78, 0.88)	0.77 (0.73, 0.81)
AUDIT	≥4*	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	32.6	AUDADIS-IV	Male	392	0.91 (0.84, 0.95)	0.80 (0.75, 0.84)
	≥4*	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	29.0	DIS, TLFB	Female	338	0.77 (0.67, 0.84)	0.88 (0.83, 0.91)
	≥5	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	34.9	DIS, TLFB	All adults	625	0.71 (0.65, 0.77)	0.87 (0.83, 0.90)
	≥5	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.1	AUDADIS-IV	All adults	1320	0.65 (0.59, 0.70)	0.94 (0.92, 0.95)
	≥5	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.1	AUDADIS-IV	Female	927	0.53 (0.46, 0.60)	0.95 (0.93, 0.96)
	≥5	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	32.6	AUDADIS-IV	Male	392	0.81 (0.74, 0.87)	0.90 (0.86, 0.93)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥5	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks/7 days or >4 drinks/day	21.0	CIDI-SAM, TLFB	Male[§]	837	0.64 (0.57, 0.71)	0.89 (0.86, 0.91)
	≥5	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks/7 days or >4 drinks/day	22.1	CIDI-SAM, TLFB	Male, HIV+	444	0.63 (0.53, 0.72)	0.87 (0.83, 0.90)
	≥5	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks/7 days or >4 drinks/day	20.1	CIDI-SAM, TLFB	Male, HIV-	393	0.65 (0.54, 0.74)	0.91 (0.87, 0.94)
AUDIT	≥5*	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	41.5	DIS, TLFB	Male	287	0.77 (0.69, 0.84)	0.76 (0.69, 0.82)
	≥5*	Rumpf, 2002[129]	Meets any criterion for at-risk drinking, alcohol dependence (DSM-IV) and/or alcohol misuse	7.9	M-CIDI	All adults	3551	0.78 (0.73, 0.82)	0.81 (0.80, 0.82)
	≥5*	Piccinelli, 1997[128]	ICD-10 dependence, harmful alcohol use,[‖] and hazardous alcohol intake (3-7/2-5 [M/F] drinks almost every day or ≥7/5 [M/F] drinks 3x/week	17.5	CIDI	All adults	482	0.84 (0.75, 0.91)	0.90 (0.87, 0.93)
	≥5*	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	8.6	ISCA	Female	128	0.73 (0.43, 0.90)	0.96 (0.90, 0.98)
	≥5*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	49.7	TLFB	Female, mild or mod depression	310	0.81 (0.74, 0.86)	0.75 (0.68, 0.81)
	≥5*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	50.2	TLFB	Female, mild depression	219	0.79 (0.71, 0.86)	0.76 (0.67, 0.83)
	≥5*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female, mod depression	91	0.84 (0.71, 0.92)	0.72 (0.58, 0.83)
	≥5*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	24.7	TLFB	Female	1011	0.79 (0.74, 0.84)	0.82 (0.79, 0.85)
	≥7*	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	41.7	ISCA	Male	127	0.87 (0.75, 0.93)	0.81 (0.71, 0.88)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥7*	Aalto, 2009[93]	Heavy drinking (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	37.6	TLFB	Male	840	0.85 (0.81, 0.89)	0.75 (0.71, 0.79)
AUDIT	≥8	Rumpf, 2002[129]	Meets any criterion for at-risk drinking, alcohol dependence (DSM-IV) and/or alcohol misuse	7.9	M-CIDI	All adults	3551	0.41 (0.35, 0.47)	0.96 (0.95, 0.97)
	≥8	Gual, 2002[115]	Risky drinking according to WHO (hazardous, harmful, above recommended limits)	41.7	ISCA	Male	127	0.73 (0.60, 0.84)	0.92 (0.83, 0.96)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	53.2	TLFB	All adults, mild or mod depression	542	0.64 (0.59, 0.69)	0.89 (0.84, 0.92)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	49.7	TLFB	Female, mild or mod depression	310	0.44 (0.37, 0.52)	0.96 (0.92, 0.98)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	61.2	TLFB	Male, mild or mod depression	222	0.86 (0.79, 0.91)	0.73 (0.62, 0.81)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	50.2	TLFB	Female, mild depression	219	0.44 (0.35, 0.53)	0.96 (0.91, 0.99)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	48.4	TLFB	Female, mod depression	91	0.46 (0.32, 0.60)	0.96 (0.86, 0.99)
	≥8*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	61.3	TLFB	Male, mild depression	163	0.84 (0.76, 0.90)	0.78 (0.63, 0.82)
	≥8	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	60.9	TLFB	Male, mod depression	70	0.90 (0.78, 0.96)	0.70 (0.52, 0.84)
	≥8	Aalto, 2009[93]	Heavy (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	30.6	TLFB	All adults	1851	0.61 (0.57, 0.65)	0.90 (0.88, 0.91)
	≥8	Aalto, 2009[93]	Heavy (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	24.7	TLFB	Female	1011	0.41 (0.35, 0.47)	0.96 (0.94, 0.97)

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥8	Aalto, 2009[93]	Heavy (≥16/10 [M/F] drinks/week in past 28 days) or binge drinking (≥7/5 [M/F] drinks on ≥1 day in past 28 days)	37.6	TLFB	Male	840	0.77 (0.72, 0.81)	0.81 (0.77, 0.84)
	≥8	Seale, 2006[132]	DSM-IV abuse or dependence, ≥4 drinks/day for women and age ≥65 years, ≥5 drinks/day for men under 65, >7 drinks/week women and age ≥65 years, >14 drinks/week for men under 65	34.9	DIS, TLFB	All adults	625	0.44 (0.38, 0.51)	0.97 (0.95, 0.98)
	≥8	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	23.1	AUDADIS-IV	All adults	1319	0.38 (0.33, 0.44)	0.97 (0.96, 0.98)
	≥8	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	19.1	AUDADIS-IV	Female	927	0.27 (0.21, 0.34)	0.98 (0.97, 0.99)
	≥8	Volk, 1997[134]	DSM-IV abuse or dependence or exceeding NIAAA recommended limits	32.6	AUDADIS-IV	Male	392	0.54 (0.45, 0.62)	0.95 (0.92, 0.97)
	≥8	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	21	CIDI-SAM, TLFB	Male§	837	0.40 (0.33, 0.47)	0.95 (0.94, 0.97)
	≥8	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) , >14 drinks /7 days, or >4 drinks/day	20.1	CIDI-SAM, TLFB	Male, HIV-	393	0.43 (0.33, 0.54)	0.96 (0.93, 0.98)
	≥8	McGinnis, 2013[125]	Abuse or dependence (diagnostic criteria source unclear) or >14 drinks /7 days or >4 drinks/day	22.1	CIDI-SAM, TLFB	Male, HIV+	444	0.38 (0.29, 0.48)	0.95 (0.92, 0.97)
	≥8	Seale, 2006[132]	DSM-IV abuse or dependence or exceeding NIAAA daily or weekly recommended limits	41.5	DIS, TLFB	Male	287	0.43 (0.34, 0.52)	0.94 (0.89, 0.97)
	≥9*	Levola, 2015[122]	At-risk drinking (>280/140 g (M/F] ethanol/week or >60/40 g [M/F] on one occasion in past 28 days)	60.9	TLFB	Male, mod depression	69	0.90 (0.78, 0.96)	0.85 (0.68, 0.94)
	≥9*	Degenhardt, 2001[108]	≥4/2 [M/F] drinks per day or ≥28/14 [M/F] drinks per week	43.4†	CIDI	Female	141	0.681 (NR)¶	0.864 (NR)¶
	≥11*	Degenhardt, 2001[108]	≥4/2 [M/F] drinks per day or ≥28/14 [M/F] drinks per week	43.4†	CIDI	Male	229	0.784 (NR)¶	0.755 (NR)¶

* Optimal cutoff
† Prevalence for the full sample; not reported by subgroup.
‡ Calculated
§ Male participants only recruited for this study

Appendix I Table 10. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Adults (KQ2)

‖ Harmful alcohol use: (a) Clear evidence that the substance use is responsible for (or is substantially contributing to physical or psychological harm (b) The nature of the harm is clearly identifiable and specified (c) The pattern of use has persisted for at least one month or has occurred repeatedly within the 12 month period (d) The subject does not fulfill criteria for alcohol dependence
¶ CI could not be calculated
# Includes a modified version of AUDIT-3 (threshold lowered for females), SUBS
** Includes AUDIT-3

Abbreviations: AI = American Indian; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; CI = confidence interval; CIDI = Composite International Diagnostic Interview; CIDI-SAM = Composite International Diagnostic Interview Substance Abuse Module; DIS = Diagnostic Interview Schedule; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; HIV = human immunodeficiency virus; HS = high school; ICD-10 = International Statistical Classification of Diseases and Related Health Problems, Tenth Edition; ISCA = Systematic Interview of Alcohol Consumption; M/F = males/females; M-CIDI = Munich Composite International Diagnostic Interview; MINI = Mini International Neuropsychiatric Interview; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NR = not reported; PI = Pacific Islander; SIP = Screening and Intervention Programme; TLFB = Timeline Followback; WHO = World Health Organization

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
4+ drinks§	≥1 day*	McNeely, 2015[126]	DSM-IV Abuse or dependence	13.1	MINI Plus	All	586	0.935 (0.855, 0.979)	0.646 (0.602, 0.687)
5/4+ drinks	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7	AUDADIS-IV	All	43093	0.87 (0.86, 0.88)	0.82 (0.82, 0.82)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	5.0	AUDADIS-IV	Asian	1332	0.86 (0.76, 0.93)	0.92 (0.90, 0.93)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	4.5	AUDADIS-IV	Female	24575	0.85 (0.83, 0.87)	0.86 (0.86, 0.87)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.2	AUDADIS-IV	Hispanic	8308	0.88 (0.85, 0.90)	0.80 (0.79, 0.81)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	8.8	AUDADIS-IV	White	24507	0.88 (0.87, 0.90)	0.81 (0.80, 0.81)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	1.3	AUDADIS-IV	≥65 years	8205	0.54 (0.44, 0.62)	0.96 (0.96, 0.97)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7‖	AUDADIS-IV	35-64 years	NR	0.83 (0.81, 0.86)	0.83 (0.83, 0.84)
	≥1/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	5.8	AUDADIS-IV	Black	8245	0.69 (0.65, 0.73)	0.89 (0.88, 0.90)
	≥1/ year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	11.3	AUDADIS-IV	AI	701	0.94 (0.86, 0.97)	0.84 (0.81, 0.86)
	≥3/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7‖	AUDADIS-IV	18-34 years	NR	0.86 (0.84, 0.88)	0.78 (0.77, 0.79)
	≥3/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	14.6	AUDADIS-IV	Male	18518	0.83 (0.81, 0.85)	0.82 (0.81, 0.82)
	≥3/year*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.3	AUDADIS-IV	Past-year drinkers	26946	0.81 (0.80, 0.83)	0.78 (0.77, 0.78)
	3-months*	Seale, 2006[132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	623	0.77 (0.69, 0.83)	0.60 (0.55, 0.64)
	3-months*	Seale, 2006[132]	DSM-IV Abuse or dependence	16.0	DIS-R	Female	338	0.73 (0.59, 0.82)	0.68 (0.62, 0.73)
	3-months*	Seale, 2006[132]	DSM-IV Abuse or dependence	32.2	DIS-R	Male	285	0.80 (0.71, 0.87)	0.50 (0.43, 0.57)
5/4+ drinks¶	3-months*	Seale, 2006[132]	DSM-IV Abuse or dependence	22.3	DIS-R	Black	238	0.81 (0.69, 0.89)	0.58 (0.51, 0.65)
	3-months*	Seale, 2006[132]	DSM-IV Abuse or dependence	25.5	DIS-R	White	377	0.76 (0.67, 0.83)	0.61 (0.55, 0.66)
	≥1*	Smith, 2009[133]	DSM-IV Abuse or dependence	11.5	CIDI	All	286	0.88 (0.73, 0.95)	0.67 (0.61, 0.72)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥1*	McNeely, 2015[126]	DSM-IV Abuse or dependence	13.1	MINI Plus	All	459	0.87 (0.75, 0.94)	0.74 (0.70, 0.78)
	≥12/year*	McNeely, 2016[136, 147]	DSM-5 Use Disorder	14.0	CIDI	All	2000	0.71 (0.65, 0.76)	0.85 (0.83, 0.87)
	≥1*	Bartoli, 2016[96]	DSM-5 Use Disorder	15.3	MINI	Past-year drinkers w/anxiety or depression	242	0.92 (0.78, 0.98)	0.91 (0.86, 0.95)
Quantity	6-11 drinks/week*	Buchsbaum, 1995[99]	Abuse or dependence	31	DIS-R	All	155	0.73 (0.59, 0.83)	0.74 (0.65, 0.81)
Maximum drinks	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	1.3	AUDADIS-IV	≥65 years	8205	0.85 (0.77, 0.91)	0.89 (0.88, 0.89)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	5.0	AUDADIS-IV	Asian	1332	0.96 (0.90, 0.99)	0.83 (0.81, 0.85)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	5.8	AUDADIS-IV	Black	8245	0.90 (0.87, 0.93)	0.78 (0.77, 0.79)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7	AUDADIS-IV	All	43093	0.90 (0.89, 0.91)	0.79 (0.78, 0.79)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	4.5	AUDADIS-IV	Female	24575	0.85 (0.83, 0.87)	0.86 (0.86, 0.87)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	11.3	AUDADIS-IV	AI	701	0.96 (0.89, 0.99)	0.82 (0.79, 0.85)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7‖	AUDADIS-IV	35-64 years	NR	0.88 (0.86, 0.90)	0.80 (0.79, 0.80)
Maximum drinks	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.3	AUDADIS-IV	Past-year drinkers	26946	0.83 (0.81, 0.84)	0.76 (0.76, 0.77)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	14.6	AUDADIS-IV	Male	18518	0.87 (0.86, 0.88)	0.77 (0.77, 0.78)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.2	AUDADIS-IV	Hispanic	8308	0.85 (0.82, 0.87)	0.83 (0.82, 0.84)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	8.8	AUDADIS-IV	Whites	24507	0.85 (0.83, 0.86)	0.84 (0.84, 0.85)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7‖	AUDADIS-IV	18-34 years	NR	0.88 (0.86, 0.90)	0.76 (0.74, 0.77)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	≥3	Crawford, 2013[104]	DSM-IV Abuse or dependence	6.4	SCID	Female	361	0.78 (0.74, 0.82)	0.70 (0.65, 0.75)
	≥3	Dawson, 2012[107]	DSM-IV Abuse or dependence	14.0	AUDADIS	Past-year drinkers	10944	0.93 (0.92, 0.93)	0.55 (0.54, 0.56)
	≥3	Dawson, 2012[107]	DSM-IV Abuse or dependence	8.9	AUDADIS	All	17225	0.93 (0.92, 0.93)	0.72 (0.71, 0.73)
	≥3	Seale, 2006[132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	625	0.86 (0.80, 0.91)	0.55 (0.51, 0.59)
	≥3*	Smith, 2009[133]	DSM-IV Abuse or dependence	9.0	CIDI	All	286	0.88 (0.73, 0.95)	0.72 (0.67, 0.78)
	≥3*	Volk, 1997[134]	DSM-IV Abuse or dependence	6.5	AUDADIS-IV	Female	927	0.87 (0.78, 0.92)	0.85 (0.82, 0.87)
	≥3	Volk, 1997[134]	DSM-IV Abuse or dependence	13.2	AUDADIS-IV	White Female	339	0.87 (0.67, 0.95)	0.86 (0.82, 0.89)
	≥3	Volk, 1997[134]	DSM-IV Abuse or dependence	7.8	AUDADIS-IV	Hispanic Female	235	0.91 (0.75, 0.97)	0.77 (0.71, 0.82)
	≥3	Volk, 1997[134]	DSM-IV Abuse or dependence	16.0	AUDADIS-IV	Black Female	332	0.88 (0.71, 0.96)	0.89 (0.85, 0.92)
	≥3	Dawson, 2012[107]	DSM-5 Use Disorder	10.3	AUDADIS	Past-year drinkers	11116	0.93 (0.92, 0.94)	0.55 (0.54, 0.56)
	≥3	Dawson, 2012[107]	DSM-5 Use Disorder	10.3	AUDADIS	All	17311	0.93 (0.91, 0.94)	0.72 (0.71, 0.73)
AUDIT-C	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	5.5	AUDADIS-IV	Pregnant past-year drinkers	256	0.96 (0.69, 0.99)	0.71 (0.65, 0.77)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	8.0	AUDADIS-IV	Female past-year drinkers	13879	0.87 (0.85, 0.89)	0.69 (0.68, 0.69)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	18-29 years past-year drinkers	6144	0.94 (0.92, 0.95)	0.55 (0.54, 0.56)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	12.8	AUDADIS-IV	30-44 years past-year drinkers	9455	0.92 (0.90, 0.93)	0.58 (0.57, 0.59)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	8.8	AUDADIS-IV	45-64 years past-year drinkers	7959	0.92 (0.90, 0.94)	0.58 (0.57, 0.60)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	12.6	AUDADIS-IV	White past-year drinkers	16732	0.94 (0.92, 0.94)	0.57 (0.56, 0.58)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	19.0	AUDADIS-IV	AI/AN past-year drinkers	416	0.94 (0.86, 0.97)	0.59 (0.54, 0.64)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.3	AUDADIS-IV	Past-year drinkers	26946	0.93 (0.92, 0.93)	0.58 (0.57, 0.58)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.0	AUDADIS-IV	Hispanic past-year drinkers	4949	0.92 (0.89, 0.94)	0.57 (0.56, 0.59)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	College students (18-29 years) past-year drinkers	1963	0.93 (0.90, 0.95)	0.55 (0.52, 0.57)
AUDIT-C	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	9.9	AUDADIS-IV	Asian/PI past-year drinkers	664	0.83 (0.73, 0.90)	0.67 (0.63, 0.71)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7	AUDADIS-IV	All	43903	0.93 (0.92, 0.93)	0.74 (0.73, 0.74)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	11.5	AUDADIS-IV	Black past-year drinkers	4185	0.88 (0.84, 0.90)	0.63 (0.61, 0.64)
	≥4*	Volk, 1997[134]	DSM-IV Abuse or dependence	16.8	AUDADIS-IV	Male	392	0.88 (0.78, 0.94)	0.75 (0.70, 0.80)
	≥4	Volk, 1997[134]	DSM-IV Abuse or dependence	13.6	AUDADIS-IV	Black Male	125	0.65 (0.41, 0.83)	0.83 (0.75, 0.89)
	≥4	Volk, 1997[134]	DSM-IV Abuse or dependence	25.5	AUDADIS-IV	Hispanic Male	98	1.0 (0.87, 1.00)	0.72 (0.61, 0.82)
	≥4	Volk, 1997[134]	DSM-IV Abuse or dependence	13.5	AUDADIS-IV	White Male	163	0.96 (0.78, 0.99)	0.70 (0.62, 0.77)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	19.0	AUDADIS-IV	AI/AN past-year drinkers	416	0.87 (0.77, 0.92)	0.73 (0.68, 0.77)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	16.9	AUDADIS-IV	Male past-year drinkers	13067	0.88 (0.86, 0.89)	0.63 (0.62, 0.64)
	≥4*	Seale, 2006[132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	625	0.74 (0.67, 0.80)	0.70 (0.66, 0.74)
	≥4*	Crawford, 2013[104]	DSM-IV Abuse or dependence	6.4	SCID	Female	361	0.70 (0.65, 0.74)	0.83 (0.79, 0.86)
	≥4	Crawford, 2013[104]	DSM-IV Abuse or dependence	9.9	SCID	Male	1414	0.87 (0.85, 0.89)	0.65 (0.63, 0.68)
	≥4	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	7.7	AUDADIS-IV	All	43903	0.84 (0.82, 0.85)	0.83 (0.83, 0.83)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	3.2	AUDADIS-IV	≥65 years past-year drinkers	3388	0.76 (0.67, 0.83)	0.74 (0.72, 0.75)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.6	AUDADIS-IV	White past-year drinkers	16732	0.85 (0.83, 0.86)	0.72 (0.72, 0.73)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.8	AUDADIS-IV	30-44 years past-year drinkers	9455	0.82 (0.80, 0.84)	0.73 (0.72, 0.74)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	8.8	AUDADIS-IV	45-64 years past-year drinkers	7959	0.81 (0.78, 0.84)	0.75 (0.74, 0.76)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	8.0	AUDADIS-IV	Female past-year drinkers	13879	0.74 (0.72, 0.77)	0.83 (0.82, 0.83)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	712.0	AUDADIS-IV	Hispanic past-year drinkers	4949	0.84 (0.81, 0.87)	0.71 (0.69, 0.72)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	16.0	AUDADIS-IV	Past-year drinkers	26946	0.84 (0.82, 0.85)	0.73 (0.72, 0.73)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	College students (18-29 years) past-year drinkers	1963	0.87 (0.84, 0.90)	0.69 (0.67, 0.72)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	11.5	AUDADIS-IV	Black past-year drinkers	4185	0.74 (0.70, 0.78)	0.76 (0.74, 0.77)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	9.9	AUDADIS-IV	Asian/PI past-year drinkers	664	0.75 (0.64, 0.85)	0.83 (0.80, 0.86)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	18-29 years past-year drinkers	6144	0.87 (0.85, 0.88)	0.69 (0.68, 0.70)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	5.5	AUDADIS-IV	Pregnant past-year drinkers	256	0.92 (0.69, 0.99)	0.87 (0.82, 0.91)
	≥4*	Dawson, 2012 [107]	DSM-IV Abuse or dependence	814.0	AUDADIS	Past-year drinkers	10944	0.83 (0.81, 0.84)	0.72 (0.71, 0.73)
AUDIT-C	≥4*	Dawson, 2012 [107]	DSM-IV Abuse or dependence	8.9	AUDADIS	All	17225	0.83 (0.81, 0.84)	0.83 (0.82, 0.83)
	≥4*	Dawson, 2012 [107]	DSM-5 Use Disorder	16.0	AUDADIS	Past-year drinkers	11116	0.84 (0.83, 0.86)	0.72 (0.71, 0.73)
	≥4*	Dawson, 2012 [104, 107]	DSM-5 Use Disorder	10.3	AUDADIS	All	17311	0.84 (0.83, 0.86)	0.82 (0.82, 0.83)
	≥5*	Crawford, 2013	DSM-IV Abuse or dependence	9.9	SCID	Male	1414	0.82 (0.80, 0.84)	0.78 (0.76, 0.80)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	College students (18-	1963	0.78 (0.74, 0.82)	0.78 (0.76, 0.80)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
						29 years) past-year drinkers			
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	9.9	AUDADIS-IV	Asian/PI past-year drinkers	664	0.67 (0.55, 0.77)	0.92 (0.89, 0.94)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	19.0	AUDADIS-IV	AI/AN past-year drinkers	416	0.80 (0.70, 0.87)	0.85 (0.81, 0.88)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	712.0	AUDADIS-IV	Hispanic past-year drinkers	4949	0.73 (0.70, 0.77)	0.81 (0.80, 0.82)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	12.6	AUDADIS-IV	White past-year drinkers	16732	0.73 (0.71, 0.75)	0.85 (0.84, 0.86)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	21.3	AUDADIS-IV	18-29 years past-year drinkers	6144	0.77 (0.75, 0.80)	0.79 (0.77, 0.80)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	16.0	AUDADIS-IV	Past-year drinkers	26946	0.72 (0.70, 0.73)	0.85 (0.85, 0.85)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Abuse or dependence	16.9	AUDADIS-IV	Male past-year drinkers	13067	0.79 (0.77, 0.80)	0.77 (0.77, 0.78)
	≥5*	Dawson, 2012 [107]	DSM-IV Abuse or dependence	14.0	AUDADIS	Past-year drinkers	10944	0.70 (0.68, 0.72)	0.85 (0.84, 0.86)
AUDIT	≥5*	Dawson, 2012 [107]	DSM-5 Use Disorder	16.0	AUDADIS	Past-year drinkers	11116	0.69 (0.67, 0.71)	0.86 (0.85, 0.86)
	≥4†	Seale, 2006 [132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	625	0.83 (0.76, 0.88)	0.67 (0.63, 0.71)
	≥4†	Volk, 1997 [134]	DSM-IV Abuse or dependence	9.0	AUDADIS-IV	Female	927	0.82 (0.72, 0.89)	0.88 (0.86, 0.90)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	11.3	AUDADIS-IV	All	1333	0.80 (0.73, 0.86)	0.88 (0.86, 0.90)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	7.8	AUDADIS-IV	Black Female	339	0.78 (0.59, 0.89)	0.94 (0.91, 0.96)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	13.6	AUDADIS-IV	Black Male	132	0.79 (0.57, 0.91)	0.86 (0.78, 0.91)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	13.2	AUDADIS-IV	Hispanic Female	248	0.75 (0.54, 0.87)	0.88 (0.83, 0.92)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	25.5	AUDADIS-IV	Hispanic Male	102	0.91 (0.73, 0.98)	0.73 (0.63, 0.82)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	6.5	AUDADIS-IV	White Female	347	0.70 (0.53, 0.83)	0.93 (0.90, 0.95)
	≥5*†	Volk, 1997 [134]	DSM-IV Abuse or dependence	13.5	AUDADIS-IV	White Male	165	0.92 (0.76, 0.98)	0.74 (0.66, 0.81)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥5*†	Seale, 2006[132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	625	0.72 (0.65, 0.79)	0.79 (0.75, 0.82)
	≥5*	Gache, 2005[111]	DSM-IV Abuse or dependence	5.3	SCID	Female	480	0.78 (0.71, 0.84)	0.88 (0.84, 0.91)
	≥6*	Crawford, 2013[104]	DSM-IV Abuse or dependence	6.4	SCID	Female	361	0.78 (0.74, 0.82)	0.91 (0.88, 0.94)
	≥6*	Gache, 2005[111]	DSM-IV Abuse or dependence	26.0	SCID	Male	480	0.77 (0.70, 0.83)	0.83 (0.79, 0.87)
	≥6*	McCann, 2000[124]	DSM-IV Abuse or dependence	15.8	Interview‡	All	139	0.82 (0.61, 0.93)	0.78 (0.69, 0.84)
	≥6*	Foxcroft, 2015[110]	DSM-5 Use Disorder	39.7	WMH-CIDI	Female	282	0.63 (0.53, 0.72)	0.74 (0.67, 0.80)
	≥7	Volk, 1997[134]	DSM-IV Abuse or dependence	16.8	AUDADIS-IV	Male	392	0.79 (0.67, 0.87)	0.87 (0.83, 0.90)
	≥7*	Degenhardt, 2001[108]	ICD-10 Abuse or dependence	27.6	CIDI	All	370	0.87 (0.79, 0.92)	0.34 (0.28, 0.39)
AUDIT	≥7*	Crawford, 2013[104]	DSM-IV Abuse or dependence	9.9	SCID	Male	1414	0.86 (0.84, 0.88)	0.82 (0.80, 0.84)
	≥8	Crawford, 2013[104]	DSM-IV Abuse or dependence	9.2	SCID	All	1775	0.79 (0.72, 0.84)	0.88 (0.86, 0.89)
	≥8	Crawford, 2013[104]	DSM-IV Abuse or dependence	6.4	SCID	Female	361	0.70 (0.65, 0.74)	0.95 (0.93, 0.97)
	≥8	Crawford, 2013[104]	DSM-IV Abuse or dependence	9.9	SCID	Male	1414	0.80 (0.78, 0.82)	0.86 (0.84, 0.88)
	≥8	Gache, 2005[111]	DSM-IV Abuse or dependence	15.3	SCID	All	926	0.58 (0.51, 0.65)	0.93 (0.91, 0.95)
	≥8	Gache, 2005[111]	DSM-IV Abuse or dependence	5.3	SCID	Female	446	0.60 (0.44, 0.75)	0.96 (0.93, 0.97)
	≥8	Gache, 2005[111]	DSM-IV Abuse or dependence	26.0	SCID	Male	480	0.58 (0.50, 0.65)	0.90 (0.86, 0.93)
	≥8	McCann, 2000[124]	DSM-IV Abuse or dependence	15.8	Interview‡	All	139	0.77 (0.57, 0.90)	0.82 (0.74, 0.88)
	≥8	Seale, 2006[132]	DSM-IV Abuse or dependence	24.2	DIS-R	All	625	0.43 (0.35, 0.51)	0.95 (0.93, 0.97)
	≥8	Volk, 1997[134]	DSM-IV Abuse or dependence	11.3	AUDADIS-IV	All	1319	0.55 (0.47, 0.63)	0.95 (0.93, 0.96)
	≥8	Volk, 1997[134]	DSM-IV Abuse or dependence	9.0	AUDADIS-IV	Female	927	0.45 (0.34, 0.55)	0.97 (0.96, 0.98)
	≥8	Volk, 1997[134]	DSM-IV Abuse or dependence	16.8	AUDADIS-IV	Male	392	0.68 (0.56, 0.78)	0.88 (0.84, 0.91)
	≥8*	Isaacson, 1994[117]	DSM-III Abuse or dependence	21.8	SCID	All	124	0.96 (0.81, 1.00)	0.96 (0.90, 0.99)

Appendix I Table 11. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥10*	Foxcroft, 2015[110]	DSM-5 Use Disorder	52.2	WMH-CIDI	Male	138	0.48 (0.35, 0.60)	0.78 (0.67, 0.87)
ASSIST	≥7*	Kumar, 2016[121]	DSM-IV Abuse or dependence	3.6	MINI Plus	Female	193	0.857 (0.421, 0.996)	0.828 (0.766, 0.879)
	≥13*	Kumar, 2016[121]	DSM-IV Abuse or dependence	18.9	MINI Plus	Male	206	0.795 (0.635, 0.907)	0.946 (0.900, 0.975)

* Optimal cutoff
† Lower AUDIT cutoffs (3, 4, and/or 5) presented for US primary care studies
‡ Unspecified structured clinical interview
§ Includes SUBS
‖ Prevalence for the full sample; not reported by subgroup.
¶ Includes SUBS, TAPS-1

Abbreviations: AI/AN = American Indian/Alaska Native; ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI = Composite International Diagnostic Interview; CIDI-SAM = = Composite International Diagnostic Interview Substance Abuse Module; DIS-R = Diagnostic Interview Schedule, Revised; DSM-III = Diagnostic and Statistical Manual of Mental Disorders, Third Edition; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; M-CIDI = Munich Composite International Diagnostic; MINI = Mini International Neuropsychiatric Interview; pct = percent; PI = Pacific Islander; SCID = Structured Clinical Interview for DSM-IV Substance Use Disorders; WMH-CIDI = World Mental Health, Composite International Diagnostic Interview

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
5/4+ drinks	≥1*	Smith, 2009[133]	DSM-IV Dependence	8.7	CIDI	All	286	0.88 (0.69, 0.97)	0.84 (0.79, 0.89)
	≥1*	Bartoli, 2016[96]	DSM-5 Severe Use Disorder	5.4	MINI	Past-year drinkers w/anxiety or depression	242	0.92 (0.64, 1.0)	0.82 (0.77, 0.87)
	≥3 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4†	AUDADIS-IV	35-64 years	NR	0.88 (0.85, 0.92)	0.85 (0.84, 0.85)
	≥3 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	All	43093	0.89 (0.88, 0.91)	0.83 (0.83, 0.84)
	≥7 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4†	AUDADIS-IV	18-34 years	NR	0.86 (0.83, 0.89)	0.79 (0.78, 0.80)
	≥7 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.6	AUDADIS-IV	Whites	24507	0.87 (0.85, 0.89)	0.86 (0.86, 0.86)
	≥7 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	6.3	AUDADIS-IV	AI	701	0.97 (0.88, 1.00)	0.87 (0.85, 0.90)
	≥7 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.2	AUDADIS-IV	Male	18518	0.87 (0.85, 0.89)	0.81 (0.81, 0.82)
	≥7 times/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.5	AUDADIS-IV	Past-year drinkers	26946	0.85 (0.83, 0.86)	0.79 (0.79, 0.80)
	≥once/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	2.9	AUDADIS-IV	Blacks	8245	0.74 (0.68, 0.79)	0.87 (0.87, 0.88)
	≥once/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	2.5	AUDADIS-IV	Asian	1332	0.89 (0.73, 0.95)	0.90 (0.88, 0.92)
	≥once/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	0.3	AUDADIS-IV	≥65 years	8205	0.74 (0.52, 0.87)	0.96 (0.95, 0.96)
	≥once/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	2.1	AUDADIS-IV	Female	24575	0.92 (0.89, 0.94)	0.85 (0.84, 0.85)
	≥once/ year*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	Hispanic	8308	0.94 (0.91, 0.96)	0.78 (0.77, 0.79)
6+ drinks‡	<Monthly*	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.50 (0.38, 0.62)	0.91 (0.89, 0.93)
	<Monthly*	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.46 (0.32, 0.63)	0.92 (0.89, 0.94)
	<Monthly*	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.52 (0.36, 0.70)	0.90 (0.87, 0.93)
Maximum drinks	≥3*	Dawson, 2005[106, 139]	DSM-IV Dependence	0.3	AUDADIS-IV	≥65 years	8205	0.92 (0.72, 0.97)	0.88 (0.87, 0.89)
	≥3*	Dawson, 2005[106, 139]	DSM-IV Dependence	2.1	AUDADIS-IV	Female	24575	0.96 (0.94, 0.98)	0.75 (0.75, 0.76)
	≥4	Dawson, 2005[106, 139]	DSM-IV Dependence	2.5	AUDADIS-IV	Asian	1332	0.92 (0.76, 0.97)	0.87 (0.85, 0.89)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	2.9	AUDADIS-IV	Blacks	8245	0.83 (0.78, 0.88)	0.84 (0.84, 0.85)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	2.1	AUDADIS-IV	Female	24575	0.92 (0.89, 0.94)	0.85 (0.84, 0.85)
	≥5	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	Hispanic	8308	0.91 (0.87, 0.93)	0.80 (0.79, 0.81)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	All	43093	0.89 (0.87, 0.91)	0.82 (0.82, 0.83)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.6	AUDADIS-IV	Whites	24507	0.92 (0.90, 0.93)	0.81 (0.80, 0.81)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4†	AUDADIS-IV	35-64 years	NR	0.86 (0.82, 0.90)	0.84 (0.83, 0.85)
	≥6	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.5	AUDADIS-IV	Past-year drinkers	26946	0.84 (0.82, 0.85)	0.78 (0.77, 0.78)
	≥6	Dawson, 2005 [106, 139]	DSM-IV Dependence	6.3	AUDADIS-IV	AI	701	0.99 (0.88, 1.0)	0.87 (0.84, 0.89)
	≥6*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4†	AUDADIS-IV	18-34 years	NR	0.87 (0.84, 0.90)	0.76 (0.75, 0.78)
	≥7*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.2	AUDADIS-IV	Male	18518	0.82 (0.80, 0.85)	0.85 (0.84, 0.85)
AUDIT-C	≥3	Dawson, 2012[107]	DSM-IV Dependence	6.6	AUDADIS	Past-year drinkers	10944	0.95 (0.94, 0.97)	0.51 (0.51, 0.52)
	≥3	Dawson, 2012[107]	DSM-IV Dependence	4.2	AUDADIS	All	17225	0.95 (0.94, 0.97)	0.68 (0.68, 0.70)
	≥3	Rumpf, 2002[129]	DSM-IV Dependence	1.38	M-CIDI	All	3551	1.0 (0.93, 1.00)	0.40 (0.38, 0.42)
	≥3	Dawson, 2012[107]	DSM-5 Severe Use Disorder	5.6	AUDADIS	Past-year drinkers	11116	0.98 (0.97, 0.99)	0.50 (0.49, 0.51)
	≥3	Dawson, 2012[107]	DSM-5 Severe Use Disorder	3.6	AUDADIS	All	17311	0.98 (0.97, 0.99)	0.68 (0.67, 0.68)
AUDIT-C	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.8	AUDADIS-IV	Black past-year drinkers	4185	0.90 (0.85, 0.93)	0.60 (0.58, 0.62)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.7	AUDADIS-IV	Female past-year drinkers	13879	0.92 (0.90, 0.94)	0.67 (0.66, 0.67)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	11.8	AUDADIS-IV	18-29 years past-year drinkers	6144	0.96 (0.95, 0.97)	0.50 (0.49, 0.52)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.2	AUDADIS-IV	45-64 years past-year drinkers	7959	0.96 (0.93, 0.98)	0.56 (0.55, 0.57)
	≥3	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	All	43093	0.96 (0.95, 0.97)	0.71 (0.70, 0.71)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	0.6	AUDADIS-IV	≥65 years past-year drinkers	3388	1.0 (0.85, 1.0)	0.58 (0.56, 0.59)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.5	AUDADIS-IV	Pregnant past-year drinkers	256	1.00 (0.70, 1.00)	0.70 (0.64, 0.76)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.1	AUDADIS-IV	30-44 years past-year drinkers	9455	0.95 (0.93, 0.97)	0.54 (0.53, 0.55)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.8	AUDADIS-IV	Hispanic past-year drinkers	4949	0.96 (0.94, 0.98)	0.54 (0.53, 0.56)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.0	AUDADIS-IV	Asian/PI past-year drinkers	664	0.87 (0.73, 0.95)	0.65 (0.61, 0.69)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	10.6	AUDADIS-IV	AI/AN past-year drinkers	416	1.00 (0.92, 1.00)	0.54 (0.49, 0.59)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.2	AUDADIS-IV	White past-year drinkers	16732	0.97 (0.96, 0.98)	0.53 (0.52, 0.54)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	13.6	AUDADIS-IV	College students (18-29 years) past-year drinkers	1963	0.97 (0.94, 0.98)	0.49 (0.47, 0.52)
	≥3*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.5	AUDADIS-IV	Past-year drinkers	26946	0.96 (0.95, 0.97)	0.54 (0.54, 0.55)
	≥3*	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.74 (0.62, 0.83)	0.73 (0.70, 0.76)
	≥3*	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.74 (0.55, 0.87)	0.72 (0.67, 0.76)
AUDIT-C	≥3*	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.74 (0.58, 0.86)	0.74 (0.70, 0.78)
	≥3*	Seale, 2006[132]	DSM-IV Dependence	9.8	DIS-R	Female	338	0.88 (0.73, 0.95)	0.65 (0.59, 0.70)
	≥3*	Smith, 2009[133]	DSM-IV Dependence	8.7	CIDI	All	286	0.92 (0.74, 0.99)	0.71 (0.65, 0.76)
	≥4	Dawson, 2012[107]	DSM-IV Dependence	6.6	AUDADIS	Past-year drinkers	10944	0.88 (0.86, 0.90)	0.68 (0.67, 0.69)
	≥4	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.69 (0.57, 0.79)	0.82 (0.79, 0.84)
	≥4	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.67 (0.48, 0.81)	0.81 (0.77, 0.85)
	≥4	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.71 (0.55, 0.84)	0.83 (0.79, 0.86)
	≥4	Rumpf, 2002[129]	DSM-IV Dependence	1.4	M-CIDI	All	3551	0.96 (0.86, 0.99)	0.62 (0.60, 0.64)
	≥4	Dawson, 2012[107]	DSM-5 Severe Use Disorder	5.5	AUDADIS	Past-year drinkers	11116	0.95 (0.93, 0.96)	0.66 (0.65, 0.67)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	7.4	AUDADIS-IV	Male past-year drinkers	13067	0.94 (0.93, 0.96)	0.58 (0.57, 0.59)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.8	AUDADIS-IV	Hispanic past-year drinkers	4949	0.89 (0.85, 0.92)	0.67 (0.66, 0.68)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.2	AUDADIS-IV	45-64 years past-year drinkers	7959	0.94 (0.90, 0.96)	0.72 (0.71, 0.73)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.5	AUDADIS-IV	Pregnant past-year drinkers	256	0.98(0.70, 1.00)	0.86 (0.81, 0.90)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.2	AUDADIS-IV	White past-year drinkers	16732	0.93 (0.91, 0.95)	0.68 (0.68, 0.69)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.1	AUDADIS-IV	30-44 years past-year drinkers	9455	0.89 (0.86, 0.91)	0.69 (0.69, 0.70)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.5	AUDADIS-IV	Past-year drinkers	26946	0.91 (0.90, 0.93)	0.69 (0.68, 0.70)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	11.8	AUDADIS-IV	18-29 years past-year drinkers	6144	0.92 (0.90, 0.94)	0.64 (0.62, 0.65)
AUDIT-C	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	10.6	AUDADIS-IV	AI/AN past-year drinkers	416	1.00 (0.92, 1.00)	0.68 (0.63, 0.72)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	13.6	AUDADIS-IV	College students (age 18-29 years)	1963	0.93 (0.89, 0.95)	0.63 (0.61, 0.66)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	0.6	AUDADIS-IV	≥65 years past-year drinkers	3388	0.88 (0.67, 0.95)	0.73 (0.71, 0.74)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.0	AUDADIS-IV	Asian/PI past-year drinkers	664	0.76 (0.59, 0.87)	0.80 (0.77, 0.83)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.8	AUDADIS-IV	Black past-year drinkers	4185	0.81 (0.76, 0.85)	0.73 (0.72, 0.74)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.4	AUDADIS-IV	All	43093	0.91 (0.90, 0.93)	0.80 (0.80, 0.81)
	≥4*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.7	AUDADIS-IV	Female past-year drinkers	13879	0.85 (0.81, 0.88)	0.81 (0.80, 0.81)
	≥4*	Dawson, 2012	DSM-IV Dependence	4.2	AUDADIS	All	17225	0.88 (0.86, 0.90)	0.79 (0.79, 0.80)
	≥4	Dawson, 2012	DSM-5 Severe Use Disorder	3.6	AUDADIS	All	17311	0.95 (0.93, 0.96)	0.78 (0.77, 0.79)
	≥5	Dawson, 2012	DSM-IV Dependence	4.2	AUDADIS	All	17225	0.79 (0.76, 0.82)	0.88 (0.87, 0.88)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	10.6	AUDADIS-IV	AI/AN past-year drinkers	416	1.00 (0.92, 1.00)	0.80 (0.76, 0.84)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.1	AUDADIS-IV	30-44 years past-year drinkers	9455	0.81 (0.77, 0.84)	0.80 (0.79, 0.80)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.5	AUDADIS-IV	Past-year drinkers	26946	0.83 (0.81, 0.84)	0.81 (0.81, 0.82)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	13.6	AUDADIS-IV	College students (18-29 years) past-year drinkers	1963	0.85 (0.80, 0.88)	0.73 (0.71, 0.75)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.8	AUDADIS-IV	Hispanic past-year drinkers	4949	0.81 (0.77, 0.86)	0.77 (0.76, 0.79)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	11.8	AUDADIS-IV	18-29 years past-year drinkers	6144	0.84 (0.81, 0.87)	0.73 (0.72, 0.75)
AUDIT-C	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	7.4	AUDADIS-IV	Male past-year drinkers	13067	0.89 (0.87, 0.91)	0.72 (0.72, 0.73)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.2	AUDADIS-IV	White past-year drinkers	16732	0.85 (0.82, 0.87)	0.81 (0.81, 0.82)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	3.2	AUDADIS-IV	45-64 years past-year drinkers	7959	0.83 (0.78, 0.87)	0.85 (0.84, 0.86)
	≥5*	Dawson, 2005 [106, 139]	DSM-IV Dependence	5.0	AUDADIS-IV	Asian/Pacific Islander past-year drinkers	664	0.68 (0.50, 0.80)	0.89 (0.86, 0.91)
	≥5*	Dawson, 2012[107]	DSM-IV Dependence	6.6	AUDADIS	Past-year drinkers	10944	0.79 (0.76, 0.82)	0.81 (0.80, 0.82)
	≥5*	Rumpf, 2002[129]	DSM-IV Dependence	1.4	M-CIDI	All	3551	0.88 (0.76, 0.94)	0.81 (0.80, 0.82)
	≥5*	Seale, 2006[132]	DSM-IV Dependence	17.8	DIS-R	Male	287	0.80 (0.68, 0.89)	0.74 (0.68, 0.79)
	≥5*	Dawson, 2012[107]	DSM-5 Severe Use Disorder	5.6	AUDADIS	All	17311	0.85 (0.81, 0.87)	0.87 (0.87, 0.88)
	≥5*	Dawson, 2012[107]	DSM-5 Severe Use Disorder	5.6	AUDADIS	Past-year drinkers	11116	0.85 (0.81, 0.87)	0.81 (0.80, 0.81)
	≥6*	Dawson, 2005 [106, 139]	DSM-IV Dependence	13.6	AUDADIS-IV	College students (18-29 years) past-year drinkers	1963	0.77 (0.72, 0.82)	0.81 (0.79, 0.83)
	≥6*	Dawson, 2005 [106, 139]	DSM-IV Dependence	7.4	AUDADIS-IV	Male past-year drinkers	13067	0.82 (0.80, 0.84)	0.80 (0.79, 0.81)
	≥6*	Dawson, 2005 [106, 139]	DSM-IV Dependence	11.8	AUDADIS-IV	18-29 years past-year drinkers	6144	0.76 (0.73, 0.79)	0.81 (0.80, 0.82)
AUDIT	≥4*	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.82 (0.71, 0.90)	0.75 (0.72, 0.78)
	≥4*	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.83 (0.67, 0.92)	0.75 (0.71, 0.79)
	≥4*	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.81 (0.63, 0.92)	0.76 (0.71, 0.80)
	≥4*	Seale, 2006[132]	DSM-IV Dependence	9.8	DIS-R	Female	338	0.88 (0.73, 0.95)	0.76 (0.71, 0.81)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥5	Boschloo, 2010[97]	DSM-IV Dependence	6.2	CIDI	Female w/o depression and/or anxiety	381	1.00 (0.61, 1.00)	0.70 (0.65, 0.75)
	≥5	Boschloo, 2010[97]	DSM-IV Dependence	10.3	CIDI	Female w/ depression and/or anxiety	1152	0.88 (0.79, 0.93)	0.72 (0.69, 0.75)
	≥5	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.74 (0.62, 0.83)	0.82 (0.79, 0.84)
	≥5	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.74 (0.58, 0.86)	0.80 (0.76, 0.84)
	≥5	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.74 (0.55, 0.87)	0.84 (0.80, 0.87)
	≥5	Seale, 2006[132]	DSM-IV Dependence	9.8	DIS-R	Female	338	0.73 (0.56, 0.85)	0.85 (0.80, 0.88)
	≥5*	Rumpf, 2002[129]	DSM-IV Dependence	1.38	M-CIDI	All	3551	0.96 (0.86, 0.99)	0.78 (0.77, 0.79)
	≥6*	Clements, 1998[103]	DSM-IV Dependence	11.4	CIDI-SAM	All	306	0.83 (0.67, 0.92)	0.82 (0.77, 0.86)
	≥6*	Boschloo, 2010[97]	DSM-IV Dependence	6.2	CIDI	Female	1533	0.86 (0.78, 0.92)	0.80 (0.78, 0.82)
	≥6*	Boschloo, 2010[97]	DSM-IV Dependence	1.6	CIDI	Female w/o depression and/or anxiety	381	1.00 (0.61, 1.00)	0.81 (0.77, 0.85)
	≥6*	Boschloo, 2010[97]	DSM-IV Dependence	7.7	CIDI	Female w/ depression and/or anxiety	1152	0.85 (0.77, 0.91)	0.80 (0.77, 0.82)
	≥6*	Seale, 2006[132]	DSM-IV Dependence	17.8	DIS-R	Male	287	0.84 (0.72, 0.92)	0.76 (0.70, 0.81)
	≥7*	Foxcroft, 2015[110]	DSM-IV Dependence	8.5	WMH-CIDI	Female	282	0.71 (0.49, 0.87)	0.70 (0.64, 0.75)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	7.5	CIDI	All	2300	0.80 (0.74, 0.86)	0.85 (0.83, 0.86)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	1.6	CIDI	Female w/o depression and/or anxiety	381	0.67 (0.30, 0.90)	0.90 (0.87, 0.93)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	7.7	CIDI	Female w/ depression and/or anxiety	1152	0.75 (0.65, 0.83)	0.89 (0.87, 0.91)

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT	≥8	Boschloo, 2010[97]	DSM-IV Dependence	6.2	CIDI	Female	1534	0.75 (0.65, 0.82)	0.89 (0.88, 0.91)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	10.3	CIDI	Male	766	0.87 (0.78, 0.93)	0.76 (0.72, 0.79)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	4.0	CIDI	Male w/o depression and/or anxiety	227	0.80 (0.45, 0.94)	0.75 (0.69, 0.80)
	≥8	Boschloo, 2010[97]	DSM-IV Dependence	13.0	CIDI	Male w/ depression and/or anxiety	539	0.88 (0.79, 0.94)	0.76 (0.72, 0.80)
	≥8	Clements, 1998[103]	DSM-IV Dependence	11.4	CIDI-SAM	All	306	0.74 (0.58, 0.86)	0.92 (0.88, 0.95)
	≥8	McGinnis, 2013[125]	DSM-IV Dependence	7.6	CIDI-SAM	All	837	0.56 (0.44, 0.68)	0.92 (0.89, 0.93)
	≥8	McGinnis, 2013[125]	DSM-IV Dependence	8.1	CIDI-SAM	HIV+	444	0.63 (0.46, 0.77)	0.92 (0.89, 0.94)
	≥8	McGinnis, 2013[125]	DSM-IV Dependence	7.1	CIDI-SAM	HIV-	393	0.48 (0.31, 0.66)	0.91 (0.88, 0.94)
	≥8	Rumpf, 2002[129]	DSM-IV Dependence	1.4	M-CIDI	All	3551	0.78 (0.64, 0.87)	0.94 (0.93, 0.95)
	≥8	Seale, 2006[132]	DSM-IV Dependence	9.8	DIS-R	Female	338	0.39 (0.25, 0.56)	0.96 (0.94, 0.98)
	≥9*	Boschloo, 2010[97]	DSM-IV Dependence	13.0	CIDI	Male w/ depression and/or anxiety	539	0.88 (0.79, 0.94)	0.81 (0.77, 0.84)
	≥9*	Boschloo, 2010[97]	DSM-IV Dependence	10.3	CIDI	Male	766	0.87 (0.78, 0.93)	0.81 (0.78, 0.84)
	≥9*	Boschloo, 2010[97]	DSM-IV Dependence	4.0	CIDI	Male w/o depression and/or anxiety	227	0.80 (0.45, 0.94)	0.82 (0.76, 0.87)
	≥12*	Foxcroft, 2015[110]	DSM-IV Dependence	13.0	WMH-CIDI	Male	138	0.67 (0.41, 0.87)	0.86 (0.78, 0.92)
	≥13*	Gache, 2005[111]	DSM-IV Dependence	7.3	SCID	All	926	0.75 (0.65, 0.83)	0.97 (0.95, 0.98)
	≥13*	Gache, 2005[111]	DSM-IV Dependence	4.0	SCID	Female	446	0.95 (0.74, 0.99)	0.98 (0.96, 0.99)
	≥13*	Gache, 2005[111]	DSM-IV Dependence	14.6	SCID	Male	480	0.70 (0.58, 0.79)	0.95 (0.93, 0.97)

* Optimal cutoff
† Prevalence for the full sample; not reported by subgroup.
‡ Includes AUDIT-3

Appendix I Table 12. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Adults (KQ2)

Abbreviations: AI/AN = American Indian/Alaska Native; AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule; ; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI = Composite International Diagnostic Interview; CIDI-SAM = Composite International Diagnostic Interview Substance Abuse Module; DIS-R = Diagnostic Interview Schedule, Revised; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; M-CIDI = Munich Composite International Diagnostic Interview; MINI = Mini International Neuropsychiatric Interview; pct = percent; PI = Pacific Islander; SCID = Structured Clinical Interview for DSM-IV Substance Use Disorders; WMH-CIDI = World Mental Health, Composite International Diagnostic Interview

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
5/4+ drinks	≥1*	Smith, 2009[133]	NIAAA	>14/7 [M/F] drinks per week or >4/3 [M/F] drinks per occasion in past 30 days	28.7	TLFB	All	286	0.84 (0.75, 0.91)	0.78 (0.72, 0.84)
	≥1*	McNeely, 2015[126]	NA	>5/4 [M/F] drinks/day or 14/7 [M/F] drinks/week	19.2	TLFB	All	459	0.86 (0.77, 0.93)	0.79 (0.74, 0.83)
	12-months	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	27.7	TLFB	Male	285	0.98 (0.91, 0.99)	0.47 (0.40, 0.54)
	12-months	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	27.1	TLFB	Whites	377	0.97 (0.92, 0.99)	0.61 (0.55, 0.67)
	12-months	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	623	0.96 (0.92, 0.98)	0.58 (0.53, 0.62)
	12-months	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	23.1	TLFB	Blacks	238	0.93 (0.83, 0.97)	0.53 (0.46, 0.60)
	12-months	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	23.1	TLFB	Female	338	0.94 (0.86, 0.97)	0.66 (0.60, 0.72)
	3-months*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	23.1	TLFB	Blacks	238	0.87 (0.76, 0.94)	0.65 (0.58, 0.72)
	3-months*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	27.1	TLFB	Whites	377	0.95 (0.89, 0.98)	0.75 (0.69, 0.80)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
5/4+ drinks	3-months*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	23.1	TLFB	Female	338	0.91 (0.83, 0.96)	0.80 (0.75, 0.84)
	3-months*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	623	0.93 (0.88, 0.96)	0.72 (0.68, 0.76)
	3-months*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	27.7	TLFB	Male	285	0.93 (0.84, 0.96)	0.61 (0.54, 0.68)
6+ drinks*	≥1*	Gomez, 2005[112]	WHO	≥280/168 [M/F] g ethanol/week	9.2	QF interview	All	500	0.83 (0.71, 0.91)	0.91 (0.88, 0.93)
	≥2*	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.75 (0.61, 0.84)	0.87 (0.85, 0.89)
	≥3*	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.76 (0.67, 0.84)	0.88 (0.85, 0.90)
Quant x Freq	≥4*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.90 (0.79, 0.96)	0.83 (0.81, 0.85)
	≥5*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.82 (0.73, 0.89)	0.79 (0.76, 0.82)
ASSIST	≥11	Kumar, 2016[121]	NA	≥3 drinks/3 hrs, ≥3 times/year	31.1	MINI Plus	Male	206	0.66 (0.53, 0.77)	0.91 (0.85, 0.95)
	≥11	Kumar, 2016[121]	NA	≥3 drinks/3 hrs, ≥3 times/year	10.4	MINI Plus	Female	193	0.45 (0.23, 0.68)	0.92 (0.87, 0.96)
	≥3*	Kumar, 2016[121]	NA	≥3 drinks/3 hrs, ≥3 times/year	31.1	MINI Plus	Female	193	1.0 (0.83, 1.0)	0.62 (0.55, 0.70)
	≥5*	Kumar, 2016[121]	NA	≥3 drinks/3 hrs, ≥3 times/year	10.4	MINI Plus	Male	206	0.86 (0.75, 0.93)	0.60 (0.52, 0.68)
AUDIT	≥10*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.73 (0.63, 0.81)	0.78 (0.75, 0.81)
	≥4*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	625	0.89 (0.84, 0.93)	0.72 (0.68, 0.76)
	≥4*	Foxcroft, 2015[110]	NA	≥21/14 [M/F] units/week or ≥3/2 [M/F] units /day for 5 days in any 1 week	51.1	TLFB	Female	282	0.88 (0.82, 0.93)	0.67 (0.59, 0.75)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥4*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.8	TLFB	All‡	837	0.82 (0.74, 0.88)	0.80 (0.77, 0.83)
	≥4*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.0	TLFB	HIV-	393	0.86 (0.72, 0.93)	0.81 (0.76, 0.85)
	≥4*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13.5	TLFB	HIV+	444	0.80 (0.68, 0.88)	0.79 (0.75, 0.83)
	≥5*	Rumpf, 2002[129]	NA	≥20/30 [F/M] g ethanol/day	5.38	M-CIDI	All	3551	0.77 (0.70, 0.82)	0.80 (0.79, 0.81)
	≥5*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.98 (0.90, 1.00)	0.70 (0.67, 0.73)
	≥6*	Gache, 2005[111]	NA	>210/140 [M/F] g ethanol/week	8.4	SCID	Female	466	0.81 (0.67, 0.91)	0.94 (0.91, 0.96)
	≥6*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.84 (0.72, 0.92)	0.78 (0.75, 0.81)
	≥7*	Gache, 2005[111]	NA	>210/140 [M/F] g ethanol/week	17.7	SCID	Male	480	82.5 (0.73, 0.89)	79.9 (0.76, 0.84)
	≥7*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.78 (0.65, 0.88)	0.86 (0.84, 0.88)
	≥8	Rumpf, 2002[129]	NA	≥20/30 [F/M] g ethanol/day	5.38	M-CIDI	All	3551	0.33 (0.27, 0.40)	0.95 (0.94, 0.96)
	≥8	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	625	0.46 (0.38, 0.54)	0.94 (0.91, 0.96)
AUDIT	≥8	Gache, 2005[111]	NA	>210/140 [M/F] g ethanol/week	10.3	SCID	Male	480	80.3 (0.70, 0.87)	82.5 (0.78, 0.86)
	≥8	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.92 (0.85, 0.96)	0.65 (0.61, 0.68)
	≥8	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Female	1011	0.59 (0.45, 0.71)	0.90 (0.88, 0.92)
	≥8*	Gomez, 2006[113]	WHO	≥280/168 [M/F] g ethanol/week	11.1	QF interview	≥65 years	189	0.67 (0.64, 0.70)	0.95 (0.95, 0.96)
	≥8*	Gomez, 2006[113]	WHO	≥280/168 [M/F] g ethanol/week	11.1	QF interview	<65 years	413	0.83 (0.82, 0.84)	0.94 (0.94, 0.94)
	≥8*	Gomez, 2005[112]	WHO	≥280/168 [M/F] g ethanol/week	9.2	QF interview	All	500	0.81 (0.68, 0.89)	0.94 (0.91, 0.96)
	≥8*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.8	TLFB	All	837	0.42 (0.33, 0.52)	0.93 (0.91, 0.94)
	≥8*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.0	TLFB	HIV-	393	0.47 (0.33, 0.61)	0.94 (0.91, 0.96)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥8*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13.5	TLFB	HIV	444	0.38 (0.27, 0.51)	0.92 (0.88, 0.94)
	≥9*	Foxcroft, 2015[110]	NA	≥21/14 [M/F] units/week or ≥3/2 [M/F] units/day for 5 days in any 1 week	48.6	TLFB	Male	138	0.64 (0.52, 0.76)	0.82 (0.71, 0.90)
	≥9*	Aalto, 2009[93]	NA	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.84 (0.75, 0.90)	0.73 (0.70, 0.76)
6+ drinks*	Less than monthly*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.8	TLFB	All‡	837	0.48 (0.39, 0.57)	0.94 (0.92, 0.95)
	Less than monthly*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.0	TLFB	HIV-	393	0.56 (0.41, 0.69)	0.94 (0.91, 0.96)
	Less than monthly*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13.5	TLFB	HIV+	444	0.42 (0.30, 0.54)	0.94 (0.91, 0.96)
AUDIT-C	≥3	Rumpf, 2002[129]	NA	≥20/30 [F/M] g ethanol/day	5.38	M-CIDI	All	3551	0.99 (0.96, 1.00)	0.42 (0.40, 0.44)
	≥3	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	625	0.94 (0.89, 0.97)	0.60 (0.56, 0.64)
	≥3	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.96 (0.87, 0.99)	0.35 (0.32, 0.38)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month (excluding those meeting AUD criteria but within NIAAA limits)	16.0	AUDADIS-IV	Asian/Pacific Islander past-year drinkers	661	0.98 (0.94, 1.00)	0.75 (0.71, 0.79)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	American Indian/Alaska Native past-year drinkers	409	1.00 (0.97, 1.00)	0.72 (0.67, 0.77)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Black past-year drinkers	4142	0.99 (0.98, 0.99)	0.74 (0.73, 0.76)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	45-64 year past-year drinkers	7870	0.99 (0.98, 0.99)	0.69 (0.68, 0.70)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	≥65 years past- year drinkers	3349	0.99 (0.98, 1.00)	0.68 (0.66, 0.70)
AUDIT-C	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Hispanic past-year drinkers	4903	0.99 (0.98, 0.99)	0.70 (0.69, 0.72)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	White past-year drinkers	16580	0.99 (0.98, 0.99)	0.68 (0.67, 0.69)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	College students (18-29 y) past-year drinkers	1948	0.99 (0.98, 1.00)	0.70 (0.67, 0.72)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Past-year drinkers	26695	0.99 (0.98, 0.99)	0.69 (0.68, 0.70)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	All	42842	0.99 (0.98, 0.99)	0.82 (0.82, 0.82)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	18-29 year past-year drinkers	6092	0.98 (0.98, 0.99)	0.69 (0.68, 0.71)
	≥3*	Gomez, 2006[113]	WHO	≥280/168 [M/F] g ethanol/week	11.1	QF interview	<65 years	413	1.00 (0.99, 1.00)	0.78 (0.78, 0.78)
	≥3*	Smith, 2009[133]	NIAAA	>14/7 [M/F] drinks per week or >4/3 [M/F] drinks per occasion in past 30 days	28.7	TLFB	All	286	0.74 (0.64, 0.83)	0.81 (0.76, 0.86)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Pregnant past-year drinkers	256	0.95 (0.85, 0.99)	0.85 (0.80, 0.88)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
AUDIT-C	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Female past-year drinkers	13778	0.96 (0.96, 0.97)	0.80 (0.79, 0.80)
	≥3*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	ER patients past-year drinkers	5655	0.99 (0.98, 0.99)	0.70 (0.68, 0.71)
	≥3*	Gomez, 2005[112]	WHO	≥280/168 [M/F] g ethanol/week	9.2	QF interview	All	500	1.0 (0.924, 1.0)	0.79 (0.75, 0.82)
	≥3*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.8	TLFB	All‡	837	0.86 (0.78, 0.91)	0.87 (0.84, 0.89)
	≥3*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	12.0	TLFB	HIV-	393	0.90 (0.77, 0.95)	0.77 (0.72, 0.81)
	≥3*	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13.5	TLFB	HIV+	444	0.83 (0.72, 0.91)	0.78 (0.73, 0.82)
	≥3*	Gomez, 2006[113]	WHO	≥280/168 [M/F] g ethanol/week	11.1	QF interview	≥65 years	189	1.00 (0.97, 1.00)	0.81 (0.80, 0.81)
	≥4	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	ER patients past-year drinkers	5655	0.94 (0.93, 0.95)	0.87 (0.86, 0.88)
	≥4	Rumpf, 2002[129]	NA	≥20/30 [F/M] g ethanol/ day	5.38	M-CIDI	All	3551	0.94 (0.90, 0.97)	0.65 (0.63, 0.67)
	≥4	Foxcroft, 2015[110]	NA	≥21/14 [M/F] units/week or ≥3/2 [M/F] units/day for 5 days in any 1 week	48.6	TLFB	Male	138	0.94 (0.85, 0.98)	0.51 (0.39, 0.63)
	≥4	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13	TLFB	HIV	444	0.75 (0.63, 0.84)	0.87 (0.83, 0.90)
AUDIT-C	≥4	McGinnis, 2013[125]	NIAAA	>14 drinks per 7-days or >4 drinks/day	13	TLFB	HIV-	393	0.80 (0.67, 0.90)	0.87 (0.83, 0.90)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Male past-year drinkers	12917	0.99 (0.99, 0.99)	0.79 (0.78, 0.80)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	18-29 year past-year drinkers	6092	0.94 (0.93, 0.95)	0.86 (0.85, 0.87)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	30-44 year past-year drinkers	9384	0.98 (0.98, 0.99)	0.69 (0.68, 0.70)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	College students (18-29y) past-year drinkers	1948	0.95 (0.93, 0.96)	0.88 (0.86, 0.89)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Hispanic past-year drinkers	4903	0.94 (0.93, 0.95)	0.86 (0.85, 0.87)
	≥4*	Seale, 2006[132]	NIAAA	≥7/14 drinks per week or >3/4 drinks in 1 day [women and men ≥65/men <65]	25.5	TLFB	All	625	0.85 (0.79, 0.90)	0.77 (0.73, 0.81)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	White past-year drinkers	16580	0.92 (0.91, 0.93)	0.86 (0.85, 0.86)
AUDIT-C	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	All	42842	0.93 (0.92, 0.93)	0.92 (0.92, 0.92)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	45-64 years past-year drinkers	7870	0.91 (0.90, 0.93)	0.87 (0.86, 0.88)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	≥65 years past- year drinkers	3349	0.93 (0.91, 0.95)	0.85 (0.84, 0.86)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Black past-year drinkers	4142	0.93 (0.91, 0.94)	0.90 (0.89, 0.91)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	American Indian/Alaska Native past-year drinkers	409	0.91 (0.84, 0.94)	0.87 (0.82, 0.90)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Past-year drinkers	26695	0.93 (0.92, 0.93)	0.86 (0.86, 0.87)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Asian/Pacific Islander past-year drinkers	661	0.93 (0.86, 0.96)	0.92 (0.89, 0.94)
	≥4*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	30-44 years past-year drinkers	9384	0.92 (0.91, 0.93)	0.86 (0.85, 0.87)
	≥4*	Foxcroft, 2015[110]	NA	≥21/14 [M/F] units/week or ≥3/2 [M/F] units/day for 5 days in any 1 week	50.2	TLFB	Female	282	0.82 (0.75, 0.88)	0.75 (0.67, 0.82)
AUDIT-C	≥5*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Hispanic past-year drinkers	4903	0.85 (0.83, 0.87)	0.97 (0.96, 0.97)
	≥5*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	18-29 years past-year drinkers	6092	0.86 (0.85, 0.87)	0.97 (0.96, 0.97)
	≥5*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	College students (18-29y) past-year drinkers	1948	0.87 (0.84, 0.89)	0.98 (0.97, 0.98)
	≥5*	Dawson, 2005[106]	NIAAA	>14/7 [M/F] standard drinks or >4/3 [M/F] drinks per day ≥once a month	16.0	AUDADIS-IV	Male past-year drinkers	12917	0.91 (0.90, 0.92)	0.95 (0.95, 0.96)
	≥5*	Rumpf, 2002[129]	NA	≥20/30 [F/M] g ethanol/ day	5.38	M-CIDI	All	3551	0.74 (0.67, 0.80)	0.83 (0.82, 0.84)
	≥5*	Foxcroft, 2015[110]	NA	≥21/14 [M/F] units/week or ≥3/2 [M/F] units/day for 5 days in any 1 week	48.6	TLFB	Male	138	0.82 (0.71, 0.90)	0.69 (0.57, 0.79)
	≥5*	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.94 (0.84, 0.98)	0.81 (0.78, 0.83)
	≥6*	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	5.0	TLFB	Female	1011	0.75 (0.61, 0.84)	0.90 (0.88, 0.92)

Appendix I Table 13. Results of Test Accuracy Studies to Detect Adults Who Exceeded Various Alcohol Drinking Limits (KQ2)

Test name	Cutoff	Author, year	Diagnostic criteria source	Description of limits	Exceeding limits, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
	≥7*	Aalto, 2009[93]	NR	≥16/10 [M/F] drinks/ week in past 28 days	10.6	TLFB	Male	840	0.85 (0.77, 0.91)	0.78 (0.75, 0.81)

* Includes AUDIT-3
† Only confidence intervals reported by the authors included in this table
‡ This study only recruited male participants.

Abbreviations: ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI = Composite International Diagnostic Interview; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; HIV = human immunodeficiency virus; ICD-10 = International Statistical Classification of Diseases and Related Health Problems, Tenth Edition; M-CIDI = Munich Composite International Diagnostic; MINI = Mini International Neuropsychiatric Interview; NA = not applicable; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NR = not reported; QF = quantity/frequency; SCID = Structured Clinical Interview for DSM-IV Substance Use Disorders; SIP = Screening and Intervention Programme; TLFB = Timeline Followback; WHM-CIDI = World Mental Health, Composite International Diagnostic Interview; WHO = World Health Organization

Appendix I Table 14. Results of Test Accuracy Studies to Detect Other Conditions Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
AUDIT	≥2*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence	9.9	AUDADIS	All (female only)	393	0.95 (0.83, 0.99)	0.64 (0.59, 0.69)
	≥2*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence, ≥7 drinks/week, or ≥4 drinks/occasion	22.6	AUDADIS	Female†	393	0.87 (0.78, 0.92)	0.71 (0.66, 0.76)
	≥4	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/ depression and/or anxiety	1092	0.81	0.60
	≥4	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/o depression and/or anxiety	392	1.00	0.50
	≥4*	Volk, 1997[134]	Problem alcohol users, hazardous alcohol users, and ICD-10 alcohol dependence	NR	AUDADIS-IV	All	1333	0.85	0.84
	≥5	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/o depression and/or anxiety	392	1.00	0.70
	≥5	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/ depression and/or anxiety	1092	0.74	0.72
	≥5*	Foxcroft, 2015[110]	DSM-IV abuse (without dependence)	24.3	WMH-CIDI	Female	282	0.72 (0.58, 0.83)	0.56 (0.50, 0.63)
	≥5*	Rumpf, 2002[129]	Current alcohol misuse (NOS)	1.15	M-CIDI	All	3551	0.61	0.77
	≥6	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/o depression and/or anxiety	392	0.94	0.81
	≥6	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/ depression and/or anxiety	1092	0.61	0.80
	≥6	Degenhardt, 2001[108]	ICD-10 dependence	9.9	CIDI	Female		0.880	0.364

Appendix I Table 14. Results of Test Accuracy Studies to Detect Other Conditions Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
AUDIT-C	≥7	Degenhardt, 2001[108]	ICD-10 abuse (without dependence)	17.7	CIDI	All	370	0.860	0.337
	≥7	Degenhardt, 2001[108]	ICD-10 dependence	9.9	CIDI	Male		0.950	0.187
	≥7	Degenhardt, 2001[108]	ICD-10 dependence	9.9	CIDI	All	370	0.857	0.412
	≥8	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/o depression and/or anxiety	392	0.59	0.90
	≥8	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Male w/ depression and/or anxiety	499	0.56	0.76
	≥8	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Female w/ depression and/or anxiety	1092	0.39	0.89
	≥8	Boschloo, 2010[97]	DSM-IV abuse (without dependence)	4.4	CIDI	Male w/o depression and/or anxiety	240	0.52	0.75
	≥8	Volk, 1997[134]	Problem alcohol users, hazardous alcohol users, and ICD-10 alcohol dependence	NR	AUDADIS-IV	All	NR	0.51	0.96
	≥8	Rumpf, 2002[129]	Current alcohol misuse (NOS)	1.15	M-CIDI	All	3551	0.37	0.94
	≥10*	Degenhardt, 2001[108]	ICD-10 abuse (without dependence)	17.7	CIDI	All	370	0.66	0.62
	≥10*	Foxcroft, 2015[110]	DSM-IV abuse (without dependence)	24.3	WMH-CIDI	Male	138	0.49 (0.34, 0.64)	0.74 (0.64, 0.83)
	≥17*	Degenhardt, 2001[108]	ICD-10 dependence	9.9	CIDI	All	370	0.643	0.961
	≥2*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence	9.9	AUDADIS	All (female)	393	0.92 (0.80, 0.97)	0.78 (0.73, 0.82)
	≥2*	Bradley, 2003[98]	DSM-IV abuse or dependence, ≥7 drinks/week, or ≥4 drinks/occasion	22.6	AUDADIS	Female†	393	0.81 (0.72, 0.88)	0.86 (0.81, 0.89)

Appendix I Table 14. Results of Test Accuracy Studies to Detect Other Conditions Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
AUDIT-C	≥3	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence	9.9	AUDADIS	All (female)	393	0.69 (0.54, 0.81)	0.89 (0.85, 0.92)
	≥3	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence, ≥7 drinks/week, or ≥4 drinks/occasion	22.6	AUDADIS	Female†	393	0.60 (0.49, 0.69)	0.96 (0.93, 0.98)
	≥3	Dawson, 2012[107]	DSM-IV abuse (without dependence)	4.7	AUDADIS	Past-year drinkers	10944	0.904	0.515
	≥3	Rumpf, 2002[129]	Current alcohol misuse (NOS)	1.15	M-CIDI	All	3551	0.95	0.40
	≥3	Dawson, 2012[107]	DSM-5 moderate use disorder	6.6	AUDADIS	Past-year drinkers	11116	0.907	0.518
	≥3*	Smith, 2009[133]	NIAAA problem or disorder	24.5	SIP or CIDI	All	286	0.80 (0.69, 0.88)	0.80 (0.74, 0.85)
	≥3*	Dawson, 2012[107]	DSM-IV abuse (without dependence)	4.7	AUDADIS	All	17225	0.904	0.690
	≥3*	Dawson, 2012[107]	DSM-5 moderate use disorder	6.6	AUDADIS	All	17311	0.907	0.693
	≥4	Rumpf, 2002[129]	Current alcohol misuse (NOS)	1.15	M-CIDI	All	3551	0.83	0.62
	≥4*	Dawson, 2012[107]	DSM-IV abuse (without dependence)	4.7	AUDADIS	Past-year drinkers	10944	0.777	0.675
	≥4*	Dawson, 2012[107]	DSM-IV abuse (without dependence)	4.7	AUDADIS	All	17225	0.777	0.792
	≥4*	Dawson, 2012[107]	DSM-5 moderate use disorder	6.6	AUDADIS	All	17311	0.789	0.794
	≥4*	Dawson, 2012[107]	DSM-5 moderate use disorder	6.6	AUDADIS	Past-year drinkers	11116	0.789	0.677
	≥5*	Dawson, 2012[107]	DSM-IV abuse (without dependence)	4.7	AUDADIS	Past-year drinkers	10944	0.627	0.804
	≥5*	Rumpf, 2002[129]	Current alcohol misuse (NOS)	1.15	M-CIDI	All	3551	0.56	0.81
	≥5*	Dawson, 2012[107]	DSM-5 moderate use disorder	6.6	AUDADIS	Past-year drinkers	11116	0.609	0.813

Appendix I Table 14. Results of Test Accuracy Studies to Detect Other Conditions Among Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI†)	Specificity (95% CI†)
5/4+ drinks‡‡	≥1*	Smith, 2009[133]	Problem or Disorder	24.5	SIP or CIDI	All	286	0.84 (0.74, 0.91)	0.75 (0.69, 0.80)
	≥1*	McNeely, 2015[126]	≥1 self-reported consequence of use	16.1	MINI-Plus SIP	All	459	0.878 (0.782, 0.943)	0.766 (0.721, 0.808)
	≥1/year*	McNeely, 2016[136, 147]	≥1 DSM-5 criterion	24.0	CIDI	All	2000	0.85	0.70
	≥12/year*	McNeely, 2016[136, 147]	DSM-5 moderate-severe use disorder	7.0	CIDI	All	2000	0.79	0.82
6+ drinks*	≥1*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence, ≥7 drinks/week, or ≥4 drinks/occasion	22.6	AUDADIS	Female†	393	0.45 (0.35, 0.55)	0.96 (0.93, 0.98)
	≥1*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence	9.9	AUDADIS	All	393	0.59 (0.43, 0.73)	0.92 (0.89, 0.94)
4+ drinks§§	≥1*	Bradley, 2003[98]	DSM-IV abuse or lifetime dependence, or ≥7 drinks/week, or ≥4 drinks/occasion	22.6	AUDADIS	Female†	393	0.69 (0.58, 0.77)	0.94 (0.91, 0.96)

* Includes AUDIT-3
† Only confidence intervals reported by the authors included in this table
‡ Includes TAPS-1 and SUBS
§ Includes a modified version of AUDIT-3 (threshold lowered for females)

Abbreviations: ASSIST = Alcohol, Smoking and Substance Involvement Screening Test; AUDADIS = Alcohol Use Disorder and Associated Disabilities Interview Schedule; AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; CIDI = Composite International Diagnostic Interview; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; HIV = human immunodeficiency virus; ICD-10 = International Statistical Classification of Diseases and Related Health Problems, Tenth Edition; M-CIDI = Munich Composite International Diagnostic; MINI = Mini International Neuropsychiatric Interview; NA = not applicable; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NR = not reported; QF = quantity/frequency; SCID = Structured Clinical Interview for DSM-IV Substance Use Disorders; SIP = Screening and Intervention Programme; TLFB = Timeline Followback; WHM-CIDI = World Mental Health, Composite International Diagnostic Interview; WHO = World Health Organization

Appendix I Table 15. Results of Test Accuracy Studies to Detect Unhealthy Alcohol Use Among Older Adults (KQ2)

Test name	Cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
4+ drinks*	≥2§	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.71 (0.62, 0.79)	0.91 (0.88, 0.93)
5/4+ drinks	≥once/ year	Dawson, 2005 [106, 139]‡	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	≥65 years	8666	0.64 (0.61, 0.67)	1.00 (1.00,1.00)
6+ drinks†	≥1§	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.94 (0.88, 0.97)	0.70 (0.65, 0.74)
Maximum drinks	≥2	Dawson, 2005 [106, 139]‡	DSM-IV abuse or dependence or ≥2/1 [M/F] average daily drinks over past year, ≥5/4 [M/F] drinks at least once in past year, or usual/maximum quantity of drinks was ≥5/4 [M/F] in past year	NR	AUDADIS-IV	≥65 years	8666	0.97 (0.96, 0.99)	0.82 (0.81, 0.83)
Quant x Freq	≥3§	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.94 (0.88, 0.97)	0.73 (0.68, 0.77)
AUDIT-C	≥3	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.99 (0.95, 1.00)	0.63 (0.58, 0.68)
	≥4§	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.94 (0.88, 0.97)	0.80 (0.76, 0.84)
AUDIT	≥5§	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.86 (0.78, 0.91)	0.87 (0.83, 0.90)
	≥8	Aalto, 2011[94]	≥8 drinks/week or ≥4 drinks/day	22.8	TLFB	All older adults	517	0.48 (0.39, 0.57)	0.97 (0.95, 0.98)

* Includes a modified AUDIT-3 (threshold lowered for age)
† Includes AUDIT-3
‡ Optimal cutoff
§ Subgroup only

Abbreviations: AUDADUS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; Freq = frequency; M/F = males/females; NR = not reported; Quant = quantity; TLFB = Timeline Followback

Appendix I Table 16. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Older Adults (KQ2)

Test name	Index test cutoff	Author, year	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	≥3	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	NR	AUDADIS-IV	≥65 years past-year drinkers	3388	0.91 (0.84, 0.95)	0.59 (0.57, 0.61)
	≥4*		DSM-IV Abuse or dependence	NR	AUDADIS-IV	≥65 years past-year drinkers	3388	0.76 (0.67, 0.83)	0.74 (0.72, 0.75)

* Optimal cutoff

Abbreviations: AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; NR = not reported

Appendix I Table 17. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Older Adults (KQ2)

Index test	Author, year	Index test cutoff	Condition description	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	Dawson, 2005 [106, 139]	≥3	DSM-IV Dependence	NR	AUDADIS-IV	≥65 years past-year drinkers	3388	1.0 (0.85, 1.0)	0.58 (0.56, 0.59)
		≥4*	DSM-IV Dependence	NR	AUDADIS-IV	≥65 years past-year drinkers	3388	0.88 (0.67, 0.95)	0.73 (0.71, 0.74)

* Optimal cutoff

Abbreviations: AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; NR = not reported

Appendix I Table 18. Results of Test Accuracy Studies to Detect Any Alcohol Use Among Pregnant Women (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
Quant x Freq	Positive score (Yes)*	Bull, 1999[100]	Any use	53.4	Structured patient interview and medical record abstraction postpartum	All pregnant women	208	0.77 (0.68, 0.83)	0.93 (0.86, 0.96)

* Optimal cutoff

Abbreviations: AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; Freq = frequency; Quant = quantity

Appendix I Table 19. Results of Test Accuracy Studies to Detect Alcohol Use Disorder Among Pregnant Women (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	≥3*	Dawson, 2005[106, 139]	DSM-IV Abuse or dependence	5.5	AUDADIS-IV	Pregnant past-year drinkers	256	0.96 (0.69, 0.99)	0.71 (0.65, 0.77)
		Lopez, 2017[135]	DSM-5 use disorder	NR	CIDI	Postpartum women	641	0.90 (0.78, 0.96)	0.79 (0.76, 0.82)
AUDIT	≥4*	Lopez, 2017[135]	DSM-5 use disorder	NR	CIDI	Postpartum women	641	0.87 (0.74, 0.94)	0.86 (0.83, 0.89)
T-ACE	≥2*	Lopez, 2017[135]	DSM-5 use disorder	NR	CIDI	Postpartum women	641	0.96 (0.86, 0.99)	0.76 (0.72, 0.79)
TWEAK	≥2*	Lopez, 2017[135]	DSM-5 use disorder	NR	CIDI	Postpartum women	641	0.96 (0.86, 0.99)	0.77 (0.73, 0.80)

* Optimal cutoff

Abbreviations: AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confdience interval; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition

Appendix I Table 20. Results of Test Accuracy Studies to Detect Alcohol Dependence Among Pregnant Women (KQ2)

Test name	Cutoff	Author, year	Condition	Condition, %	Reference standard	Screened group	Total	Sensitivity (95% CI)	Specificity (95% CI)
AUDIT-C	≥3	Dawson, 2005[106, 139]	DSM-IV Dependence	3.5	AUDADIS-IV	Pregnant past-year drinkers	256	1.0 (0.70, 1.0)	0.70 (0.64, 0.76)
	≥4*	Dawson, 2005[106, 139]	DSM-IV Dependence	3.5	AUDADIS-IV	Pregnant past-year drinkers	256	0.98 (0.70, 1.0)	0.860 (0.81, 0.90)

* Optimal cutoff

Abbreviations: AUDADIS-IV = Alcohol Use Disorder and Associated Disabilities Interview Schedule, Fourth Edition; AUDIT-C = Alcohol Use Disorders Index Test, Consumption; CI = confidence interval; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders, Fourth Editio

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
Adolescents	Haug, 2016[210]	Classroom	None (all-comers, but only abstracted medium and high risk subgroups)	Included subgroup: ≥1 heavy use episode (≥5/4 [M/F] drinks on a single occasion) or ≥14/7 (M/F) drinks consumed in a typical week	NA	469	6	92.8	Drinks/wk: 11.7 Heavy use episodes/wk: 0.45
	Mason, 2015[215]	Primary care visit	CRAFFT	2 or 3 on CRAFFT (at risk for substance use disorder)	15.8	119	1, 3, 6	98.3	Drinking days/month: 0.9
Young adults	Bertholet, 2015[220]	Email, identified though Army recruitment center	AUDIT	>14 drinks/weeks or at least one episode of binge drinking (≥6 drinks/ occasion) per month during the past 12 months, or an AUDIT ≥8	45.1	737	1, 6	90.5	Drinks/wk: 9.8 AUDIT: 10.6 % Alcohol use disorder: 52.0
	Carey, 2006[189]	Introductory psychology class	Screening survey (details NR)	≥1 episodes of heavy drinking in an average week, or four heavy drinking episodes in the last month (5/4 drinks [M/F])	57.6	509	1, 6, 12	77.8	Drinks/wk: 19.3 Drinks/drinking day: 5.8 Heavy use episodes/wk: 1.8
	Collins, 2014[223]	Email, identified through university administrative database	Frequency-Quantity (F-Q)	≥1 episodes of heavy drinking (5/4 drinks [M/F]) in the past month	59.7	724	1, 6, 12	74.2	Drinks/wk: 10
	Daeppen, 2011[192]	Military recruitment center	Self-administered assessment questionnaire (details NR) and AUDIT	Included subgroup: ≥1 heavy use episode (≥5 drinks on a single occasion) per month on average	22	217	6	86.7	Drinks/wk: 10.5 Heavy use episodes/wk: 0.9
Young adults	Fleming, 2010[160] CHIPS	Primary care visit	NR	>50/40 drinks or ≥8 heavy use episodes (≥5/4 drinks) in the past 28 days [M/F]	7.6	986	6, 12	88	Drinks/wk: 17.5 Heavy use episodes/wk: 1.8
	Johnsson, 2006[194]	Freshman orientation	AUDIT	AUDIT ≥11/ ≥7 [M/F]	28.5	177	12	84	AUDIT: 12.6
	Kypri, 2004[161]	Primary care visit	AUDIT	AUDIT ≥8 or more than 6/4 [M/F] standard drinks on ≥1 occasion in the past 4 weeks	57.4	104	1.5, 6	90.4	AUDIT: 16.6
	Kypri, 2008[162]	Primary care visit	AUDIT	AUDIT ≥8 and 6/4 [M/F] standard drinks on ≥1 occasion in the past 4 weeks	61.4	576	6, 12	83.9	AUDIT: 14.9
	Kypri, 2009[195]	Mail and email, identified through university	AUDIT	AUDIT ≥8 and more than 6/4 [M/F] standard drinks on ≥1 occasion in the past 4 weeks	33.6	2435	1,6	64.8	Drinks/drinking day: 8.5

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
		administrative database							
	LaBrie, 2009[196]	Mail, identified through university administrative database	20-item Drinking Motives Questionnaire	None (study not limited to risky drinkers)	NA	285	2.5, 6	87.7	Drinks/wk: 4.2 Heavy use episodes/wk: 2.2
	LaBrie, 2013[227]	Mail and email, identified through university administrative database	Generic/study-specific	≥5/4 [M/F] drinks on ≥1 occasion(s) during the past month	38.0	554	1, 3, 6, 12	76.9	
	Larimer, 2007[197]	Mail, identified through university administrative database	QFP	None (study not limited to risky drinkers)	NA	1488	12	67.2	Drinks/wk: 4.6
Young adults	Leeman, 2016[211]	Email, identified through university administrative database	DDQ-R	≥5/4 [M/F] drinks on one occasion in the past month	51.6	208	1,6	78.8	Drinks/wk: 7 Heavy use episodes/wk: 1.3
	Lewis, 2014[225]	Email, identified through university administrative database	QF	≥5/4 [M/F] drinks on one occasion in the past month	42.5	359	3, 6	83.8	Drinks/wk: 13.1 Drinks/drinking day: 4.7
	Marlatt, 1998[198]	Mail, identified through university administrative database	QF	≥5 drinks on one occasion in the past month, or 3 alcohol-related problems on 3-5 occasions in the past 3 years on the RAPI	24.9	348	12, 24, 36, 48	85.9	Drinks/wk: 9.9 Drinks/drinking day: 4.5
	Martens, 2010[199]	Email, identified through university administrative database	Generic/study-specific	None (study not limited to risky drinkers)	89.5	263	1, 6	81.4	Drinks/wk: 6.5
	Neighbors, 2004[200]	Psychology class	QF	5/4 [M/F] drinks on ≥1 occasion(s) during the past month	43.1	252	3,6	82.1	Drinks/wk: 11.5
	Neighbors, 2010[201]	Mail, identified through university administrative database	QF	≥5/4 [M/F] drinks on ≥1 occasion(s) during the past month	42.9	818	6, 12, 18, 24	86.6	Drinks/wk: 11.2 Heavy use episodes/wk: 6.4
	Neighbors, 2016[239]	Email, identified through university	QF	≥5/4 [M/F] drinks on ≥1 occasion(s) during the past month	43.5	623	3, 6	85.1	Drinks/wk: 9.4

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
		administrative database							
Young adults	Schaus, 2009[170]	Primary care visit	Single QF question	≥5/4 [M/F] drinks on ≥1 occasion(s) during the past month	24.2	363	3, 6, 9, 12	65	Drinks/wk: 9 Drinks/drinking day: 4.8 Heavy use episodes/wk: 1.3
	Turrisi, 2009[205]	Mail and email, identified through university administrative database	NA (drinking not required for participation)	None (study not limited to risky drinkers)	79	1275	10	85.5	Drinks/wk: 3.8
	Voogt, 2014[226] What Do You Drink (WDYD)	Email, identified through university administative data; flyers	QF	≥21/14 [M/F] drinks per week and/or consumption of ≥5 drinks at least one day per week in past 6 months	18.3	913	1, 3, 6	81.6	Drinks/wk: 22.2 Heavy use episodes/wk: 1.8 % Alcohol dependence: 0.0
Adults	Aalto, 2000[206] Lahti Project	Primary care visit	CAGE and QF	Ethanol≥ 280/190 g/week [M/F] or CAGE ≥ 3/2 [M/F]	NR	265	12, 24*, 36	72.5	Drinks/wk: 23.1 Drinks/drinking day: 11 % Alcohol dependence: 0.0
	Bischof, 2008[149]	Primary care visit	AUDIT and LAST	Alcohol dependence, abuse, at-risk consumption (>30/20 g ethanol per day [M/F], or >80/60 g of alcohol [M/F] on at least two occasions within the last 4 weeks)	20.7	408	12	91.7	Drinks/wk: 31.4 % Alcohol dependence: 30.4
	Burge, 1997[188]	Primary care visit	DIS (from DSM-III)	Alcohol abuse or dependence within the past year	8.1	242	12, 18	72.3	Drinks/wk: 37.3 % Alcohol dependence: 35.0
	Chang, 2011[190]	Mail, identified through medical and administrative databases, subway ads	T-ACE	T-ACE alcohol screen-positive and/or typically consumes >7 drinks/week or >2 drinks at a time	29.5	511	12	96.1	Drinks/drinking day: 2.2 Heavy use episodes/wk: 0.2 % Alcohol use disorder: 9.4
	Crawford, 2014[185] SHEAR	Sexual health clinic visit	M-SASQ	>8/6 [M/F] units of alcohol on ≥1 occasion per month	68.5	802	6	73.8	% Heavy use episodes/wk: 61.8

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
Adults	Cunningham, 2012[231]	Random digit dialing	AUDIT	AUDIT ≥8	19.7	1767	3, 6	76.3	Drinks/wk: 12
	Curry, 2003[152]	Primary care visit	Other/generic and AUDIT	≥2 drinks per day in the past month, ≥2 episodes of binge drinking (≥5 drinks on a single occasion), or ≥1 episodes of driving after consuming ≥3 drinks AND scoring ≤15 on AUDIT	11	307	3, 12	72	Drinks/wk: 14.2 % Alcohol dependence: 0.0
	Drummond, 2009[208]	Primary care visit	AUDIT	AUDIT ≥8 or a diagnosis of AUD or >21 units/week or >8 units/day	24.9	112	6	80.4	Drinks/wk: 59.1 Drinks/drinking day: 14
	Emmen, 2005[193]	Primary care visit	Rasch homogeneous scale	Answered affirmatively to any of the screening questions	6	123	6	91.1	Drinks/wk: 27.5 % Alcohol dependence: 14.0
	Fleming, 1997[153] Project TrEAT (Trial for Early Alcohol Treatment)	Primary care visit	QF, CAGE	>14/11 [M/F] drinks per week	16.5	774	6, 12, 24, 36, 48	93.4	Drinks/wk: 19 Heavy use episodes/wk: 1.4
	Hansen, 2012[234]	National health examination survey	Other/generic	>21/14 [M/F] drinks per week	6.3	1380	6, 12	77.1	Drinks/wk: 27.2
	Heather, 1987[209] DRAMS (drink reasonably and moderately with self-control)	Primary care visit	Other/generic	35/20 [M/F] units of alcohol per week or clinical impression of an alcohol-related problem	NR	104	6	87.5	Drinks/wk: 50.7
Adults	Helstrom, 2014[240]	PCP Referral, after screening at primary care visit	AUDIT-C	>21/14 [M/F] drinks over the past week or any episodes of binge drinking (≥5/4 [M/F] drinks on one occasion)	NR	139	8, 12	95.2	Drinks/wk: 24 Drinks/drinking day: 4.8 Heavy use episodes/wk: 2.5
	Hilbink, 2012[233]	Primary care visit	AUDIT	AUDIT ≥8	11.3	712	24	65.4	AUDIT: 712 patients scored >7 and <20
	Kaner, 2013[186] Screening and Intervention	Primary care visit	FAST or M-SASQ	Positive for alcohol use disorder according to FAST or M-SASQ	30.1	756	6, 12	79.1	AUDIT: 12.7

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
	Programme for Sensible drinking (SIPS)								
	Maisto, 2001[163]	Primary care visit	AUDIT and QF	AUDIT ≥8 or 16/12 [M/F] average drinks per week over past year	10.5	301	6, 12	77.1	Drinks/wk: 16.6 Drinks/drinking day: 5.6
	Ockene, 1999[165]	Primary care visit	CAGE and unspecified QF items	>12/9 [M/F] drinks per week or binged (≥5/4 [M/F] drinks) on 1 or more occasions in previous month	18	530	6, 12, 48	84.3	Drinks/wk: 17.6 Heavy use episodes/wk: 1.1 % Alcohol dependence: 2.0
	Richmond, 1995[175]	Primary care visit	QF	>35/21 [M/F] drinks per week	6.9	285	6, 12	69.1	Drinks/wk: 36% Alcohol dependence: 0.0
	Rose, 2017[245]	Primary care visit	SASQ	≥1 on the SASQ (≥5/4 [M/F] drinks per day in the past year)	36.8	1855	3, 6	73.5	
	Rubio, 2010[168]	Primary care visit	AUDIT	≥5/4 [M/F] drinks per occasion on one or more occasions in the previous month and AUDIT ≤15	15.9	752	12	89.6	Drinks/wk: 27.2 Heavy use episodes/wk: 0.7
Adults	Saitz, 2003[169]	Primary care visit	CAGE and QF	Answered yes to ≥ 1 CAGE items (modified to past year), >4/3 [M/F] drinks per occasion in past 30 days, or >14/7 [M/F] drinks per week in past 30 days	14.3	312	6	75.6	Drinks/drinking day: 5.5
	Schulz, 2013[228]	Email, identified through research access panel	QFV and AUDIT	>2/1 [M/F] drinks per day; drinking >5 days per week; AUDIT ≥8; or currently trying to become pregnant, drinking alcohol while pregnant or breastfeeding, or trying to get one's partner pregnant (for men)	39	448	6	59.2	Drinks/wk: 13.65
	Scott, 1990[171]	Primary care visit and direct mail, identified through administrative database	Other/generic (QF)	≥ 350/210 g ethanol [M/F] of alcohol per week	NR	226	12	66.4	Drinks/wk: 44.3
	Senft, 1997[172]	Primary care visit	AUDIT	AUDIT score 8-21	7.7	516	6, 12	80.2	Drinks/wk: 16.7 Drinks/drinking day: 4.9
	Upshur, 2015[218]	Primary care visit	AUDIT-C	AUDIT-C ≥4	NR	82	3, 6	92.7	% Alcohol use disorder: 88.9

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
	Project RENEWAL								
	Wallace, 1988[174]	Primary care visit and direct mail, identified through administrative database	QF and CAGE	≥35/21 [M/F] units per week	7.2	909	6, 12	82.3	Drinks/wk: 49.5
Adults	Watkins, 2017[246]	Primary care visit	NIDA quick screen	Positive score for risky opioid or alcohol use in previous 3 months on NIDA 3-item quick screen	61.2	397	6	69.2	Typical drinks per day, past 12 months (median [IQR]): 6 (3-10) (limited to those who reported using alcohol in the past, n=366) Years of heroin use (median [IQR]): 4 (2-10) (limited to those who reported having used heroin in the past, n=149) Ever hospitalized for alcohol or opioid use, %: 26.8
	Wilson, 2014[169, 224]	Direct mailing, identified through medical records databases	AUDIT	AUDIT ≥8 score	35.5	102	6	65.7	AUDIT: 12
Older adults	Ettner, 2014[183] Project SHARE	Mail, identified through administrative database	CARET	CARET ≥1	33.6	1186	6, 12	88.4	Drinks/wk: 13.6
	Fleming, 1999[157] Project GOAL (Guiding Older Adult Lifestyles)	Primary care visit	QF	>11/>8 [M/F] drinks per week, CAGE ≥2 (≥4/3 drinks per occasion [M/F] ≥2 times in past 3 months)	10.8	158	3, 6, 12, 24	92.4	Drinks/wk: 16 Heavy use episodes/wk: 1
	Moore, 2010[176] Healthy Living As You Age (HLAYA)	Phone, identified through administrative data	CARET	CARET ≥1	29.5	631	3, 12	82.6	Drinks/wk: 15.2
	Watson, 2013[230]	Primary care visit	AUDIT	AUDIT ≥8	4.4	529	6, 12	87.5	% Alcohol dependence: 7.9

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
Pregnant women	Chang, 1999[181]	Prenatal visit	T-ACE	Positive T-ACE ≥ 2	45.7	250	5	99.8	Drinks/drinking day: 0.8
	Chang, 2005[191]	Prenatal visit	T-ACE	T-ACE ≥2 and at risk for prenatal alcohol use (any alcohol consumption in 3 months before study enrollment [while pregnant], consumption of ≥1 drink per day in 6 months before study enrollment, or drinking during a previous pregnancy)	27.4	304	3	94.7	Drinks/drinking day: 1.6
	O'Connor, 2007[202]	Prenatal visit	QF and TWEAK	Current alcohol use	82	345	4	73.9	Drinks/drinking day: 1.9
	Ondersma, 2015[217]	Prenatal visit	T-ACE, and a single NIAAA item	Drinking weekly or more in the past month; or ≥4 drinks at least monthly in the 12 months before becoming pregnant	9.2	48	6	81.2	% Heavy use episodes/wk when not pregnant: 58.3 % Alcohol abuse/dependence: 25.0
	Osterman, 2014[221]	Prenatal visit	AUDIT	Any alcohol use in past year	71.2	122	1, 5	80.3	Drinks/wk: 0 Drinks/drinking day: 0.2 AUDIT: 5.2
	Reynolds, 1995[203]	Prenatal visit	T-ACE	Any alcohol use in past month	9.2	78	2	92.3	Drinks/month: 36.6
	Rubio, 2014[184]	Prenatal visit	QF	≥3 drinks per week between conception and recognition of pregnancy, ≥1 drink per week after recognition of pregnancy, or had ≥1 episode of drinking ≥4 drinks on one occasion, after conception	47.2	330	8.5, 13, 19	76.1	Drinks/drinking day: 0.3 % Alcohol dependence: 23.6
Pregnant women	Tzilos, 2011[235]	Prenatal visit	T-ACE	T-ACE ≥2 or ≥7 standard drinks per week or ≥2 drinks at a time before pregnancy	20.4	50	1	96	Drinks/wk: 8.7
	van der Wulp, 2014[222]	Email and phone, identified through administrative database	5-item Dutch QFV	Any alcohol use since awareness of pregnancy	NR	393	3, 6	62.8	Drinks/wk: 1.0

Appendix I Table 21. Trial Recruitment Methods and Baseline Substance-Related Variables, by Subpopulation (KQ4)

Target pop	Author, year Study name	Recruitment method	Screener	Substance use eligibility criteria	Screen pos, %	n rand	FU, mos	% FU	BL substance use-related characteristics
Postpartum women	Fleming, 2008[158]	Postpartum visit	QF	≥ 20 standard drinks or ≥4 drinks on ≥4 occasions or ≥20 drinking days in the last 28 days	13.9	235	6	88.1	Drinks/wk: 8.3 Heavy use episodes/wk: 0.8
	Ondersma, 2016[212]	Hospital post-delivery recovery	QF and T-ACE	TACE ≥2 and >4 standard drinks at a time at least twice a month in the 12 months prior to becoming pregnant	25.6	123	3, 6	69.9	ASSIST alcohol score (alcohol use in the 3 months prior to pregnancy): 22.3

*12 and 24 month data were not abstracted due to limited participants with full followup and attrition was >40%

Abbreviations: AUDIT = Alcohol Use Disorders Identification Test; CAGE = Cut down, Annoyed, Guilty, Eye-opener; CARET = Comorbidity Alcohol Risk Evaluation Tool; CRAFFT = Car, Relax, Alone, Forget, Friends, Trouble; DDQ-R = Daily Drinking Questionnaire-Revised; DIS = Diagnostic Interview Schedule for Alcohol Abuse and Dependence; DSM = Diagnostic and Statistical Manual of Mental Disorders; FAST = Fast Alcohol Screening Test; FU = followup; LAST = Luebeck Alcohol Dependence and Abuse Screening Test; M/F = males/females; mos = months; M-SASQ = Modified Single Alcohol Screener; n = number of participants; NA = not applicable; NIAAA = National Institute on Alcohol Abuse and Alcoholism; NR = not reported; pos = positive; QF = brief (e.g., 1-3 item quantity/frequency assessment); QFP = Quantity/Frequency/Peak; QFV = Quantity-Frequency-Variability; rand = randomized; RAPI = Rutgers Alcohol Problem Index; T-ACE = Tolerance, Annoyance, Cut down, Eye-opener; TWEAK = Tolerance, Worried, Eye-opener, Amnesia, [K] Cut down; wk = week

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Adolescents	Haug, 2016[210]	IG1	MobileCoach Alcohol intervention	Brief Multiple	Web-based personalized feedback + 95/97 ([medium/high risk] text messages)	High school, home	Self-directed	None	None
	Mason, 2015[215]	IG1	Peer network counseling	Extended Single	One 20-min individual counseling session	Primary care clinic	Mental or behavioral health specialists	None	AC
Young adults	Bertholet, 2015[220]	IG1	Internet-based personalized feedback	Brief Single	Internet-based personalized feedback	Other	Self-directed	None	None
	Carey, 2006[189]	IG1	Enhanced Motivational Interviewing	Extended Single	One in-person motivational interview with enhanced counseling	College	Interventionist	None	None
		IG2	Basic Motivational Interviewing	Extended Single	One in-person motivational interview	College	Interventionist	None	None
		IG3	Enhanced Motivational Interviewing plus TLFB	Extended Single	One in-person TLFB interview and one in-person motivational interview with enhanced counseling	College	Research staff, interventionist	None	None
		IG4	Basic Motivational Interviewing plus TLFB	Extended Single	One in-person TLFB interview and one in-person motivational interview	College	Research staff, interventionist	None	None
	Collins, 2014[223]	IG1	Personalized normative feedback	Very Brief	One web-based personalized feedback session	Home	Self-directed	None	None
		IG2	Decisional balance feedback	Very Brief	One web-based decisional balance feedback session	Home	Self-directed	None	None
	Daeppen, 2011[192]	IG1	Brief motivational intervention	Brief Single	One in-person 15-minute brief motivational session	Other	Psychologists	None	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Young adults	Fleming, 2010 CHIPS[160]	IG1	Brief physician intervention	Brief Multiple	Two 15-min visits with physicians plus 2 followup calls or emails	College health clinic	Medical doctors	Delivered most/all	UC
	Johnsson, 2006[194]	IG1	Cognitive Behavioral Group	Extended Multiple	Five 2-hour group sessions based on BASICS manual	College health clinic	Research staff, peers	None	Minimal
	Kypri, 2004[161]	IG1	Computer-based personalized feedback	Brief Single	One computer-based personalized feedback session	College health clinic	Self-directed	None	None
	Kypri, 2008[162]	IG1	Multi-session computer based feedback	Brief Multiple	Two computer-based personalized feedback sessions	College health clinic	Self-directed	None	Minimal
		IG2	Single session computer based feedback	Brief Single	One computer-based personalized feedback session	College health clinic	Self-directed	None	Minimal
	Kypri, 2009[195]	IG1	Computer-based personalized feedback	Brief Multiple	Two computer-based personalized feedback sessions	College	Self-directed	None	None
	LaBrie, 2009[196]	IG1	Group Counseling	Extended Single	One group counseling session	College	Research staff	None	Minimal
	LaBrie, 2013[227]	IG1	Web-BASICS feedback	Brief Single	One computer-based personalized feedback session + optional printed feedback	College	Self-directed	None	AC
		IG2	Web-based personalized normative feedback	Brief Single	One gender-, race-, and Greek status-specific computer-based personalized feedback session	College	Self-directed	None	AC
	Larimer, 2007[197]	IG1	Personalized mailed feedback	NA (mailing-only)	One personalized feedback postcard followed by 10 generic postcards	Home	Self-directed	None	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Young adults	Leeman, 2016[211]	IG1	Personalized feedback (direct + indirect)	Brief Single	One computer-based personalized feedback session with direct + indirect protective behavioral strategies	College	Self-directed	None	None
		IG2	Personalized feedback (direct only)	Brief Single	One computer-based personalized feedback session with direct protective behavioral strategies	College	Self-directed	None	None
		IG3	Personalized feedback (indirect only)	Brief Single	One computer-based personalized feedback session with indirect protective behavioral strategies	College	Self-directed	None	None
	Lewis, 2014[225]	IG1	Alcohol-only web-based personalized feedback	Very Brief	One web-based personalized normative feedback session	Home	Self-directed	None	AC
		IG2	Alcohol and alcohol-related risky sexual behavior web-based feedback	Very Brief	One web-based combined alcohol and alcohol-related RSB personalized normative feedback session	Other	Self-directed	None	AC
	Marlatt, 1998[198]	IG1	Motivational Interviewing and Personalized Feedback	Extended Single	One 60-min motivational interviewing session & summary sheet; mailed personalized feedback; followup phone calls and session optional (high risk or extreme)	College, home	Psychologists	None	None
Young adults	Martens, 2010[199]	IG1	Targeted personalized feedback	Very Brief	One targeted computer-based personalized drinking feedback session	Home	Self-directed	None	Minimal
		IG2	Standard personalized feedback	Very Brief	One standard computer-based personalized drinking feedback session	Home	Self-directed	None	Minimal
	Leeman, 2016[211]	IG1	Personalized Normative Feedback	Very Brief	Web-based personalized normative feedback printout	College	Self-directed	None	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
	Neighbors, 2010[201]	IG1	Gender-specific personalized feedback	Brief Multiple	Five web-based gender-specific personalized normative feedback sessions	Home	Self-directed	None	AC
		IG2	Gender-nonspecific personalized feedback	Brief Multiple	Five web-based gender-nonspecific personalized normative feedback sessions	Home	Self-directed	None	AC
		IG3	Single gender-specific personalized feedback	Brief Single	One web-based gender-specific personalized normative feedback session followed by 4 web-based attention-control sessions	Home	Self-directed	None	AC
		IG4	Single gender-nonspecific personalized feedback	Brief Single	One web-based gender-nonspecific personalized normative feedback session followed by 4 web-based attention-control sessions	Home	Self-directed	None	AC
Young adults	Neighbors, 2016[201]	IG1	Normative + Social feedback	Very Brief	One computer-based personalized normative feedback session	College	Self-directed	None	AC
		IG2	Social comparison feedback	Very Brief	One computer-based personalized social comparison feedback session	College	Self-directed	None	AC
	Leeman, 2016[211]	IG1	Motivational intervention	Extended Single	Two 20-min brief motivational intervention sessions plus personalized feedback document and alcohol-prevention brochure	College health clinic	Medical doctors, nursing professionals, physician's assistants	Delivered most/all	UC
	Turrisi, 2009[205]	IG1	Peer-delivered personalized feedback + parent-handbook	Extended Single	One 45- to 60-min personalized feedback session delivered by peer athlete + parent handbook intervention	College, home	Peers, self-directed	None	Minimal
		IG2	Peer-delivered personalized feedback	Extended Single	One 45- to 60-min personalized feedback session with peer athlete	College	Peers	None	Minimal

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
		IG3	Parent handbook	Very Brief	Informational handbook mailed to the participants' parents	Home	Self-directed	None	Minimal
	Voogt, 2014[226] What Do You Drink (WDYD)	IG1	Personalized feedback	Brief Single	One web-based personalized feedback session	Home	Self-directed	None	None
Adults	Aalto, 2000[206] Lahti Project	IG1	Personalized feedback	Brief Multiple	Three 10- to 20-min personalized feedback sessions with GP	Primary care clinic	Medical doctors	Delivered most/all	UC
	Bischof, 2008[149]	IG1	Motivational interviewing + computerized feedback	Extended Multiple	Four 30-min computerized feedback and brief individual counseling sessions comprising motivational interviewing and behavioral change counseling	Primary care clinic	Psychologists	None	UC
		IG2	Motivational interviewing + stepped care	Extended Multiple	Up to three 30- to 40-min computerized feedback and motivational interviewing sessions	Primary care clinic	Psychologists	None	UC
	Burge, 1997[188]	IG1	Physician-delivered brief intervention + group psychoeducation	Extended Multiple	Two 10- to 15-min physician-delivered sessions and six 90-min patient educator-led group psychoeducation sessions	Primary care clinic	Medical doctors, health educators	Delivered part	None
		IG2	Group psychoeducation sessions	Extended Multiple	Six 90-min patient educator-led group psychoeducation sessions	Primary care clinic	Health educators	None	None
		IG3	Physician-delivered brief intervention	Brief Multiple	Two 10- to 15-min physician delivered brief intervention sessions	Primary care clinic	Medical doctors	Delivered most/all	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Adults	Butler, 2013[242] PRE-EMPT	IG1	Behavior change counseling	NA (provider-focused intervention)	Provider training in behavior change counseling; no specific guidance for structure of patient visits	Primary care clinic	Medical doctors, Nursing professionals	Delivered most/all	UC
	Chang, 2011[190]	IG1	Physician-led brief intervention	Extended Single	One 30-min physician-delivered individual counseling session	Other medical center	Medical doctors	None	None
	Crawford, 2014[185] SHEAR	IG1	Physician-delivered brief advice and referral	Very Brief	One 2- to 3-min physician-delivered brief intervention followed by 1-2 optional Alcohol Health Worker-delivered ≤30-min FRAMES sessions	Other medical center	Medical doctors, substance use treatment specialist	Delivered part	AC
	Cunningham, 2012[231]	IG1	Personalized Feedback Pamphlet	Very Brief	Personalized Feedback Pamphlet	Home	Self-directed	None	None
	Curry, 2003[152]	IG1	Motivational interviewing + personalized feedback	Brief Multiple	One 5-min motivational interviewing session with PCP followed by written personalized feedback and 3 phone counseling calls	Primary care clinic, home	Medical doctors, health educators	Delivered part	None
	Drummond, 2009[208]	IG1	Stepped Care	Extended Multiple	One 40-min counseling session plus up to four additional 50-min counseling sessions	Primary care clinic	Nursing professionals, substance use treatment specialist	None	Minimal
	Emmen, 2005[193]	IG1	Personalized Health Feedback	Extended Multiple	90-min assessment and a 60-min personalized health feedback session	Primary care clinic	Psychologists	None	UC
Adults	Fleming, 1997[153] Project TrEAT (Trial for Early Alcohol Treatment)	IG1	Physician-delivered brief intervention	Brief Multiple	Two 15-min physician-delivered brief intervention sessions followed by two nurse-delivered followup calls	Primary care clinic	Medical doctors, nursing professionals	Delivered most/all	UC
	Hansen, 2012[234]	IG1	Computer-based personalized feedback	Very Brief	One computer-based personalized feedback session	Home	Self-directed	None	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
		IG2	Computer-based personalized brief advice	Very Brief	One computer-based personalized brief advice session	Other	Self-directed	None	None
	Heather, 1987[209] DRAMS (Drink Reasonably And Moderately With Self-Control)	IG1	DRAMS Physician-delivered brief intervention	Brief Multiple	Two screening and brief counseling sessions with PCP	Primary care clinic	Medical doctors	Delivered most/all	None
		IG2	Advice-only	Brief Single	One brief advice session with PCP	Primary care clinic	Medical doctors	Delivered most/all	None
	Helstrom, 2014[240]	IG1	Telephone counseling	Brief Multiple	One PCP-delivered counseling session followed by 3 phone counseling sessions	Primary care clinic, home	Medical doctors, nursing professionals, mental or behavioral health specialists	Delivered part	UC
Adults	Hilbink, 2012[233]	IG1	Staff training and mailed personalized feedback	NA (provider-focused intervention)	Staff educational training and mailed, printed personalized feedback, letters and self-help booklets	Primary care clinic	Medical doctors	Delivered part	UC
	Kaner, 2013[186] Screening and Intervention Programme for Sensible drinking (SIPS)	IG1	Brief advice + brief lifestyle counseling	Extended Multiple	One 5-min brief advice session followed by one 20-min brief lifestyle counseling session	Primary care clinic	Medical doctors, nursing professionals	NR	UC
		IG2	Brief advice	Very Brief	One 5-min brief advice session	Primary care clinic	Medical doctors, nursing professionals	NR	UC
	Maisto, 2001[163]	IG1	Motivational enhancement	Extended Multiple	One 30- to 45-min ME session followed by two 15- to 20-min followup booster sessions	Primary care clinic	Interventionist	None	UC
		IG2	Brief advice	Brief Single	One 10- to 15-min brief advice session	Primary care clinic	Interventionist	None	UC
	Ockene, 1999[165]	IG1	PCP-delivered counseling	Brief Single	One to two 5- to 10-min patient-centered counseling session with PCP	Primary care clinic	Medical doctors	Delivered most/all	Minimal
	Richmond, 1995[175]	IG1	Physician-delivered counseling (Alcoholscreen Program Group)	Extended Multiple	Five physician-delivered counseling sessions of varying length	Primary care clinic	Medical doctors	Delivered most/all	None

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Adults	Richmond, 1995[175]	IG2	Physician-delivered brief advice	Very Brief	One 5 min physician-delivered brief advice session	Primary care clinic	Medical doctors	Delivered most/all	None
	Rose, 2017[245]	IG1	Brief Interactive Voice Response	Very Brief	One 6.2-min (median) Interactive Voice Recognition session via phone	Home	Self-directed	None	None
	Rubio, 2010[168]	IG1	Physician-delivered brief counseling	Brief Multiple	2 10- to 15-min physician-delivered counseling sessions followed by two nurse contacts	Primary care clinic	Medical doctors, nursing professionals	Delivered most/all	UC
	Saitz, 2003[169]	IG1	Physician-delivered brief intervention	Very Brief	One physician-delivered brief intervention	Primary care clinic	Medical doctors	Delivered most/all	None
	Schulz, 2013[228]	IG1	Web-based personalized feedback (alternating advice)	Brief Multiple	Three web-based personalized feedback sessions	Home	Self-directed	None	WL
		IG2	Web-based personalized feedback (advice all at once)	Brief Multiple	Three web-based personalized feedback sessions	Home	Self-directed	None	WL
	Scott, 1990[171]	IG1	Physician-delivered personalized feedback	Brief Single	One 10-min personalized feedback session with PCP	Primary care clinic	Medical doctors	Delivered most/all	None
Adults	Senft, 1997[172]	IG1	Brief counseling	Brief Multiple	One 30-sec message from primary care clinician and one 15-min counseling session from health counselor	Primary care clinic	Medical doctors, nursing professionals, health educators	Delivered part	None
	Upshur, 2015[218] Project RENEWAL	IG1	Chronic care model	Extended Multiple	1 brief intervention session with PCP followed by 4-6 appointments with PCP and at least 15 phone or in-person sessions with care manager	Primary care clinic	Medical doctors, social work professionals	Delivered part	UC

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
	Wallace, 1988[174]	IG1	One physician-delivered personalized feedback session and up to four followup sessions with physician	Brief Multiple		Primary care clinic	Medical doctors	Delivered most/all	UC
	Watkins, 2017[246]	IG1	Collaborative care (registry, regular assessment, adherence support) plus training for behavioral therapists and MDs for medication-assisted treatment	Extended Multiple		Primary care clinic	Medical doctors, mental or behavioral health specialists, social work professionals	Delivered part	UC
Older adults	Wilson, 2014[224]	IG1	Personalized feedback	Very Brief	One 5-min personalized feedback session	Primary care clinic	Research staff	None	UC
Older adults	Ettner, 2014[183] Project SHARE	IG1	Educational intervention	Brief Multiple	Two personalized mailings, reviewed at routine visits with PCP, and three health educator calls	Primary care clinic, home	Medical doctors, health educators	Delivered part	UC
	Fleming, 1999[157] Project GOAL (Guiding Older Adult Lifestyles)	IG1	Physician-delivered brief intervention	Brief Multiple	Two 10- to 15-min physician-delivered counseling sessions and two clinic nurse followup calls	Primary care clinic	Medical doctors, nursing professionals	Delivered most/all	AC
	Moore, 2010[176] Healthy Living As You Age (HLAYA)	IG1	Physician-delivered personalized feedback plus health education	Extended Multiple	One physician-delivered personalized feedback session followed by one 40-min health educator call and two 20-min health educator calls	Primary care clinic, Home	Medical doctors, health educators	Delivered part	Minimal
	Watson, 2013[230]	IG1	Stepped care	Extended Multiple	Stepped care: one 20-min counseling session with followup phone call; as needed, three 40-min sessions, referral to specialist	Primary care clinic	Nursing professionals, mental or behavioral health specialists, research staff	None	Minimal

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
Pregnant women	Chang, 1999[181]	IG1	Physician-delivered counseling	Extended Single	One 45-min physician-delivered counseling session	Prenatal, reproductive or OBGYN clinic	Medical doctors	NR	None
	Chang, 2005[191]	IG1	Partner-enhanced brief intervention	Extended Single	One 25-min partner-enhanced brief intervention	Prenatal, reproductive or OBGYN clinic	Nursing professionals, Research staff	NR	None
Pregnant women	O'Connor, 2007[202]	IG1	Brief intervention	Brief Single	One brief intervention session	Community-based	Nutritionists	None	UC
	Ondersma, 2015[217]	IG1	Computer-delivered brief intervention (e-SBI) plus tailored mailings	Extended Multiple	One 20-min web-based intervention with three subsequent tailored mailings	Prenatal, reproductive or OBGYN clinic, Home	Self-directed	None	AC
	Osterman, 2014[221]	IG1	Motivational interviewing	Extended Single	One 30-min motivational interviewing session	Prenatal, reproductive or OBGYN clinic	Research staff	None	None
	Reynolds, 1995[203]	IG1	Brief counseling and self-help	Brief Multiple	One 10-min health educator delivered brief counseling session plus self-help manual and one followup call to assess progress	Prenatal, reproductive or OBGYN clinic, Home	Health educators	None	UC
	Rubio, 2014[184]	IG1	Brief motivational enhancement	Extended Multiple	Four 10- to 15-min in-person prenatal motivational interview sessions and one 10- to 30-min postpartum in person motivational interview sessions	Prenatal, reproductive or OBGYN clinic	Nursing professionals, lay counselors	NR	UC
Postpartum women	Tzilos, 2011[235]	IG1	Computer-delivered motivational intervention	Extended Single	One 15- to 20-min computer-based motivational intervention	Prenatal, reproductive or OBGYN clinic	Self-directed	None	AC
	van der Wulp, 2014[222]	IG1	Health counseling	Brief Multiple	Three midwife-delivered counseling sessions	Prenatal, reproductive or OBGYN clinic	Midwives	None	UC

Appendix I Table 22. Intervention Characteristics of All Trials, by Subpopulation (KQ4)

Target pop	Author, year Study name	Int arm	Intervention	Intensity category	Brief description	Setting	Provider	Primary care clinician role	Control
		IG2	Web-based feedback	Brief Multiple	Three web-based personalized feedback sessions	Home	Self-directed	None	UC
	Fleming, 2008[158]	IG1	Brief alcohol intervention	Brief Multiple	Two 15-min in-person counseling sessions with a workbook and followup phone calls after each session	Prenatal, reproductive or OBGYN clinic, Home	Nursing professionals, interventionist	NR	AC
	Ondersma, 2016[212]	IG1	Electronic screening and brief intervention (e-SBI)	Extended Single	One 20-min web-based brief interview session	Prenatal, reproductive or OBGYN clinic	Self-directed	None	AC

Abbreviations: AC = attention control; BASICS = Brief Alcohol Screening And Intervention For College Students; DRAMS = Drink Reasonably And Moderately With Self-Control; e-SBI = electronic screening and brief intervention; FRAMES = Feedback, Responsibility, Advice, Menu of Options, Empathy, Self-efficacy; IG = intervention group; Int = intervention; MI = motivational interviewing; NR = not reported; OBGYN = obstetrics and gynecology; PCP = primary care provider; SHEAR = Sexual Health and Excessive Alcohol: Randomized trial; TLFB = Timeline Followback Method Assessment; UC = usual care; WL = waitlist

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Aalto, 2000[206] Lahti Project	Adults	IG1	Participants received 3 brief 10- to 20-min interventions delivered by their general practitioner at baseline, 12, and 24 months. Participants were provided with a self-help booklet at baseline as a supplement to the brief interventions. The brief interventions consisted of the FRAMES (Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy) ingredients according to the needs of each individual participant, including information about the adverse effects of how the patient's alcohol consumption compared with recommended limits, feedback from the laboratory tests, information on the benefits of drinking less, and encouragement to reduce drinking. Laboratory tests were taken before each session and at each session the participant's alcohol consumption was inquired about in a structured way.	Individual face-to-face sessions	General counseling, PNF, FRAMES	Participants were advised to reduce drinking and contact their GP in the event of any health problems. In the case of abnormal laboratory values, appropriate clinical followup was done.
Bertholet, 2015[220]	Young adults	IG1	Upon completing the baseline assessment, participants received personalized feedback, including normative feedback indicating the percentage of people of the same age drinking more or less than participants (for weekly drinking and binge drinking frequency), feedback on the consequences of alcohol use ('me, my body and my mind'; 'me and the others'; 'me and my professional activities'; and 'me, violence and accidents') with a gradation of impact for each category from low and high according to the number of reported consequences), calorific value of reported consumption, computed blood alcohol consumption, computed blood alcohol concentration for reported consumption, indication of risk, information on alcohol and health, and recommendations indicating low-risk drinking limits. Participants also received an email thanking them for finishing the questionnaire with a copy of the feedback.	Web-based	PNF	Assessment only
Bischof, 2008[149]	Adults	IG1	Following screening, participants received a stage-tailored manual after the diagnostic procedure and computerized feedback based on core constructs of the transtheoretical model of behavior change. Participants simultaneously received brief (30 min) counseling sessions conducted by trained psychologists based on motivational interviewing and containing structured elements of behavioral change counseling to enhance motivation to reduce problematic drinking after baseline assessment, as well as 1, 3, and 6 months later.	Telephone calls, web-based	MI, PNF, TTM	Received a booklet on health behavior
	Adults	IG2	Following screening, participants received a stage-tailored manual after the diagnostic procedure and computerized feedback based on core constructs of the transtheoretical model of behavior change. Participants received a maximum of 3 brief (30- to 40-min) counseling sessions based on motivational interviewing and behavioral change counseling. If participants reported reduction in	Telephone calls, web-based	MI, PNF, SC, TTM	Received a booklet on health behavior

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			alcohol consumption below study criteria for at-risk drinking and binge drinking within the last 4 weeks and also indicated a high self-efficacy to maintain the acquired behavioral change, defined as self-reported self-efficacy of at least 6 points on a 10-point Likert scale, they received no further intervention. If the first intervention was not successful, participants were offered a counseling session. The same procedure was conducted at the third contact after 3 months and the fourth contact after 6 months.			
Burge, 1997[188]	Adults	IG1	Participants received a 10- to 15-min physician-delivered brief confrontation and discussion session in which physicians used a standardized protocol following a "WEEP-F" format, beginning with a gentle confrontation: (W)orry - "I'm worried about your drinking." To support the "worry,, physicians presented specific (E)vidence that alcohol had an impact on the patient's life, such as health problems related to drinking, social consequences of drinking, or the patient's responses on the screening interview. The physician then (E)ducated the patient about the negative consequences of alcohol and collaboratively developed a (P)lan for changing patient's drinking behavior. For participants who screened as alcohol dependent, physicians recommended complete abstinence with a negotiable option of "sensible drinking," using drinking limits based on the WHO protocol. Physicians recommended AA to patients who were receptive to change. Physicians then scheduled (F)ollowup appointments with participants to continue the dialogue about the patient's progress in drinking behavior changes. Participants also received six 90-min psychoeducation sessions delivered by a bilingual Mexican American patient educator based on culturally adapted curriculum from the Dallas Council on Alcoholism. The 6 sessions included 1) Alcoholism: A Feeling Disease; 2) Chemical Dependency as a Disease; 3) Effects of Chemical Dependency on the Family Unit; 4) Individual Survival Roles; 5) Losses and Grief Related to Change; and 6) Decision-Making: Options and Resources. Each session included didactic instruction, videotapes, and group discussion. All materials, including videotapes, were offered in both English and Spanish. The curriculum was oriented around abstinence as an endpoint, with a recommendation for involvement in AA and emphasized family involvement in assisting with behavior change. Participants had the option to bring a family member or friend who was interested in helping them solve problems that alcohol had caused for them. Sessions were held regularly and patient educators made several reminder phone calls to encourage attendance.	Individual face-to-face sessions, group face-to-face sessions	General counseling, PHF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			Participants without phones at home were contacted at work or at a relative's house.			
	Adults	IG2	Participants received six 90-min psychoeducation sessions delivered by a bilingual Mexican American patient educator based on culturally adapted curriculum from the Dallas Council on Alcoholism. The 6 sessions included 1) Alcoholism: A Feeling Disease; 2) Chemical Dependency as a Disease; 3) Effects of Chemical Dependency on the Family Unit; 4) Individual Survival Roles; 5) Losses and Grief Related to Change; and 6) Decision-Making: Options and Resources. Each session included didactic instruction, videotapes, and group discussion. All materials, including videotapes, were offered in both English and Spanish. The curriculum was oriented around abstinence as an endpoint, with a recommendation for involvement in AA and emphasized family involvement in assisting with behavior change. Participants had the option to bring a family member or friend who was interested in helping them solve problems that alcohol had caused for them. Sessions were held regularly and patient educators made several reminder phone calls to encourage attendance. Participants without phones at home were contacted at work or at a relative's house.	Group face-to-face sessions	General counseling	Assessment only
	Adults	IG3	Participants received a 10- to 15-min physician-delivered brief confrontation and discussion session in which physicians used a standardized protocol following a "WEEP-F" format, beginning with a gentle confrontation: (W)orry - "I'm worried about your drinking." To support the "worry," physicians presented specific (E)vidence that alcohol had an impact on the patient's life, such as health problems related to drinking, social consequences of drinking, or the participants' responses on the screening interview. The physician then (E)ducated the patient about the negative consequences of alcohol and collaboratively developed a (P)lan for changing patient's drinking behavior. For participants who screened as alcohol dependent, physicians recommended complete abstinence with a negotiable option of "sensible drinking," using drinking limits based on the WHO protocol. Physicians recommended AA to patients who were receptive to change. Physicians then scheduled (F)ollowup appointments with participants to continue the dialogue about the patient's progress in drinking behavior changes.	Individual face-to-face sessions	PHF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Butler, 2013[242] PRE-EMPT	Adults	IG1	GPs and nurses were trained to deliver behavior change counseling (BCC) program called the Talking Lifestyle learning program. BCC incorporated elements of motivational interviewing, brief intervention, and cognitive behavioral therapy. Practitioners were trained to shift their consulting style away from directing to a guiding style when talking about lifestyle change, to use an agenda-setting strategy to negotiate what change to focus on, and to use a range of other strategies to encourage patients to clarify why and how they might change. The intervention sought to engage practitioners in thinking about the value of a more flexible shifting between communication styles with patients and to consider the more refined use of a guiding style when talking about behavior change.	Individual face-to-face sessions	CBT, MI	Assessment only
Carey, 2006[189]	Young adults	IG1	Interventionists used motivational interviewing techniques to administer the intervention. Basic BMI was enhanced with a decisional balance exercise, which occurred after the discussion of consequences and risk behaviors. The exercise used a worksheet with a 2x2 grid described as "a way to organize your thoughts about your current drinking and any potential changes you might want to make." The top half of the grid was labeled with "Cutting down on my drinking: What I might lose/What I might gain." The interventionist elicited information for each of the 4 boxes, summarized information, ending on the potential advantages of reducing alcohol use, and solicited the student's reactions. Students received the completed grid to take home.	Individual face-to-face sessions	MI, PNF	Assessment only
	Young adults	IG2	Interventionists used motivational interviewing techniques to administer the intervention. The intervention combined personalized feedback and alcohol education to increase awareness of current drinking and its consequences, facilitate comparisons to peer norms, provide information that increases understanding of the effects of alcohol and the role it plays in the student's life, and provide tips for reducing risks related to alcohol use. A personalized feedback sheet structured the session, providing information on drinking patterns, local and national gender-specific drinking norms, tolerance, typical and peak BAC, positive and negative alcohol expectancies, alcohol-related negative consequences and risk behaviors, and discussion of harm reduction, individual goal setting, and tips for safer drinking.	Individual face-to-face sessions	MI, PNF	Assessment only
	Young adults	IG3	The TLFB was administered by a trained RA. Participants were oriented to calendars for the previous 90 days, on which holidays and campus events were marked to prompt recall. The RA provided definitions of standard drinks and helped the participant reconstruct	Individual face-to-face sessions	MI, PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			daily drinking, starting with the current week and working backwards. The TLFB included sequential assessment of alcohol use, drug use, and sexual behavior. After daily alcohol use was documented, the process was repeated for drug use and then for sexual behavior, on the same calendar. Participants received an appointment within the following week for the Enhanced BMI intervention. Interventionists used motivational interviewing techniques to administer the intervention. Basic BMI was enhanced with a decisional balance exercise, which occurred after the discussion of consequences and risk behaviors. The exercise used a worksheet with a 2x2 grid described as "a way to organize your thoughts about your current drinking and any potential changes you might want to make." The top half of the grid was labeled with "Cutting down on my drinking: What I might lose/What I might gain." The interventionist elicited information for each of the 4 boxes, summarized information, ending on the potential advantages of reducing alcohol use, and solicited the student's reactions. Students received the completed grid to take home.			
	Young adults	IG4	Participants were oriented to calendars for the previous 90 days, on which holidays and campus events were marked to prompt recall. The RA provided definitions of standard drinks and helped the participant reconstruct daily drinking, starting with the current week and working backwards. The TLFB included sequential assessment of alcohol use, drug use, and sexual behavior. After daily alcohol use was documented, the process was repeated for drug use and then to sexual behavior, on the same calendar. Participants receive an appointment within the following week. Interventionists used motivational interviewing techniques to administer the BMI intervention. The intervention combined personalized feedback and alcohol education to increase awareness of current drinking and its consequences, facilitate comparisons to peer norms, provide information that increases understanding of the effects of alcohol and the role it plays in the student's life, and provide tips for reducing risks related to alcohol use. A personalized feedback sheet structured the session, providing information on drinking patterns, local and national gender-specific drinking norms, tolerance, typical and peak BAC, positive and negative alcohol expectancies, alcohol-related negative consequences and risk behaviors, and discussion of harm reduction, individual goal setting, and tips for safer drinking.	Individual face-to-face sessions	MI, PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Chang, 1999[181]	Pregnant women	IG1	Upon completion of the comprehensive assessment, participants were scheduled for the in-person intervention with a study physician. The physician renewed participant's general health and course of pregnancy to date; reviewed the participant's lifestyle changes made since pregnancy, including work schedule, exercise, diet, cigarette smoking and alcohol consumption; requested that the participant articulate her drinking goals while pregnant and their reason; had the participant identify circumstances when she might be tempted to drink; identified alternatives to drinking when she is tempted to drink; summarized the session by emphasizing 4 key points (drinking goal, motivation, risk situations for drinking and alternatives to alcohol) and noting them in the take-home manual, "How to prevent alcohol-related problems," which was given to the subject. Participants were also informed of the recommendation of the U.S. Surgeon General, with prenatal abstinence being the most prudent drinking goal.	Individual face-to-face sessions	General counseling	Assessment only
Chang, 2005[191]	Pregnant women	IG1	Participants and their partners received a 25-min brief intervention comprising: 1) knowledge assessment with feedback, 2) contracting and goal setting, 3) behavioral modification, and 4) summary. Knowledge assessment with feedback began with a review of the Healthy Pregnancy Facts knowledge measure completed by both the subject and her partner. Questions were answered and any misapprehensions were discussed. The participant's actual alcohol consumption was not discussed in the presence of her partner, unless she volunteered the information. In the next step of goal setting and contracting, the participant was asked to describe her prenatal drinking goal (e.g., abstinence), and the rationale for her choice was explored. The couple was informed that maternal abstinence from alcohol was the most prudent choice during pregnancy. They were asked if either the participant or the couple had made any lifestyle changes because of her pregnancy (e.g., work schedule). The behavioral modification portion consisted of asking the participant to identify situations or circumstances when she might be tempted to drink alcohol (e.g., at a wedding) and to then list some alternative behaviors (e.g., having some food instead). The partner was asked to describe ways in which he or she had modified or made plans to change behaviors that could offer support to the pregnant woman, such as drinking less, socializing differently, or doing more at home. The content of the brief intervention was summarized on a no-carbon-required form, and the couple was given the original summary.	Individual face-to-face sessions	General counseling, partner involvement	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Chang, 2011[190]	Adults	IG1	Participants received one 30-min brief intervention delivered by trained study physicians shortly after eligibility assessment. The brief intervention included 4 components: 1) Assessment and feedback, which summarized the individual's drinking patterns compared with national averages and offered standardized information on the health consequences of drinking on her medical program; 2) Goal setting and contracting, which asked for the participant's drinking goal and important reasons for modifying drinking behavior; 3) Behavioral modification, in which participants were asked to identify the circumstances they would be at increased risk for drinking and to develop alternative behaviors; and 4) Written materials, participants were given their own copy of Personal Steps to a Health Choice: A Woman's Guide and Helping Patients Who Drink Too Much (NIAAA), annotated with their personal information.	Individual face-to-face sessions	CBT, MI, PNF	Assessment only
Collins, 2014[223]	Young adults	IG1	Upon completion of the baseline surveys, participants were linked to their personalized feedback. The intervention presented participants with personalized information designed to reduce overestimated normative perceptions about drinking in one's own peer group. The intervention consisted of 4 main feedback elements: typical weekly quantity compared with perceived and actual same-gender peer norms; typical and peak estimated BAL compared with same-gender peer norms; calories consumed from alcohol in a typical week compared with same-gender peer norms; money spend on alcohol during a typical week compared with same gender-peer norms.	Web-based	PNF	Assessment only
	Young adults	IG2	Upon completion of the baseline surveys, participants were linked to their personalized feedback. Participants received personalized feedback on their perceived advantages and disadvantages of their current drinking based on their self-report responses to the baseline decisional balance worksheet. The feedback included: a graphic representation of the decisional balance proportion; graphic and textual representations of the quantitative total; qualitative content of advantages and disadvantages of current drinking and reducing drinking; likelihood and importance of each advantage and disadvantage.	Web-based	General counseling	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Crawford, 2014[185] SHEAR	Adults	IG1	Participants received a 2- to 3-min physician-delivered brief advice and referral session consisting of 4 components: 1) confirming the current level of alcohol use and brief feedback that alcohol use at that level has the potential to harm health; 2) making a link between alcohol and clinic attendance; 3) written information on alcohol and health in the form a leaflet recommended by UK Department of Health: "How much is too much?"; 4) offer of an appointment with an Alcohol Health Worker (AHW). Participants who accepted the offer of an appointment with an AHW received a ≤30 min FRAMES (Feedback about the adverse effects of alcohol, an emphasis on personal Responsibility for changing drinking behavior, Advice about alcohol consumption, a Menu of options for further help and advice, an Empathic stance towards the patient and an emphasis on Self-efficacy)-based intervention. If participants were drinking at a harmful or dependent level, the AHW had the option of arranging a followup appointment or referring the participant to local alcohol services for individual alcohol counseling, detoxification, or other services. If participants were unable to attend an appointment that day, they were offered an appointment at a later date or phone-based support and advice.	Individual face-to-face sessions	Referral, FRAMES	Participants were offered a copy of "Five Choices to Help You Stay Healthy" leaflet comprising information on health and prevention of ill health including information on alcohol use, diet, exercise and cigarette smoking and details of how to obtain further information about health and lifestyle.
Cunningham, 2012[231]	Adults	IG1	Participants were mailed a pamphlet modeled after Drinker's Check Up and the Fostering Self-Change Intervention. The pamphlet began with encouragement for the participant to evaluate their drinking, followed by asking the participant to record their drinking for each day of a typical week and to sum this information to calculate the number of drinks usually consumed per week. Participants were provided with information on the drinking patterns of males and females in the general Canadian population and were encouraged to compare their personal drinking to that of other Canadians. The pamphlet also included a graph of the likelihood of adverse effects associated with different levels of consumption. The pamphlet concluded with a menu of different options they could choose with regard to their drinking. Included in the menu were low-risk drinking guidelines and a toll-free phone number for participants who would like to call to receive free referral to a local treatment agency.	Mail	PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Curry, 2003[152]	Adults	IG1	During participants' regularly scheduled visit with PCP, PCP reconfirmed participants' self-reported drinking patterns, provided supportive advice about potential risks associated with those drinking patterns, asked patients if they had thought about changing their drinking habits, and gave a 1- to 5-min motivational message that acknowledged the patients' current intentions. PCPs gave patients a packet containing the self-help manual (Drinking Alcohol: A Guide for Evaluating and Changing Drinking Patterns) and written personalized feedback. The manual included basic guidelines for safe drinking patterns on the inside cover and 5 sections entitled "Take Stock of Your Drinking," "Decide to Change Your Drinking Habits," "Set Limits," "Stay Within Limits," and "Keep a Healthy Balance." The written personalized feedback a) provided normative information about the prevalence of the patient's reported drinking patterns and associated risks, b) highlighted the patient's reported intrinsic motivators for changing drinking patterns and compared them with others who had successfully changed, and c) highlighted the cons of at-risk drinking patterns that they endorsed on the screening survey. The phone counseling calls were timed to occur a) 1-2 weeks after their clinic appointment, b) within 4 weeks after the first call, and c) within 4 weeks after the second call. The second and third calls could be scheduled with some flexibility at the request of the participant. The phone counselor sent a handwritten note following each completed call or when she failed to reach a participant. The counselor worked with a manual that included goal-driven protocols for each call. The overall objective was to encourage patients to use the Drinking Alcohol booklet and to reinforce the motivational messages they received in the personalized feedback. The protocol was built around 10 intervention goals that depended on the patient's readiness to change. The format for the calls was open-ended. The counselor requested permission to make subsequent calls at the end of the first and second counseling call.	Individual face-to-face sessions, telephone calls	MI, PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Daeppen, 2011[192]	Young adults	IG1	The approximately 15-min intervention intended to reinforce motivation to change behaviors related to alcohol use. The first aim was to introduce a behavior change perspective and discuss it in a nonjudgmental, empathic and collaborative manner. The hypothesis was that an open discussion with additional reinforcement by a trained counselor around alcohol use and its repercussions on different life areas could heighten the conscript's awareness of the importance to change this behavior now or in the future. The model was not a structured intervention with a succession of phases, but rather a menu of strategies in the form of topics, or areas of conversation that the counselor might address, according to individual drinking status and readiness to change. Strategies consisted of: an opening strategy exploring lifestyle, general alcohol use, alcohol use within a typical day/session, then focusing on the hypothesis of a reduction in alcohol use among bingers or on the status quo among nonbingers; focusing on the pros and cons of alcohol use; evoking hypothetical changes in drinking patterns; exploring importance, ability, and confidence to change; eliciting commitment to change, and the identification of a hypothetical change. In order to avoid any confrontational dimension, the intervention did not include a personalized feedback.	Individual face-to-face sessions	MI	Assessment only
Drummond, 2009[208]	Adults	IG1	Patients received a sequential series of interventions according to need and response after each step. Step 1: Patients received a 40-min motivational interview with a practice nurse. Patients who consumed >21 units of alcohol in any 1 week or >10 units in any 1 day during the 28-day period were referred to Step 2. Step 2: Patients were offered four 50-min motivational enhancement sessions with an alcohol counselor (1 per week for 4 weeks), followed by a followup session with the practice nurse. Patients who consumed >21 units of alcohol in any 1 week or >10 units in any 1 day during the 28-day period were referred to Step 3. Step 3: Patients were referred to the local community alcohol team for specialist intervention, which could include detoxification, inpatient treatment, outpatient counseling, and drug therapy. Any patient who needed urgent referral to Step 3 at any stage was able to be referred without having to go through intermediate steps.	Individual face-to-face sessions	ME, MI	Patients received a 5-min advice session encouraging them to reduce their alcohol consumption. Additionally, patients received a short self-help booklet outlining the consequences of excessive alcohol consumption and included details on where to seek help

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Emmen, 2005[193]	Adults	IG1	Patients received a brief psychological intervention based on the Dutch Motivational Drinker's Check-Up. This included a 90-min assessment session and a 60-min feedback session given by a psychologist. The assessment session consisted of evaluating a variety of indicators of alcohol use and alcohol-related problems. The second session was conducted 1-2 weeks later and consisted of feedback (using MI techniques), and advice if appropriate. It ended with consensus and conclusion. After the second session participants received a personal letter summarizing the results and the conclusions drawn.	Individual face-to-face sessions, mail	MI	Patients received usual care, which "mostly meant the physicians' confronting advice on a single occasion with occasionally a further reference to the alcohol use at the next consultation." 50% received advice from physicians.
Ettner, 2014[183] Project SHARE	Older adults	IG1	Participants were mailed a personalized patient report; an educational booklet on alcohol and aging; a drinking diary to track alcohol consumption; and, depending on the participant's reported alcohol-associated risks (as identified on the CARET), up to 13 "tip sheets" (e.g., on drinking sensibly, sleep, preventing falls and fractures, gout). The report was generated using software used to score the CARET and included specific reasons for the "at-risk drinking" classification (e.g., the participant's use of alcohol in combination with benzodiazepines and sedating antihistamines) and potential harms that could result (e.g., sedation and impaired coordination). New reports were generated and mailed to the participants after completion of the 6-month CARET survey. After participants completed the CARET at baseline and 6 months, provider reports similar to the participant reports were generated. Immediately before each regularly scheduled appointment of an intervention patient, all available provider reports for that participant were placed on the front of the medical record. Intervention physicians were asked to review and use the information in the provider reports to discuss the participant's drinking and associated risks during the appointment and advise the participant to reduce alcohol use if the participant was still an at-risk drinker. Via phone, a health educator contacted intervention participants 3 times: a) 2 weeks after sending the baseline participant report, b) 3 months after sending the baseline participant report, and c) 2 weeks after sending the patient's 6-month participant report. During these calls, the health educator answered questions about the written materials and engaged in the following 5 steps: a) assessment and direct feedback, b) negotiation and goal setting, c) behavioral modification techniques, d) self-help-directed bibliotherapy, and e) followup and reinforcement.	Individual face-to-face sessions, telephone calls	CBT, PHF	Participants received care as usual, which could have included alcohol counseling.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Fleming, 1997[153] Project TrEAT (Trial for Early Alcohol Treatment)	Adults	IG1	Participants were provided with a health booklet on general health issues and scheduled to see their personal physician for a brief intervention. Participants received two 15-min intervention sessions with their physician scheduled 1 month apart (brief intervention and reinforcement session). At the first session, participants were provided with a workbook that contained feedback regarding current health behaviors, a review of the prevalence of problem drinking, a list of the adverse effects of alcohol, a worksheet on drinking cues, a drinking agreement in the form of a prescription, and drinking diary cards. The intervention was based on protocols developed for the Medical Research Council (MRC). Participants received 2 followup phone calls from the clinic nurse 2 weeks after each physician-delivered intervention session.	Individual face-to-face sessions, telephone calls	CM	Participants were provided a health booklet on general health issues and were instructed to address any health concerns in their usual manner.
Fleming, 1999[157] Project GOAL (Guiding Older Adult Lifestyles)	Older adults	IG1	The brief intervention was developed according to protocols used by the Medical Research Council trial and Project TrEAT and comprised a workbook containing feedback on the patient's health behaviors, review of problem-drinking prevalence, reasons for drinking, adverse effects of alcohol, drinking cues, a drinking agreement in the form of a prescription, and drinking diary cards. The intervention was delivered in two 10- to 15-min physician-delivered counseling sessions scheduled 1 month apart (a brief intervention and a reinforcement session). Participants received one followup call from a clinic nurse 2 weeks after each visit.	Individual face-to-face sessions	General counseling	Participants received a general health booklet.
Fleming, 2008[158]	Postpartum women	IG1	The intervention was based on protocols developed for Project TrEAT, and was modified for the Healthy Moms trial, after consultation with obstetricians, obstetrical nurses and experts in the field. The intervention protocol was contained in a workbook, which included scripted messages with feedback regarding current health behaviors, a review of the prevalence of problem drinking, a list of the adverse effects of alcohol focused on women and pregnancy, a worksheet on drinking cues, a drinking agreement in the form of a prescription, and drinking diary cards. The workbook was based on the principles of motivational interviewing and cognitive behavioral therapy. Participants received two 15-min in-person sessions with the clinic nurse scheduled 1 month apart and 2 followup calls 2 weeks after each session. During the face-to-face sessions, the clinic nurse or obstetrician went through the workbook with the participant. The participants took the workbook home between visits and filled out a number of homework assignments focused on high-risk drinking situations and drinking cues (i.e., things they liked and did not like about drinking). The patient was also asked to fill out drinking diary cards between visits	Individual face-to-face sessions, telephone calls	CBT, MI	Participants received a health booklet on general health issues and were followed up at 6 months. They were not given any specific counseling, and were instructed to address any health concerns in their ‘‘usual manner’’.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			to more accurately assess their current drinking level. The followup phone calls reinforced the drinking limits set at each visit, challenges they faced in cutting down on drinking and offering continued support.			
Fleming, 2010[160] CHIPS	Young adults	IG1	Physicians were trained using a brief intervention manual. This included feedback regarding current health behaviors, a review of the prevalence of high-risk drinking among college students, a list of alcohol's adverse consequences relevant to college students, lists of personal likes and dislikes of drinking, worksheets on drinking cues, a blood alcohol level calculator, life goals and drinking effects, agreement in the form of a prescription, drinking diary cards, and long-term action plan that included tips about finding alternatives to drinking, refusal, strategies, rewarding yourself, and getting support. Participants were also given a booklet covering general health issues. Two 15-min visits with the physician were scheduled 1 month apart (brief intervention and reinforcement session). Each patient received a followup phone call or email 2 weeks after the first visit and 1 month after the second.	Individual face-to-face sessions, emails, telephone calls	General counseling	Participants received a health booklet on general health issues and participated in followup phone calls at 6 and 12 months. Clinicians were instructed to address any health concerns in their usual manner.
Hansen, 2012[234]	Adults	IG1	Participants received one fully automated, computer-based personalized feedback intervention (PFI) session displayed in a single screenshot that addressed participants by name. The PFI consisted of a summary of the participant's weekly consumption, a comparison of weekly consumption with the maximum drinking limit, and a graphical comparison of the participant's consumption with the average level in the municipality (gender-specific). The PFI also included information about the risks to health and social relationships related to heavy drinking, as well as links to further self-help material and a local alcohol treatment facility.	Web-based	PNF	Assessment only
	Adults	IG2	Participants received one fully automated, computer-based personalized brief advice (PBA) session displayed in a single screenshot that addressed participants by name. The PBA informed the participant that his or her alcohol consumption exceeded the recommended maximum drinking limit, followed by information about the health and social risks associated with heavy drinking, as well as links for further standardized self-help material and a local alcohol treatment facility.	Web-based	PNF	Assessment only
Haug, 2016[210]	Adolesc-ents	IG1	Upon completion of the baseline assessment, participants received web-based personalized feedback regarding: number of drinks consumed per week in relation to the age and gender-specific reference group; financial costs of drinking; calories consumed with alcoholic drinks; number of risking single drinking occasions in	Web-based, text-messages	PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			relation to the age- and gender-specific reference group. Participants also received individually tailored text messages provided over the 3-month intervention period. On the first level, the content and number of text messages were tailored according to baseline drinking patterns. Participants were assigned to 1 of 3 risk groups according to their baseline drinking patterns: a) low risk: no RSOD occasions during the preceding 30 days and ≤14 (7 for girls) standard drinks consumed during a typical week, b) medium risk: 1 or 2 RSOD occasions during the preceding 30 days or no RSOD occasions during the preceding 30 days and ≤14 (7 for girls) standard drinks consumed during a typical week, and c) high risk: >2 RSOD occasions during the preceding 30 days. On the second level, the content of the text messages was tailored according to individual values for the following baseline variables: sex, motivation to reduce alcohol consumption, alcohol-related problems, typical drinking day and time, estimated peak BAC during the preceding 30 days, positive outcome expectancies, typical drinking situations, strategies to resist alcohol in different drinking situations, and assessment location. Text messages for the medium risk group focused on: motivation to drink within low risk limits, using individual data concerning positive outcome expectancies derived from a list; alcohol-related problems, established using individual data on previous alcohol-related problems; estimated peak BAC and related risk calculated using data concerning sex, body weight, and maximum number of drinks consumed on a single occasion in the preceding month; strategies to resist alcohol in different drinking situations, established using data concerning individual drinking situations and chosen strategies for resisting alcohol. Participants in the medium- and high-risk groups received 2 text messages per week from the content categories described above. Additionally, they received information regarding local outpatient alcohol counseling services according to assessment location. Irrespective of risk group, three short message service (SMS) text message assessments were performed during the intervention period: a) an SMS quiz on the metabolism of alcohol, for which participants received immediate individualized feedback on their answers, and if they did not respond within 48 hr, they were sent the correct response, b) a message contest that required participants to create a text message to motivate other participants to drink within low-risk limits. The best text message was sent anonymously to all other participants after 48 hr, c) an SMS assessment of RSOD within the preceding week, which included immediate individualized			

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Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			feedback. Participants in the medium- and high-risk groups received 27 text messages (1 welcome message, 3 assessment messages, 22 tailored feedback messages, and 1 goodbye message).			
Heather, 1987[209] DRAMS (drink reasonably and moderately with self-control)	Adults	IG1	Participants were screened in the waiting room prior to appointment with PCP. If any items were answered affirmatively, PCP discussed questionnaire results with participants and requested a blood test. Participants were provided a 2-week self-monitoring drinking diary card and were instructed to fill it out. PCP set up a followup appointment with participants 2 weeks later. At the followup consultation, PCP reviewed blood test results and drinking diary card with participant and, if the existence of a drinking problem was confirmed, PCP advised participant to try to control their amount of alcohol consumption. PCP introduced participant to a 59-pg self-help manual for controlled drinking produced by the Scottish Health Education Group and encouraged them to decide on a realistic plan of action based on the measures suggested in the book and using further diary sheets. Additional appointments were made at which participant's medical condition and progress at cutting down were reviewed, using results from further blood tests.	Individual face-to-face sessions	General counseling, PHF	Assessment only
	Adults	IG2	Participants were informed that their drinking could be harmful and were given advice to "cut down", but no precise quantities were recommended and no followup consultations regarding their alcohol problem were arranged.	Individual face-to-face sessions	General counseling	Assessment only
Helstrom, 2014[240]	Adults	IG1	Participants received PCP-delivered standard care comprising information and brief advice about the risks associated with alcohol misuse and suggestions to decrease alcohol use. Participants also received a letter informing them of recommended drinking limits and a description of standard drinks. At 3, 6 and 9 months following baseline assessment and standard care, participants received the telephone care management (TCM) intervention. TCM included elements of motivational enhancement, decisional balance, education about alcohol misuse, and development of an individualized behavior change plan. Behavioral health specialists, 2 nurses trained in motivational approaches to substance use and brief intervention for addictions, maintained regularly scheduled phone contact to develop a treatment plan, monitor treatment effectiveness, and adverse effects, assess and encourage treatment adherence, and offer support and education. The content of individual sessions included alcohol use monitoring, support and education, and individualized education about at-risk drinking and	Individual face-to-face sessions, telephone calls	ME	Participants received PCP-delivered standard care comprising information and brief advice about the risks associated with alcohol misuse and suggestions to decrease alcohol use. Participants also received a letter informing them of recommended drinking limits and a description of standard drinks, as well as referral to a behavioral health service.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			information about common comorbidities (e.g., depressive symptoms). The TCM manual also included the use of a telephone-adapted addiction management algorithm that provided guidelines for clinical decision making regarding referral to specialty addictions treatment when needed (e.g., following a significant increase in alcohol use) and close collaboration with the patient's PCP. Workbooks logging treatment goals and progress were mailed to participants after each session. The behavioral health specialists also had access to consultation and supervision with a psychiatrist.			
Hilbink, 2012[233]	Adults	IG1	The intervention was comprised of 9 activities, which combined professional, organizational, and patient-directed interventions. Professional-directed interventions focused on training the general practice team and consisted of the distribution of a guideline on problematic alcohol consumption, a reminder card with signs, symptoms and patient characteristics associated with excessive alcohol consumption to be displayed on the desk of the GP, and small-scale educational training sessions (1-3 sessions, 2-3 hours per session, 10 participants max). Organizational-directed interventions further focused on training the general practice team, and included a feedback report about the proportion of patients with excessive drinking habits (participants divided into 4 categories according to the AUDIT), facilitation of the cooperation with local addiction services for support and referral, and outreach visits by a trained facilitator tailored to needs of the practice (1-3 visits, 1 hour per visit). Patient-directed interventions consisted of GPs distribution of informational letters, leaflets and self-help books to their patients, an informational poster in the waiting room, which drew the attention to alcohol with the advice to contact the GP or look at the websites for further information, and mailed personalized feedback letters, which cited the category the patient belonged and the corresponding advice. The advice was to consult their GP or to look at websites of the National Institute for Health Promotion and Disease Prevention or Trimbos Institute. This advice was not given to patients in category 1 (safe-to-moderate drinkers). For participants in category 4 (possible dependent drinkers), the advice to inquire at a local addiction center was added.	Mail	PNF	Participants were mailed the guidelines and patient information letters about problematic alcohol consumption, but received no further support or training. Participants received personalized feedback on alcohol consumption after the closure of the intervention period.

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Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Johnsson, 2006[194]	Young adults	IG1	Students were invited to a 10-hour education program, given over 5 sessions (2 hours each) at 1-week intervals. The invitation included personalized feedback based on their AUDIT scores. Each session included 8-10 students and was taught by a member of the research staff, along with 8 trained peers who acted as discussion leaders. The session content was based on the BASICS manual and included the following: 1) identifying high-risk drinking situations; 2) providing accurate information about alcohol; 3) identifying personal risk factors; 4) challenging of myths and positive expectations; 5) establishing appropriate and safer drinking goals; 6) managing high-risk drinking situations, and 7) learning from mistakes. In addition, Session 3 focused on gender roles and students were able to ask members of the opposite sex how alcohol influences interactions and how the effects differ between men and women. Session 4 included a sham alcohol-drinking session where students were supposed to estimate their blood alcohol level.	Group face-to-face sessions	CBT, PNF	Students were provided their AUDIT scores in relation to all freshman via mail. They were informed that they belonged in the upper quartile with the highest scores and the score was plotted into a diagram with all quartiles shown. The feedback also included recommendations to drink less and if necessary to get in contact with treatment organizations. Telephone numbers for organizations were also provided.
Kaner, 2013[186] Screening and Intervention Programme for Sensible drinking (SIPS)	Adults	IG1	Participants received feedback on screening plus five minutes of structured brief advice from practice staff using the SIPS Brief Advice tool 'Brief advice about alcohol risk'. The SIPS tool was based on the 'How much is too much? Simple Structured Advice intervention tool' developed as part of the UK version of the Drink-Less brief intervention program. Participants were provided with specific details about the health and social consequences of hazardous and harmful drinking, were shown a sex-specific graph, which indicated that their drinking exceeded that of most of the population, and a list of benefits that would result from reduced drinking. Thereafter patients were taken through a menu of techniques to help reduce drinking and asked to consider a personal target for an achievable reduction in drinking. At the end of the brief advice session, participants received a patient information leaflet, the Department of Health's 'How much is too much? Drinking and you', which contained details of the Drinkline telephone number where the patient could access further information including treatment options for alcohol problems. A sticker with local alcohol services was attached to the back cover. Participants then scheduled a follow-up consultation within two weeks for a 20-min brief lifestyle counseling session. The counseling was based on a condensed form of motivational interviewing called health behavior change. Participants first described their typical drinking day and then rated the importance of changing their drinking and their confidence about changing their drinking on a 10 point-scale (where a higher number indicated	Individual face-to-face sessions	MI, PNF	Participants received a patient information leaflet, the Department of Health's 'How much is too much? Drinking and you', which contained details of the Drinkline telephone number were the patient can access further information including treatment options for alcohol problems. A sticker with local alcohol services was attached to the back cover.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			greater importance or confidence and vice versa). The practitioner worked with these ratings to establish why they were at the current level and how they might be increased to a higher point, before eliciting both pros and cons of drinking and finally working through a six step plan to help reduce drinking levels.			
	Adults	IG2	Participants received feedback on screening and the patient information leaflet plus five minutes of structured brief advice from practice staff using the SIPS Brief Advice tool 'Brief advice about alcohol risk'. The SIPS tool was based on the 'How much is too much? Simple Structured Advice intervention tool' developed as part of the UK version of the Drink-Less brief intervention program. Participants were provided with specific details about the health and social consequences of hazardous and harmful drinking, were shown a sex-specific graph, which indicated that their drinking exceeded that of most of the population, and a list of benefits that would result from reduced drinking. Thereafter patients were taken through a menu of techniques to help reduce drinking and asked to consider a personal target for an achievable reduction in drinking. At the end of the brief advice session, participants received a patient information leaflet, the Department of Health's 'How much is too much? Drinking and you', which contained details of the Drinkline telephone number where the patient could access further information including treatment options for alcohol problems.	Individual face-to-face sessions	PNF	Participants received a patient information leaflet, the Department of Health's 'How much is too much? Drinking and you', which contained details of the Drinkline telephone number were the patient can access further information including treatment options for alcohol problems. A sticker with local alcohol services was attached to the back cover.
Kypri, 2004[161]	Young adults	IG1	Participants completed an online assessment, which included a 14-day retrospective drinking diary, self-reported weight, and perceptions of peer drinking norms. Upon completion of the assessment, they received personalized feedback consisting of a summary of consumptions: their risk status, comparison of their consumption with recommended upper limits, and an estimate of their blood alcohol concentration for their heaviest drinking occasion in the preceding 4 weeks, comparison of their consumption with that of national & university norms, and a correction of norm misperceptions. Additionally, they received a leaflet titled "Alcohol Facts and Effects".	Web-based	PNF	Assessment only

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Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Kypri, 2008[162]	Young adults	IG1	Upon initial completion of the assessment, participants received personalized feedback consisting of risk status, a summary of their recent consumption with recommended limits, an estimate of blood alcohol concentration for their heaviest drinking occasion in the preceding 4 weeks, a comparison of the consumption with that of national and university norms, and a correction of norm misperceptions. Intervention involved repetition of the assessment and feedback, with the participant's drinking at 6 months compared against that at baseline and at 1 month in a series of bar charts.	Web-based	PNF	Participants received an information pamphlet only.
	Young adults	IG2	Upon completion of the initial assessment, participants received personalized feedback consisting of risk status, a summary of their recent consumption with recommended limits, an estimate of blood alcohol concentration for their heaviest drinking occasion in the preceding 4 weeks, a comparison of the consumption with that of national and university norms, and a correction of norm misperceptions.	Web-based	PNF	Participants received an information pamphlet only.
Kypri, 2009[195]	Young adults	IG1	Participants received: 1) their AUDIT score with an explanation of the associated health risk and information about how to reduce that risk; 2) an estimated blood alcohol concentration for the respondent's heaviest episode in the previous 4 weeks, with information on the behavioral and psychological sequelae of various blood alcohol concentrations and traffic crash relative risk; 3) estimates of monetary expenditure per month and year; 4) bar graphs comparing episodic and weekly consumption with that of other students of the same age and sex; 5) hyperlinks for smoking cessation and help with drinking problems. Three more web pages were given as options, offering facts about alcohol and tips for reducing the risk of alcohol-related harms as well as providing information about where to find medical health and counseling support. After the 1-month assessment, participants received additional feedback, comparing drinking levels that they reported at 1 month with those at BL.	Web-based	PNF	Assessment only
LaBrie, 2009[196]	Young adults	IG1	Participants took part in a single session consisting of TLFB, group discussion regarding alcohol expectancies ("good things" and "not so good things" about drinking) and the role social expectancies play in alcohol consumption. In addition, the session included normative feedback, which presented the average level of drinking for women at the university. Inherent physiological differences between men and women were discussed, along with blood alcohol content levels with corresponding effects. Each participant was given a personalized blood alcohol content card. Symptoms of alcohol poisoning and information for local resources were	Group face-to-face sessions	CBT, PNF	Participants were given a packet of alcohol-related information specific to women.

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Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			provided. Participants discussed women's specific reasons for drinking with a focus on social and relational reasons for drinking. As a group, participants generated reasons for drinking less and reasons against drinking less and wrote down their personal reasons for change. Finally, participants set a behavioral goal indicating their intentions about drinking over the next 30 days and reported on the importance of the goal and their confidence in achieving it.			
LaBrie, 2013[227]	Young adults	IG1	The Web-BASICS feedback contained a total of twenty-six pages of interactive comprehensive motivational information based on assessment results, modeled from the efficacious in-person BASICS intervention. It addressed quantity and frequency of alcohol use, past month peak alcohol consumption, estimated blood alcohol content (BAC), and provided information regarding standard drink size, how alcohol affects men and women differently, oxidation, alcohol effects, reported alcohol-related experiences, estimated calories and financial costs based on reported weekly use, estimated level of tolerance, risks based on family history, risks for alcohol problems, and tips for reducing risks while drinking as well as alternatives to drinking. The feedback also included PNF utilizing typical student drinking norms. Participants were given the option to click links throughout the feedback to obtain additional information on standard drink size, sex differences and alcohol use, oxidation, biphasic tips, hangovers, alcohol costs, tolerance, and protective factors, as well as provided with a link to a BAC calculator. Participants were given the option to print their feedback.	Web-based	PNF	The generic control feedback contained three pages of information in text and bar graph format. Separate graphs, each including two bars, were used to present information regarding the number of hours spent texting, number of hours spent downloading music, and number of hours spent playing video games per week for (a) one's own behavior, and (b) actual college student behavior. Participants were also provided with their percentile rank comparing them with other students on their respective campus (e.g., "Your percentile rank is 60%, this means that you text as much or more than 60% of other college students on your campus").
	Young adults	IG2	Participants were presented 2 levels of specificity for students at the same university matched to participant's gender, race, and Greek status. The PNF contained 4 pages of information in text and bar graph format. Separate graphs, each including 3 bars, were used to present information regarding the number of drinking days per week, average drinks per occasion, and total average drinks per week for a) one's own drinking behavior, b) their reported perceptions of the reference group's drinking behavior on their respective campus according to their gender, race, and Greek status, and c) actual college student drinking norms for their gender, race, and Greek status. Actual norms were derived from large representative surveys conducted on each campus in the prior year as a formative step in the trial. Participants were also provided with their percentile rank comparing them with other students on their respective campus for their gender, race, and	Web-based	PNF	

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			Greek status (e.g., "Your percentile rank is 99%, this means that you drink as much or more than 99% of other college students on your campus").			
Larimer, 2007[197]	Young adults	IG1	Participants received a postcard containing personalized feedback custom programmed to draw information from the web-based assessment. The feedback included each participant's current drinking behavior, their percentile ranks in comparison with the campus average (and the percentage of students who didn't drink in a typical month), estimated peak and typical blood alcohol levels, and the effects of alcohol at different blood alcohol levels. Feedback also included a comparison of each participant's perceived descriptive norms with actual campus drinking rates, their alcohol outcome expectancies with embedded text indicating that many social effects of alcohol are influenced by placebo effects, feedback regarding negative consequences of drinking the participant had reported in a number of domains (i.e., alcohol and sex, alcohol and weight), and specific protective behaviors the participant was already engaging in as well as those they could initiate. Feedback content and style were similar to the Brief Alcohol Screening and Intervention for College Students (BASICS) program. Participants then received 10 weekly postcards with additional information they could use to avoid drinking-related negative consequences. Postcard tips expanded on personalized feedback topics by providing information about calculating blood alcohol levels on the basis of weight, sex, and number of drinks per hour, protective behaviors students could use (such as setting limits, alternating alcoholic with nonalcoholic beverages, and choosing not to drink), reasons why students might choose not to drink (both general and situation specific), and additional tips about avoiding negative consequences associated with alcohol use at parties, alcohol and sexual behavior, and alcohol poisoning incidents. Each postcard also included accurate information about the campus descriptive norm (i.e., 85% of students had 0, 1, 2, 3, or at most 4 drinks when they partied), and 1 postcard specifically highlighted the percentage of students on campus (more than 25%) who never drank alcohol.	Mail	PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Leeman, 2016[211]	Young adults	IG1	Students completed a web-based intervention based on THRIVE. The personalized feedback generated included four components: alcohol dependence risk, estimated monetary cost of alcohol consumed, peak past 30 day estimated blood alcohol concentration, and 2 graphs comparing students' drinks per drinking day and drinks per week to normative drinking levels by sex and age group (18-20, 21-24). In addition, protective behavioral strategies were provided, along with facts about alcohol, and information about local resources for reducing drinking. Protective behavioral strategies were presented with a short title and 2-4 sentence descriptions. The four strategies that loaded best into a direct factor and four best-loading indirect items became the focused strategy sets. Direct strategies were as follows: count the number of drinks, set a drink limit and stick to it, slow down and space drinks out, and alternate alcoholic with nonalcoholic drinks. Indirect strategies were the following: look out for your friends and them for you, carry protection for sexual encounters, preplan a ride home, and secure a designated driver and ensure he/she doesn't drink.	Web-based	PNF	Assessment only
	Young adults	IG2	Students completed a web-based intervention based on THRIVE. The personalized feedback generated included four components: alcohol dependence risk, estimated monetary cost of alcohol consumed, peak past 30 day estimated blood alcohol concentration, and 2 graphs comparing students' drinks per drinking day and drinks per week to normative drinking levels by sex and age group (18-20, 21-24). In addition, protective behavioral strategies were provided, along with facts about alcohol, and information about local resources for reducing drinking. Protective behavioral strategies were presented with a short title and 2-4 sentence descriptions. Only direct strategies were given, including: count the number of drinks, set a drink limit and stick to it, slow down and space drinks out, and alternate alcoholic with nonalcoholic drinks.	Web-based	PNF	Assessment only
	Young adults	IG3	Students completed a web-based intervention based on THRIVE. The personalized feedback generated included four components: alcohol dependence risk, estimated monetary cost of alcohol consumed, peak past 30 day estimated blood alcohol concentration, and 2 graphs comparing students' drinks per drinking day and drinks per week to normative drinking levels by sex and age group (18-20, 21-24). In addition, protective behavioral strategies were provided, along with facts about alcohol, and information about local resources for reducing drinking. Protective	Web-based	PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			behavioral strategies were presented with a short title and 2-4 sentence descriptions. Only indirect strategies were given, including: look out for your friends and them for you, carry protection for sexual encounters, preplan a ride home, and secure a designated driver and ensure he/she doesn't drink.			
Lewis, 2014[225]	Young adults	IG1	Upon completion of the baseline survey, participants were presented a link that routed them to view their personalized feedback. Participants were also sent an e-mail inviting them to view their personalized feedback at any time. All pages contained a banner with the study logo that read "How do you compare to other male/female [University Name] students?" The feedback included information (presented in both text and bar graph format) regarding: one's own behavior; one's perceptions of the typical same-sex students' behavior; the typical same-sex students' actual behavior. Drinking behaviors in the past 3 months included: number of times spent drinking during the typical week; average number of drinks consumed per typical drinking occasion; number of drinks consumed per typical week. Participants were also provided with their percentile rank comparing them with other students' drinking behavior. Participants were notified that the information contained in the feedback came from a random sample of 1,002 students at their university. Intervention feedback material contained 4 screens. Each screen presented one graph and related feedback content. The final screen of the feedback provided a percentile rank for the comparison between the participants' reported drinking and that of their same-sex peers. On the last screen of their feedback, participants were given the option to print their feedback.	Web-based	PNF	Participants were shown information related to use of technology. Technology use was broken down into three topics: texting, downloading music, and playing video games. Each screen presented one graph and related feedback content. For each of the 3 feedback screens, participants were provided their percentile rank for the specific technology uses.
	Young adults	IG2	Upon completion of the baseline survey, participants were presented a link that routed them to view their feedback. Participants were also sent an e-mail inviting them to view their personalized feedback at any time. All pages contained a banner with the study logo that read "How do you compare to other male/female [University Name] students?" The feedback (presented in both text and bar graph format) included information regarding: one's own behavior; one's perceptions of the typical same-sex students' behavior; the typical same-sex students' actual behavior. Participants were also provided with their percentile rank comparing them with other students' drinking behavior. Participants were notified that the information contained in the feedback came from a random sample of 1,002 students at their university. Intervention feedback material contained 8 screens. On the last	Emails, web-based	PNF	Participants were shown information related to use of technology. Technology use was broken down into three topics: texting, downloading music, and playing video games. Each screen presented one graph and related feedback content. For each of the 3 feedback screens, participants were provided their percentile rank for the specific technology uses.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			screen of their feedback, participants were given the option to print their feedback. Items assessing sexual behaviors and normative misperceptions were adapted from those used by Lewis et al. (2007). Alcohol use in conjunction with oral, vaginal, or anal sex was measured by the question, "You said you had sex ___ time(s) in the past 3 months. Of the ___ time(s), how many times did you consume alcohol before or during the sexual encounter?" Response options ranged from 0 = none to 25 = 25+ times. The number of drinks consumed prior to sex was examined using the question, "You said you had consumed alcohol before or during sex ___ time(s) in the past 3 months. During the ___ time(s), how many drinks on average did you consume?" Response options ranged from none (0) to 25+ drinks (25).			
Maisto, 2001[163]	Adults	IG1	Participants received a 30-45 min motivational enhancement (ME) session that used empathy, reflective listening and other techniques to enhance participants' motivation to change their alcohol use and focused on delivery of feedback of baseline assessment data and setting alcohol use goals. The interventionist used techniques designed to encourage participants to elaborate or discuss their thoughts related to alcohol use and its consequences and gave participants freedom and time to discuss and select drinking goals. Participants then received two 15-20 min booster sessions scheduled 2 and 6 weeks following the initial ME session. The booster sessions provided a formal check-up on the participant's progress toward achieving the alcohol use goals articulated in the initial ME session and helped the participant make any necessary adjustments if problems had been experienced in working toward achieving the goals, or to modify the goals themselves. Participants were provided with a booklet for reference titled "Is it time for a change? Is alcohol harming you?", which contained basic information about the physical psychological and social effects of alcohol, with emphasis on alcohol-related problems. The booklet then described the concept of "sensible drinking" and its relationship to the individual alcohol consumption goal that emerged from the participant's ME session.	Individual face-to-face sessions	ME	Participants' physicians received selected feedback from screening and baseline assessments, including AUDIT score, if positive; alcohol consumption, if in the "high risk" range; systolic blood pressure if ≥200; diastolic blood pressure if ≥110; GGT levels at least five times higher than normal; and blood glucose if ≥350. Participants did not receive any systematic intervention for their alcohol use from project staff, but their physicians were not discouraged from doing so. Physicians did not receive any instructions about use of interventions for participant's alcohol use.
	Adults	IG2	Participants received one 10-15 min brief advice (BA) session that emphasized feedback from the baseline results and its implications for the participant's drinking. The feedback was coupled with advice regarding a goal to reduce or stop alcohol consumption. Interventionists were trained to focus on delivering feedback to the participant and guiding selection of a drinking goal. There was	Individual face-to-face sessions	General counseling	Participants' physicians received selected feedback from screening and baseline assessments, including AUDIT score, if positive; alcohol consumption, if in

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			minimum elaboration on the information that was delivered, either by the interventionist or, through the use of techniques to limit their comments to direct questions, by the participants. Participants were provided with a booklet for reference titled "Is it time for a change? Is alcohol harming you?", which contained basic information about the physical psychological and social effects of alcohol, with emphasis on alcohol-related problems. The booklet then described the concept of "sensible drinking" and its relationship to the individual alcohol consumption goal that emerged from the participant's BA session.			the "high risk" range; systolic blood pressure if ≥200; diastolic blood pressure if ≥110; GGT levels at least 5 times higher than normal; and blood glucose if ≥350. Participants did not receive any systematic intervention for their alcohol use from project staff, but their physicians were not discouraged from doing so. Physicians did not receive any instructions about use of interventions for participant's alcohol use.
Marlatt, 1998[198]	Young adults	IG1	Winter of 1st year: Participants were contacted to schedule an appointment for the feedback interview and provided with alcohol consumption monitoring cards to keep track of their drinking on a daily basis for 2 weeks prior to their interview. In the feedback session, interviewers reviewed participants' alcohol self-monitoring cards, and provided individualized feedback about their drinking patterns, risks, and beliefs about alcohol effects. Students' self-reported drinking rates were compared with college averages, and perceived risks for current and future problems (grades, blackouts, and accidents) were identified. Beliefs about real and imagined alcohol effects were addressed through discussions of placebo effects and the nonspecific effects of alcohol on social behavior. Biphasic effects of alcohol were described and the students were encouraged to question the assumption that "more alcohol is better." Suggestions for risk reduction were outlined. Each participant left the interview with a personalized summary feedback sheet (comparing his/her responses with college norms and listing individualized problems and risk factors), along with a generic tips page describing biphasic responses to alcohol, placebo effects, and suggestions for techniques of reduced risk drinking. Winter of 2nd year: Participants were mailed graphic personalized feedback pertaining to their reports of drinking at baseline and 6- and 12-month follow-ups. Each feedback sheet contained individualized bar graphs depicting baseline and subsequent levels of drinking quantity, drinking frequency, and RAPI items. On the basis of two variables at the 1-year follow-up, the report of peak drinking experiences and the number of reported alcohol-related problems	Individual face-to-face sessions, telephone calls, mail	MI, PNF, Referral	Assessment only

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Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			(RAPI), intervention participants were categorized into 4 risk categories: low (neither elevated), medium (one elevated), high (both elevated), and extreme (both elevated and RAPI problems >10). In a summary paragraph, each intervention participant was given individualized feedback about his/her level of risk and encouraged to seek assistance if desired. Participants in the high and extreme risk categories were also contacted by phone to offer assistance and encouragement to reduce their risks associated with alcohol use. If the student was interested, an additional follow-up interview was scheduled.			
Martens, 2010[199]	Young adults	IG1	Upon completion of the baseline questionnaire, participants were sent an email with a link and password to their personalized drinking feedback. Components of the intervention included: review of weekly drinking pattern; comparison of personal drinking to the norm for the typical college athlete; estimated BAC and risks associated with it for peak drinking over the past 30 days, typical weekend drinking, and drinking the last time one parted/socialized; stated motivations for drinking and a statement about understanding the importance of alcohol expectancies; general alcohol-related problems; calories per week from alcohol; financial costs of alcohol; use of protective behaviors; sport-specific alcohol-related problems; possible impact of alcohol use on athletic performance (e.g., going to practice with a hangover, having alcohol use affect performance in a game), including the relationship between binge/heavy episodic drinking and performance impairment; possible impact of alcohol use on athletic injury. Participants were then contacted at both 1 month and 6 months post intervention through an email that contained a link to follow-up questionnaires.	Web-based	PNF	Upon completion of the baseline questionnaire, participants were sent a link via email to a password-protected page that contained alcohol-related educational information. The information included: The general relationship between alcohol use and athletic performance (e.g., negative effects on sleep and hydration), the more specific relationship between binge/heavy episodic drinking and alcohol use, and the link between alcohol use and injury risk.
	Young adults	IG2	Upon completion of the baseline questionnaire, participants were sent an email with a link and password to their personalized drinking feedback. Components of the intervention included: review of weekly drinking pattern; comparison of personal drinking to the norm for the typical college student; estimated BAC and risks associated with it for peak drinking over the past 30 days, typical weekend drinking, and drinking the last time one partied/socialized; stated motivations for drinking and a statement about understanding the importance of alcohol expectancies; general alcohol-related problems; calories per week from alcohol; financial costs of alcohol; use of protective behaviors	Web-based	PNF	Upon completion of the baseline questionnaire, participants were sent a link via email to a password-protected page that contained alcohol-related educational information. The information included: The general relationship between alcohol use and athletic performance (e.g., negative effects on sleep and hydration), the more

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						specific relationship between binge/heavy episodic drinking and alcohol use, and the link between alcohol use and injury risk.
Mason, 2015[215]	Adolesc-ents	IG1	Participants received a 20-min Peer Network Counseling intervention guided by 5 key motivational interviewing (MI) clinical issues: rapport, acceptance, collaboration, reflections, and non-confrontation. Therapists used baseline data from participants' screening surveys to show graphic displays of substance use and peer network characteristics during the counseling session. The intervention followed Motivational Enhancement procedures with age-matched substance use normative data presented as feedback. The intervention was structured into four component parts each lasting for 5 minutes: (a) rapport building and laptop presentation of substance use feedback in simple graphic form, (b) discussion of substance use likes/dislikes and discrepancies, (c) introduction of peer network information and graphical feedback, and (d) summary, change talk, and plans. The rapport building and feedback component was used to establish a non-judgmental relationship and to present the participant with a graphical display of their substance use compared with national normative data. During the likes/dislikes discussion, participants' baseline responses are then reflected back to the teen, highlighting goals and values in order to have the participant identify and articulate discrepancies between current use and future goals and values. The peer network component began by introducing the concept of peer network and its influence on health using the laptop to illustrate the concept. The participants' peer network is reviewed for risks, protection, support, prosocial activities, and encouragement for healthful behavior as well as for substance use, influence/offers to use substance, and risky/dangerous activities. Participants were encouraged to reflect on their network and to consider making small modifications, such as adjusting the amount of time spent with particular peers as well as time spent at particular locations in order to support participants' willingness for peer network adjustment. The summary, change, talk and plans component summarized the session with appreciation of the client's honesty, and pays particular attention to underscoring discrepancies and reflecting on client-generated change talk. If the adolescent has articulated a change plan, this is reviewed, encouraged, and	Individual face-to-face sessions	ME, MI, PNF	Participants reviewed an informational handout with the therapist which covered several topics related to health behaviors such as exercise, nutrition/weight management, and life skills. These sessions lasted 20 minutes, matching the experimental condition in length.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			supported. If the teen has not made a specific change plan, the counselor encourages personal reflection on what was discussed.			
Moore, 2010[176] Healthy Living As You Age (HLAYA)	Older adults	IG1	Participants received a personalized feedback report and drinking diary, as well as a physician-delivered personalized feedback session guided by the report. The report outlined participants' alcohol-related risks identified by the CARET (quantity/frequency of drinking, episodic heavy drinking, driving after drinking, others' concern about drinking, medical/psychiatric conditions, symptoms that could be worsened by drinking, medications that could interact with or be diminished by alcohol.) and potential consequences (e.g., increased sedation and falls). The physician gave the participant oral and written advice (in prescription-style format on an alcohol and aging education booklet). Participants received up to three calls delivered by a health educator (HE) at 2, 4, and 8 weeks after baseline visit. During the first call, the HE reviewed and discussed risks associated with drinking, and used principles of motivational interview to facilitate behavioral change. The content of the booklet given to participants at baseline was discussed, providing opportunities to learn more about specific risks. Participants' drinking patterns, reasons for alcohol consumption, and details regarding any previous attempts to quit were assessed. At the end of the call, the HE asked about participants' intentions to reduce alcohol use, and encouraged them to develop a drinking agreement. If a drinking agreement was completed during the first (40 min) call, it was reviewed during the second and third (20 min) telephone calls. If no drinking agreement was completed, during the remaining calls, the HE reiterated the benefits of reducing alcohol use and discussed potential problems associated with initiating behavioral changes.	Individual face-to-face sessions, telephone calls	MI, PHF	Participants received a booklet outlining recommended behaviors for alcohol use, nutrition, exercise, medication use and smoking. Research assistants encouraged participants to read the booklet and discuss it with their PCPs.
Neighbors, 2004[200]	Young adults	IG1	Upon completion of the computerized baseline assessment, participants received a personalized feedback printout. The format of the feedback was modeled after the normative component of the BASICS interview. The feedback included a summary of the participant's perceived drinking norms compared with actual drinking norms and a summary of participants' reported consumption compared with average college drinking behavior. Additionally, participants' percentile ranking, comparing their drinking with other college students drinking, was provided. Actual norms were based on data collected on the same campus in the previous year from a large sample of randomly selected undergraduate students participating in the Motivating Campus Change (MC2) project. The feedback was designed to	Web-based	PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			communicate three things: (a) “This is how much you drink,” (b) “This is how much you think the typical student drinks,” and (c) “This is how much the typical student actually drinks.”			
Neighbors, 2010[201]	Young adults	IG1	Immediately following assessment, participants received gender-specific web-based personalized normative feedback (PNF) based on the participants' screening results. The intervention was developed on the basis of the normative feedback component of the Brief Alcohol Screening and Intervention for College Students (BASICS) intervention. Following the conceptualization of PNF as personalized information designed to correct overestimated normative perceptions, this intervention was extremely brief and contained only three required elements, which included information regarding (a) one's own drinking behavior, (b) one's perceptions of other same-sex students' drinking behavior on the participating campus, and (c) other same-sex students' self-reported drinking behavior in text and bar graph formats. Together, these three pieces of information explicitly illustrated that participants overestimated the prevalence of drinking among their same-sex peers and, for participants who reported heavy drinking, that most same-sex students drank less than the participant did. Bar graphs were provided for weekly frequency and number of drinks consumed per week. Each graph included three bars representing the campus norm (specific to participant's gender), the participants' reported perception of the campus norm, and the participants' reported behavior. Normative feedback about episodic heavy drinking was not provided. Participants given feedback regardless of whether they overestimated the campus norm. The structures of the bar graphs were individually tailored to the participants' data so that, for each graph, the scale on the y-axis was dependent on the maximum of these three values for each participant. Participants were also provided with their percentile rank comparing them with other students (e.g., “Your percentile rank is 96%, which suggests that you drink more than 96% of other college students [of the same gender]”). Participants were notified at each time-point that the information contained in the feedback came from a random sample of 2,548 freshmen students at their university. Participants received the same feedback after the completion of each followup survey (6, 12, 18 months).	Web-based	PNF	Participants received feedback from assessment results pertaining to non-alcohol related items (e.g., % of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).
	Young adults	IG2	Immediately following assessment, participants received web-based personalized normative feedback (PNF) based on the participants' screening results. The intervention was developed on the basis of the normative feedback component of the Brief Alcohol	Web-based	PNF	Participants received feedback from assessment results pertaining to non-alcohol related items (e.g.,

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			Screening and Intervention for College Students (BASICS) intervention. Following the conceptualization of PNF as personalized information designed to correct overestimated normative perceptions, this intervention was extremely brief and contained only three required elements, which included information regarding (a) one's own drinking behavior, (b) one's perceptions of other students' drinking behavior on the participating campus, and (c) other students' self-reported drinking behavior in text and bar graph formats. Together, these three pieces of information explicitly illustrated that participants overestimated the prevalence of drinking among their peers and, for participants who reported heavy drinking, that most students drank less than the participant did. Bar graphs were provided for weekly frequency and number of drinks consumed per week. Each graph included three bars representing the campus norm, the participants' reported perception of the campus norm, and the participants' reported behavior. Normative feedback about episodic heavy drinking was not provided. Participants given feedback regardless of whether they overestimated the campus norm. The structures of the bar graphs were individually tailored to the participants' data so that, for each graph, the scale on the y-axis was dependent on the maximum of these three values for each participant. Participants were also provided with their percentile rank comparing them with other students (e.g., "Your percentile rank is 96%, which suggests that you drink more than 96% of other college students"). Participants were notified at each time-point that the information contained in the feedback came from a random sample of 2,548 freshmen students at their university. Participants received the same feedback after the completion of each followup survey (6, 12, 18 months).			% of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).
	Young adults	IG3	Immediately following assessment, participants received gender-specific web-based personalized normative feedback (PNF) based on the participants' screening results. The intervention was developed on the basis of the normative feedback component of the Brief Alcohol Screening and Intervention for College Students (BASICS) intervention. Following the conceptualization of PNF as personalized information designed to correct overestimated normative perceptions, this intervention was extremely brief and contained only three required elements, which included information regarding (a) one's own drinking behavior, (b) one's perceptions of other same-sex students' drinking behavior on the participating campus, and (c) other same-sex students' self-reported drinking behavior in text and bar graph formats. Together, these three	Web-based	PNF	Participants received feedback from assessment results pertaining to non-alcohol related items (e.g., % of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			pieces of information explicitly illustrated that participants overestimated the prevalence of drinking among their same-sex peers and, for participants who reported heavy drinking, that most same-sex students drank less than the participant did. Bar graphs were provided for weekly frequency and number of drinks consumed per week. Each graph included three bars representing the campus norm (specific to participant's gender), the participants' reported perception of the campus norm, and the participants' reported behavior. Normative feedback about episodic heavy drinking was not provided. Participants given feedback regardless of whether they overestimated the campus norm. The structures of the bar graphs were individually tailored to the participants' data so that, for each graph, the scale on the y-axis was dependent on the maximum of these three values for each participant. Participants were also provided with their percentile rank comparing them with other students (e.g., "Your percentile rank is 96%, which suggests that you drink more than 96% of other college students [of the same gender]"). Participants were notified at each time-point that the information contained in the feedback came from a random sample of 2,548 freshmen students at their university. Participants received feedback from assessment results pertaining to non-alcohol related items (e.g., % of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).			
	Young adults	IG4	Immediately following assessment, participants received web-based personalized normative feedback (PNF) based on the participants' screening results. The intervention was developed on the basis of the normative feedback component of the Brief Alcohol Screening and Intervention for College Students (BASICS) intervention. Following the conceptualization of PNF as personalized information designed to correct overestimated normative perceptions, this intervention was extremely brief and contained only three required elements, which included information regarding (a) one's own drinking behavior, (b) one's perceptions of other students' drinking behavior on the participating campus, and (c) other students' self-reported drinking behavior in text and bar graph formats. Together, these three pieces of information explicitly illustrated that participants overestimated the prevalence of drinking among their peers and, for participants who reported heavy drinking, that most students drank less than the participant did. Bar graphs were provided for weekly frequency and number of drinks consumed per week. Each graph included three bars representing the campus norm, the participants' reported	Web-based	PNF	Participants received feedback from assessment results pertaining to non-alcohol related items (e.g., % of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			perception of the campus norm, and the participants' reported behavior. Normative feedback about episodic heavy drinking was not provided. Participants given feedback regardless of whether they overestimated the campus norm. The structures of the bar graphs were individually tailored to the participants' data so that, for each graph, the scale on the y-axis was dependent on the maximum of these three values for each participant. Participants were also provided with their percentile rank comparing them with other students (e.g., "Your percentile rank is 96%, which suggests that you drink more than 96% of other college students"). Participants were notified at each time-point that the information contained in the feedback came from a random sample of 2,548 freshmen students at their university. Participants received feedback from assessment results pertaining to non-alcohol related items (e.g., % of students reporting playing an instrument) after the completion of each followup survey (6, 12, 18 months).			
Neighbors, 2016[239]	Young adults	IG1	Upon completion of the computerized baseline survey, participants received personalized feedback. The intervention consisted of presenting feedback regarding: participant's own drinking behavior; the participant's perceptions of other students' drinking behavior at that university; students at that university's actual drinking behavior (displayed in both text and bar graphs). Each bar graph included bars for one's own drinking, perceptions of others' drinking, and others' actual drinking. Feedback was reported on 4 screens, the first displaying weekly drinking frequency, the second showing typical drinks consumed per occasion, the third consisting of the number of drinks consumed in a week, and the last screen presenting the participant's percentile rank based on their own reported number of drinks per week when compared with other same-sex students at their university. Source information for the data from each campus was provided at the bottom of the respective screens for each school, noting that the norms information came from a previous survey conducted on each campus and listed the sample size for the survey referenced. After reviewing their feedback, participants completed a post-intervention survey and were debriefed by RAs. Participants also received a copy of their feedback to take with them.	Web-based	PNF	Participants received information from a large survey at their university regarding how much time their fellow students spent doing various non-drinking related activities, such as exercising, texting, and playing video games. The attention-control feedback included both text and bar graphs for the non-drinking activities, and was similar to the feedback presented in the intervention conditions, with the exception that it did not include references to alcohol.
	Young adults	IG2	Upon completion of the computerized baseline survey, participants received personalized feedback, which included information regarding one's own drinking and actual rates of others' drinking displayed in both text and bar graphs. Feedback was reported on 4 screens, the first displaying weekly drinking frequency, the second	Web-based	PNF	Participants received information from a large survey at their university regarding how much time their fellow students spent

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			showing typical drinks consumed per occasion, the third consisting of the number of drinks consumed in a week, and the last screen presenting the participant's percentile rank based on their own reported number of drinks per week when compared with other same-sex students at their university. Source information for the data from each campus was provided at the bottom of the respective screens for each school, noting that the norms information came from a previous survey conducted on each campus and listed the sample size for the survey referenced. After reviewing their feedback, participants completed a postintervention survey and were debriefed by RAs. Participants also received a copy of their feedback to take with them.			doing various non-drinking related activities, such as exercising, texting, and playing video games. The attention-control feedback included both text and bar graphs for the non-drinking activities, and was similar to the feedback presented in the intervention conditions, with the exception that it did not include references to alcohol.
Ockene, 1999[165]	Adults	IG1	Following assessment, participants received a health booklet that included advice on general health issues and were told that at their next regularly scheduled appointment their providers would probably discuss one of the health issues that was asked about in their Lifestyle Interview. Providers received 2.5 hr of training in the patient-centered alcohol intervention program that elicited active patient involvement in behavior change through initially non-directive, open-ended questioning (e.g., "How do you feel about your drinking?"). Providers were taught to use patient educational materials (i.e., tip sheets) and a goal statement that enabled participants to identify problems interfering with alcohol behavior change and identified solutions that were realistic for their circumstances and past experiences. Providers were asked to carry out the brief 5-10 min patient-centered alcohol counseling intervention at the time of a regular visit with patients identified as high-risk drinkers. Counseling focused on the number of drinks per week, binge drinking, or both, depending on the participant's problem area(s). At the end of the intervention, providers were instructed to request that the patient set up a follow-up visit to review progress.	Individual face-to-face sessions	MI	Following assessment, participants received a health booklet that included advice on general health issues and were told to address any health questions with their providers. Providers were encouraged to identify and intervene with patients with alcohol-related issues to whatever extent they though appropriate. All providers were encouraged to attend the weekly conference series in which the approach to the patient with alcohol problems was presented biannually as part of a 2-year curriculum.
O'Connor, 2007[202]	Pregnant women	IG1	Participants received a comprehensive assessment of alcohol use, as well as a standardized workbook-driven brief intervention, designed specifically to help women reduce alcohol consumption during pregnancy. The workbook consisted of traditional brief intervention techniques, including education and feedback, cognitive behavioral procedures, goal setting, and contracting.	Individual face-to-face sessions	CBT	Participants received a comprehensive assessment of alcohol use and were instructed to stop drinking during pregnancy.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Ondersma, 2015[217]	Pregnant women	IG1	The intervention, completed on a tablet computer, sought to facilitate self-change and/or treatment-seeking through a 20-minute computer-based interactive session, using techniques such as: brief education regarding alcohol-related pregnancy risks; helping the participant evaluate the pros and cons of change and the extent to which the decision to avoid alcohol might align with deeply held values or goals; feedback regarding how many women drink during pregnancy and the potential cost savings if they should avoid/continue to avoid drinking; eliciting a specific, participant-selected goal regarding drinking during the rest of pregnancy, with requests for details and proactive problem-solving for those who chose to set a goal. Participants who chose to make a change goal were free to define it as abstinence, a reduction in use, maintenance of a previous reduction, or maintenance of abstinence. The intervention was highly interactive and tailored, particularly on participants' status with regard to change since becoming pregnant and goals for the remainder of their pregnancy. Participants were shown a series of brief videos that featured a physician providing gain-framed information about alcohol use in pregnancy and a mother providing a testimonial regarding her decision to avoid alcohol use during pregnancy. Multiple versions of each video were available and were tailored based on 3 participant characteristics: quit status, self-efficacy, and frequency of binge drinking. Additionally, 3 tailored mailings were sent at evenly spaced intervals that varied with the participant's expected due date. The first mailing was sent 1 month after enrollment in the study, and the next 2 were sent so that the second mailing was received in the middle of the remaining time left, and the third near the expected due date. All mailings were tailored based on participant age, gestational age, race, quit goal, level of social support for stopping alcohol use, frequency of binge drinking, and self-efficacy for quitting, all of which were collected via the ACASI software at baseline. Each participant's pattern of responses on tailoring variables was then entered into a form, which generated single-page flyers consisting of standard text, tailored text, and tailored images.	Web-based, mail	MI, PNF	The control condition provided a time-matched (20 minutes) and moderately interactive intervention focused on infant nutrition, with no mention of alcohol use during pregnancy. Although developed using the same intervention authoring tool as the experimental condition, the control specifically avoided engaging in actions such as expression of empathy or affirmations.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Ondersma, 2016[212]	Post-partum women	IG1	Upon completion of the computer-based assessment, participants were directed to the intervention software. The goal of the software was to facilitate reductions in alcohol use via a single 20-min intervention session following motivational interviewing principles, as well as the FRAMES brief intervention model with use of synchronous interactivity, user input and empathic reflection. A mobile three-dimensional cartoon character capable of over 50 specific animated actions did the 'talking' for the entire program. This character read each item for the participant, acted as narrator and guide throughout the process, and actively sought a non-judgmental, empathic and non-threatening demeanor using reflections and self-deprecating humor. The experience of working with the software was intended to be highly interactive, with immediate responses to most input, occasional summaries, branching based on participant characteristics, responses or preferences and empathic reflections. The overall intervention was broken down into components broadly focusing on: eliciting the participant's thoughts about change and their perceived advantages of doing so, if any; reviewing feedback regarding how the participant's alcohol use compares to that of others, and of possible benefits of changing; and optional goal-setting, including a menu of change options. The intervention allowed participant input (e.g. whether or not to see more information on a certain topic), and used different branches/approaches based on participant reports of current alcohol use as well as on participants' stated plans regarding drinking after leaving the hospital. Participants listened to the narrator via headphones to insure privacy. The intervention was not designed specifically around current active drinking.	Web-based	MI, PNF, FRAMES	Participants were asked a number of questions about their preferences in music and television, were shown brief video clips consistent with their preferences, and were asked to provide feedback regarding their opinion of the various video clips.
Osterman, 2014[221]	Pregnant women	IG1	Participants received one 30 min motivational interviewing session guided by Self-determination theory (SDT), which postulates that motivation to perform a behavior increases when three basic psychological needs are satisfied – the need for autonomy (developing discrepancy, rolling with resistance), the need for competence (supporting self-efficacy), and the need for relatedness (establishing empathy). In addressing the need for relatedness, the researcher discussed with the participant in a respectful caring manner, her goals for her pregnancy, as well as her beliefs and attitudes about prenatal alcohol use. Participants also received feedback regarding alcohol use obtained in the initial assessment, which the researcher provided in a non-judgmental way. In addressing the need for autonomy, the researcher engaged the participant in simple and complex reflections, open-ended	Individual face-to-face sessions	MI	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			questions, and summarizations to assist the participant in developing increased awareness of any incongruence between her goals for the pregnancy and her current drinking behaviors. If met with resistance due to the participant's ambivalence between current behaviors and changes needed to meet pregnancy goals, the researcher, with participant permission, provided neutral information and direction to assist the participant in development of strategies for behavior change. In addressing the need for competence, the researcher supported the participant with respect and acceptance of the participant as capable of making healthy decisions for herself.			
Reynolds, 1995[203]	Pregnant women	IG1	The intervention was developed using Social Cognitive Theory, which comprises components including goal setting, self-monitoring, perceived self-efficacy, negative outcome expectancies of drinking, positive outcome expectancies of cessation, and skills for cessation. The intervention included a 10 min educational session coupled with a nine-step self-help manual to be completed by participants at home in 9 days. During the education session, an educator described the effects of alcohol on the fetus and explained the use of the manual, which participants then completed the manual at home. Each step in the manual targeted a behavior or cognition that would enhance the likelihood of cessation. Exercises were included to stimulate thought about key ideas, to build alcohol cessation skills, and to provide practice related to those skills. The content of the steps in the manual included: (1) FAS information: increasing motivation to quit; (2) building self-efficacy to quit; (3) identifying the participant's drinking pattern using a diary; (4) removing alcohol and avoiding drinking locations; (5) finding a buddy and engaging in social support; (6) self-monitoring and self-reward for quitting; (7) resisting interpersonal and media pressure to drink; (8) coping with stress without drinking; and (9) maintaining abstinence. Participants were called one week after counseling session to assess their progress and answer questions about the self-help manual.	Individual face-to-face sessions	CBT	Participants received information on the effects of alcohol and pregnancy including brief discussions with clinic staff and a video tape on prenatal care.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Richmond, 1995[175]	Adults	IG1	Participants received Alcoholscreen, a physician-delivered structured behavioral change program. This consisted of five short consultations (introduction, patient education and three follow-up visits) designed to reduce drinking to limits recommended by the National Health and Medical Research Council (NHMRC) of 28 or fewer drinks per week for men and 14 or fewer for women. Alcoholscreen was adapted from the Smokescreen and DRAMS programs for GPs. At the first visit, the GP invited the participant to join the study, provided a self-help manual ("A Guide to Healthier Drinking") and recommended certain sections to be read during the following week. Participants were instructed to use day diary for monitoring alcohol consumption during the following week. At the second visit, lasting 15-20 min, a personalized approach to patient education regarding the harmful effects of excessive alcohol consumption was employed using a flip-over display unit. This consisted of 12 pictorial and text prompts to raise the participant's level of awareness of alcohol-related problems. Participant counseling included motivational interviewing techniques in which the "good things" about heavy drinking were weight against the "bad things", prompting the participant to make a personal decision to reduce drinking. Information was provided about recommended daily and weekly limits, problems associated with excessive drinking, identification of high-risk situations, instructions on coping with high-risk situations without heavy drinking, discussion of alternatives associated with a changed lifestyle, and other advice on relapse prevention. The participant's consumption level was compared with Australian drinking norms and the drinking pattern was analyzed using information recorded in the drinking diary. Participants had followup visits 1, 3, and 5 months later aimed at encouraging and supporting new drinking habits. Goals and drinking decisions were reviewed and reasons for lapses analyzed, and renewed motivation for cutting down was attempted when necessary. The first followup visit was a standard consultation (lasting 5-25 min), and the remaining two were short consultations lasting 5 min or less.	Individual face-to-face sessions	CBT, MI, PNF	Assessment only
	Adults	IG2	Participants received a 5 min physician-delivered brief advice session regarding reducing drinking to recommended levels, information on the health risks of continued heavy drinking, and a self-help manual ("A Guide to Healthier Drinking").	Individual face-to-face sessions	General counseling	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Rose, 2017[245]	Adults	IG1	The intervention group received a pre-programmed single session brief intervention delivered by Interactive Voice Response (IVR-BI) prior to their healthcare visit. The IVR-BI content is based on the four steps of NIAAA's clinical recommendations for helping patients with unhealthy drinking: (a) Ask, (b) Assess, (c) Advise and Assist and (d) Followup Support. 'Ask' is accomplished with the SASQ from the pre-visit behavioral health screen. The 'Assess' step consists of a short screen for AUD: (a) use in hazardous situations and (b) drinking larger amounts or for a longer period of time than intended, plus a question about prior withdrawal experiences. Positive responses to any of the three questions trigger a recommendation to seek an evaluation by a doctor or alcohol specialist. The recommendation is followed by a statement that doctors typically prescribe abstinence for people with these symptoms and that patients should discuss any quit attempt with a doctor to avoid dangerous withdrawal. The 'Advise and Assist' step begins with a readiness to change assessment and then branches accordingly. The Not Ready branch offers three 'Readiness Suggestions' before terminating the call. The Ready branch leads to a choice to hear guidance on cutting down and/or quitting. Advice for Cutting Down includes goal-setting, planning for urges and high-risk situations, proactive avoidance of triggers, self-monitoring and other strategies. The Advice to Abstain section describes treatment and mutual help models commonly used to achieve abstinence and includes information on local support and treatment resources. The last step of the IVR-BI is 'Follow-up Support,' in which participants are	Telephone calls	SC, TTM	Assessment only
Rubio, 2010[184]	Adults	IG1	Participants were provided with a booklet on general health issues and were scheduled to receive 2 10-15 min physician-delivered counseling sessions 4 weeks apart. Each session was offered within the context of routine patient care by a physician using a scripted workbook. The intervention workbook included a review of alcohol-related health effects, a pie chart displaying the frequency of different types of at-risk drinkers, a list of methods for cutting down drinking, a treatment contract, and cognitive behavioral exercises. An office nurse contacted the participants 2 and 8 weeks after the initial counseling sessions to reinforce face-to-face sessions.	Individual face-to-face sessions	CBT, General counseling	Participants were provided with a booklet on general health issues and were instructed to address any health concerns in their usual manner.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
Rubio, 2014[184]	Pregnant women	IG1	Participants in the intervention group were asked to attend 5 sessions that used motivational interviewing and FRAMES strategies. The intervention sessions focused on alcohol use, provided specific feedback based on use and alcohol risks to the fetus, and included a plan for changes in behavior. The sessions took place at enrollment, 4 and 8 weeks later, at 32 weeks of gestation, and at 6 weeks postpartum during participants' regular scheduled clinic visits with their obstetrical providers. For the 6-week postpartum visit only, the intervention was conducted by telephone if the participant missed the clinic visit. This intervention session focused on safe drinking behaviors. Otherwise, make-up intervention sessions were not scheduled if the participant missed the prenatal clinic visit or the intervention could not be done for another reason. The prenatal sessions lasted 10–15 minutes, and the postpartum session lasted 10–30 minutes. The main goals were to motivate the women to abstain from alcohol while pregnant, encourage alcohol-dependent women to accept referral to a specialized treatment program, reinforce safe prenatal alcohol use in women who had already eliminated alcohol, and encourage safe drinking behaviors after delivery to protect future pregnancies and to improve overall health. The sessions were motivational, face-to-face, and led by a registered nurse or a lay counselor.	Individual face-to-face sessions, telephone calls	ME, MI, Referral, FRAMES	Participants received the standard warning on alcohol use that are administered by the prenatal clinic staff, but did not receive any other intervention.
Saitz, 2003[169]	Adults	IG1	Physicians reviewed a sheet of paper that included the participant's screening results, a preliminary assessment, and specific recommendations prior to participant's appointment. The screening results include responses to CAGE questions, reports of usual weekly and per occasion maximum drinking amounts, and the patient's report of readiness to change on a 10-pt scale. For participants reporting hazardous drinking amounts but no affirmative CAGE questionnaire responses, the assessment was “drinking hazardous amounts” and the recommendation was “consider advising safe drinking limits” and “consider providing patients with” a pamphlet provided by the study titled “How to Cut Down on Your Drinking”. For participants reporting any affirmative CAGE responses but no hazardous drinking amounts, the assessment was “possible alcohol problems” and recommendations were “consider advising abstinence,” provide the pamphlet, and “referral to addiction treatment.” For participants reporting affirmative CAGE questionnaire responses and hazardous drinking amounts, the assessment was both “possible alcohol problems” and “drinking hazardous amounts” and recommendations were “consider advising abstinence” and “referral to addiction treatment.” The other side of the paper	Individual face-to-face sessions	General counseling	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			provided the predictive value of CAGE based on the prevalence of alcohol abuse or dependence in the practice, definitions of hazardous drinking, an approach for participants who were not ready to change, a list of abuse or dependence symptoms, and referral information. To increase counseling rates (not for data collection), we attached a Post-it note to the encounter form asking physicians to indicate whether alcohol was discussed and, if not, why.			
Schaus, 2009[170]	Young adults	IG1	Participants received two 20 min brief motivational intervention (BMI) sessions, two weeks apart, administered by four trained providers (two physicians, one physician's assistant, and one nurse practitioner) within the university health services. The intervention combined patient-centered motivational interviewing (MI) techniques and cognitive-behavioral skills training based on NIAAA curriculum "Clinical Protocols to Reduce High Risk Drinking in College Students" and the Brief Alcohol Screening and Intervention for College Students (BASICS). The MI framework included clinician empathizing, reflecting, reframing negative talk into change talk, rolling with resistance, avoiding argumentation, developing discrepancy between negative or ambivalent feelings toward alcohol, supporting self-efficacy through contemplation of past success, and acknowledging reluctance to change. A "participant feedback" document was compiled by research staff based on each participant's responses to the Healthy Lifestyle Questionnaire and TLFB, and this document was used by the providers as the source of individual normative feedback information. The participant feedback document summarized the participant's Healthy Lifestyle Questionnaire responses regarding overall healthy lifestyle behaviors (nutrition, exercise, mental health, safety, tobacco, drugs, sleep); alcohol-related harms, especially drinking and driving; alcohol expectancies; tolerance; use of protective behaviors, including choosing not to drink, counting drinks and setting limits, eating before drinking, selecting a designated driver, and avoiding drinking games and distilled spirits; and readiness-to-change. The participant feedback document also summarized the TLFB data on quantity and frequency of alcohol consumption, including number of drinking days, average and peak number of drinks per drinking day, typical and peak BAC with instructions on estimation of BAC using a BAC card, and norms clarification by comparing personal alcohol consumption with peer alcohol consumption. The focus of the first BMI session was to establish rapport between the participant and the provider. By initially focusing on the participant's expressed	Individual face-to-face sessions	CBT, MI, PNF	Participants were assigned to university health services providers who received no training in the BMI protocol and were provided an alcohol-prevention educational brochure, "Drinking: What's Normal, What's Not".

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			healthy lifestyle concern, the provider was able to gain the interest and trust of the participant, allowing for a facilitated introduction of the alcohol discussion and the start of cognitive-behavioral skills training. The second session maintained the participant-centered focus of MI and stressed the alcohol skills training components of the BASICS program. At completion of the second BMI session, participants received the participant feedback document for future reference. In addition to the BMI, participants were provided an alcohol-prevention educational brochure, “Drinking: What’s Normal, What’s Not”.			
Schulz, 2013[228]	Adults	IG1	The intervention program, called "Alcohol-Everything within the Limits?!, is a web-based 3-session tailored program targeting adult problem drinking. The theoretical framework was the I-Change model, which combines different models and integrates them in premotivational, motivational, and postmotivational phases. Participants received personalized advice immediately following assessment, which consisted of 5 parts, each focusing on a different psychosocial construct (i.e., knowledge, awareness, attitude, social influence, self-efficacy, and action-planning). The first part of the program served as a starting point of the drinking behavior change process (premotivational phase) by addressing the concepts of knowledge and awareness, providing participants with information about German alcohol guidelines (not drinking more than 1 [women] or 2 [men] standard drinks per day and having at least 2 alcohol-free days a week), and assessed whether respondents were meeting this guideline by using comparative/normative feedback. In addition, participants' scores were depicted graphically using a traffic light symbol (indicating whether they met, almost met, or did not meet the guidelines). To increase participants' knowledge, the relationship between alcohol and various diseases was explained, and information tailored to the respondent's health status was given about alcohol and pregnancy, and about the possible influence of participants' drinking behavior on their children (if applicable). The second part of the program offered personalized feedback concerning the perceived pros and cons of alcohol drinking as perceived by the respondent, with the goal of creating a positive attitude toward not drinking more >2/1 [M/F] drinks per day. The first part explained the importance of social influence in a tailored message by focusing on the respondent's partner, family friends, and colleagues. In the fourth part, preparatory action plans were defined to prepare the intended behavior change. The final part focused on self-efficacy and coping plans by identifying difficult situations and suggesting ways to cope	Web-based	PNF	After completing the 3rd measurement, respondents were given the link to the intervention website where they could receive personalized advice.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			with them. Personalized tips were given on how to deal with the perceived difficult situations to overcome potential barriers (postmotivational phase), and the situations and plans were summarized for individual respondents to help them remember the tips. During the feedback moment after 3 and 6 months, participants again received personalized advice based on their previous scores for the psychosocial constructs. Additionally, ipsative feedback was given about the participants' alcohol intake by comparing the drinking score at the current visit with that at the last visit or visits. Feedback was given about potential change and all scores were illustrated in a graph to enable the respondent to monitor the total change process at a glance. At all 3 feedback moments (at baseline, after 3 months, and after 6 months), participants received questions and personal advice alternately.			
	Adults	IG2	The intervention program, called "Alcohol-Everything within the Limits?!, is a web-based 3-session tailored program targeting adult problem drinking. The theoretical framework was the I-Change model, which combines different models and integrates them in premotivational, motivational, and postmotivational phases. Participants received personalized advice immediately following assessment, which consisted of 5 parts, each focusing on a different psychosocial construct (i.e., knowledge, awareness, attitude, social influence, self-efficacy, and action-planning). The first part of the program served as a starting point of the drinking behavior change process (premotivational phase) by addressing the concepts of knowledge and awareness, providing participants with information about German alcohol guidelines (not drinking more than 1 [women] or 2 [men] standard drinks per day and having at least 2 alcohol-free days a week), and assessed whether respondents were meeting this guideline by using comparative/normative feedback. In addition, participants' scores were depicted graphically using a traffic light symbol (indicating whether they met, almost met, or did not meet the guidelines). To increase participants' knowledge, the relationship between alcohol and various diseases was explained, and information tailored to the respondent's health status was given about alcohol and pregnancy, and about the possible influence of participants' drinking behavior on their children (if applicable). The second part of the program offered personalized feedback concerning the perceived pros and cons of alcohol drinking as perceived by the respondent, with the goal of creating a positive attitude toward not drinking more >2/1 [M/F] drinks per day. The first part explained the importance of social influence in a tailored message by focusing on the	Web-based	PNF	After completing the 3rd measurement, respondents were given the link to the intervention website where they could receive personalized advice.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			respondent's partner, family friends, and colleagues. In the fourth part, preparatory action plans were defined to prepare the intended behavior change. The final part focused on self-efficacy and coping plans by identifying difficult situations and suggesting ways to cope with them. Personalized tips were given on how to deal with the perceived difficult situations to overcome potential barriers (postmotivational phase), and the situations and plans were summarized for individual respondents to help them remember the tips. Additionally, ipsative feedback was given about the participants' alcohol intake by comparing the drinking score at the current visit with that at the last visit or visits. Feedback was given about potential change and all scores were illustrated in a graph to enable the respondent to monitor the total change process at a glance. At all 3 feedback moments (at baseline, after 3 months, and after 6 months), participants were given all personal advice at once after having answered all the questions.			
Scott, 1990[171]	Adults	IG1	Participants were asked at the end of their assessment interview to make an appointment with their own PCP. At the appointment, PCP delivered 10 min of advice consisting of feedback from the assessment interview and results of blood tests, information on the risks of excessive drinking, information on the benefits of drinking less, information on how the patient's weekly alcohol consumption compared with that of the general population using a histogram, and advice to reduce alcohol consumption to below 210/140 g [M/F] per week. Advice was supplemented with a self-help booklet (the "Cut Down on Drinking" booklet) designed for the study. PCPs received one 15 min training session as a group and one individual session in which they received results of the assessment interview and a written summary of the intervention strategy for each patient.	Individual face-to-face sessions	PNF	Assessment only
Senft, 1997[172]	Adults	IG1	Participants received a 30-second scripted message from a primary care clinician (PCP, nurse practitioner, or physician assistant) in which the clinician thanked participants for completing the AUDIT questionnaire, stated their concerns about their drinking, recommended they cut down on their drinking, and encouraged them to meet briefly with a health counselor following their visit. Participants who agreed to meet with a health counselor received a 15 min counseling session that contained elements of motivational interviewing and included: (1) Gathering additional information about the quantity and frequency of the subject's alcohol use and giving feedback by comparison to national norms; (2) Explaining the acute and chronic effects of alcohol use and teaching the patient ways to estimate blood alcohol level; (3) Recommending no	Individual face-to-face sessions	MI, PNF	Assessment only

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			more than three drinks daily for men, no more than two drinks daily for women, and no alcohol on at least two days per week. Abstinence was mentioned as the only sure method of eliminating health risks from alcohol and "zero" alcohol was recommended for driving; (4) Suggesting some options to help achieve lower-risk drinking. If the patient was receptive, a low-risk drinking plan was created; (5) Building the patient's confidence that he or she could succeed. All intervention group patients, whether or not they agreed to the counseling session, were offered a packet of printed materials.			
Turrisi, 2009[205]	Young adults	IG1	Participants met one-on-one with a trained peer-facilitator for a 45-60-minute personalized feedback session. Facilitators were trained undergraduate (n = 18) or entry-level graduate students (n = 3) who had recently participated or were currently participating in competitive athletics. Facilitators were instructed to wear casual athletic clothing and to use inclusive language (i.e., use of words such as “we” and “us”) when referring to alcohol’s role in athletic performance, injury recovery, and the like, but they did not otherwise emphasize their athletic participation unless asked by participants. The facilitator oriented the participant to a computer-generated personalized feedback sheet. Sections covered topics that included the participant’s drinking pattern, perceived and actual descriptive norms for drinking, drinking consequences, alcohol caloric consumption (based on reported typical drinking) and hours of exercise required to burn those calories, and protective behavioral strategies the participant had already used. Participants received a copy of the personalized feedback, a personalized wallet-sized BAC card, a tips sheet (including general Brief Alcohol Screening and Intervention for College Students (BASICS) information and tips as well as information specific to alcohol and athletic performance), and a resource list of addiction services in the area. Participants who were randomized to, but did not attend, the BASICS session were mailed their session materials. Feedback included norms for the percentage of students who did not drink at all, and BASICS skills tips included support for both non-drinking and moderate-drinking goals. Additionally, the participants’ parents were mailed a handbook during the transition period between their teens’ high school graduation and first year. The 35-page handbook included an overview of college student drinking, strategies and techniques for communicating effectively with teens, tips on discussing ways to help teens develop assertiveness and resist peer pressure, and in-depth information on teen drinking and how alcohol affects the body. To ensure that	Individual face-to-face sessions, mail	ME, MI, PNF, Parent involvement	Participants were mailed the BASICS intervention, and parent intervention was offered at followup.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			parents read the materials, they were asked to evaluate the handbook by filling out a brief questionnaire, as well as making notes directly on the handbook itself, and then returning both. The questionnaire asked parents to make ratings of how interesting, readable, useful, and effective the material was in each section (0 = not at all, 1 = slightly, 2 = moderately, 3 = quite, and 4 = extremely) and whether they had discussed the materials with their teens.			
	Young adults	IG2	Participants met one-on-one with a trained peer-facilitator. Facilitators were trained undergraduate (n = 18) or entry-level graduate students (n = 3) who had recently participated or were currently participating in competitive athletics. Facilitators were instructed to wear casual athletic clothing and to use inclusive language (i.e., use of words such as "we" and "us") when referring to alcohol's role in athletic performance, injury recovery, and the like, but they did not otherwise emphasize their athletic participation unless asked by participants. The facilitator oriented the participant to a computer-generated personalized feedback sheet. Sections covered topics that included the participant's drinking pattern, perceived and actual descriptive norms for drinking, drinking consequences, alcohol caloric consumption (based on reported typical drinking) and hours of exercise required to burn those calories, and protective behavioral strategies the participant had already used. Participants received a copy of the personalized feedback, a personalized wallet-sized BAC card, a tips sheet (including general BASICS information and tips as well as information specific to alcohol and athletic performance), and a resource list of addiction services in the area. Participants who were randomized to, but did not attend, the BASICS session were mailed their session materials. Feedback included norms for the percentage of students who did not drink at all, and BASICS skills tips included support for both non-drinking and moderate-drinking goals.	Individual face-to-face sessions	ME, MI, PNF	Participants were mailed the BASICS intervention, and parent intervention was offered at followup.
	Young adults	IG3	Parents were mailed a handbook during the transition period between their teens' high school graduation and first year. The 35-page handbook included an overview of college student drinking, strategies and techniques for communicating effectively with teens, tips on discussing ways to help teens develop assertiveness and resist peer pressure, and in-depth information on teen drinking and how alcohol affects the body. To ensure that parents read the materials, they were asked to evaluate the handbook by filling out a brief questionnaire, as well as making notes directly on the handbook itself, and then returning both. The questionnaire asked	Mail	Parent involvement	Participants were mailed the BASICS intervention, and parent intervention was offered at followup.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			parents to make ratings of how interesting, readable, useful, and effective the material was in each section (0 = not at all, 1 = slightly, 2 = moderately, 3 = quite, and 4 = extremely) and whether they had discussed the materials with their teens.			
Tzilos, 2011[235]	Pregnant women	IG1	Participants received one 15- to 20-min computer-delivered intervention. Participants listened to the narrator by using headphones; all questions were read out loud by the narrator, and response options could be read if tapped by the participant. The automated software also allowed participants the option to go back and revisit questions as needed. The intervention was specifically tailored to pregnant women; the motivational intervention itself included a brief educational component that delivered current information about FASD. All images and examples in the software were specifically tailored to pregnant women. The software also tailored content based on the current drinking status of each participant. For women who reported they had already quit, the narrator presented a section that focused on relapse prevention (''My plan to remain abstinent'') while asking the participant to provide the reasons/benefits to them of having made this change. The remaining participants were asked about their current interest in quitting (Are you willing/ready to quit?), leading to a bifurcated treatment response such that those participants reporting a goal of immediate abstinence moved more quickly to a section consistent with phase 2 of MI (primarily goal setting), whereas those who did not wish to quit received elements consistent with phase 1 of MI (e.g., pros and cons, normed feedback).	Web-based	MI, PNF	Participants randomly assigned to the control group were administered a series of questions about television show preferences and viewed a brief series of videos of popular entertainers/shows, with subsequent requests for ratings of subjective preference.
Upshur, 2015[218] Project RENEWAL	Adults	IG1	The intervention consisted of: 1) providing evidence-based training and supports to the medical leadership and randomized intervention PCPs; 2) modifying the electronic medical record (EMR) to provide alcohol screening results and alcohol-specific notes for PCP and Care Manager (CM) visits; and 3) training a CM specifically designated to provide intervention participants with alcohol education materials, ongoing self-management support, linkage to formal addiction treatment services and self-help groups, and wellness counseling and goal setting. The PCP training included 8 hours in 5 didactic sessions on the chronic care model, using the modified EMR module for documenting problem alcohol use and intervention strategies (e.g. brief motivational intervention, education materials, drinking reduction goal setting, wellness goals, referrals to formal substance abuse services, referrals to the clinic's mental health services), interpreting the screening measure, completing a brief alcohol intervention as described in the NIAAA	Individual face-to-face sessions, telephone calls	General counseling, MI	Usual care patients did not receive referrals to, or outreach from, the study-trained CM and their PCPs were not provided any alcohol intervention training or patient materials. They delivered usual care for medical conditions, including any behavioral health or drug or alcohol use problems. All usual care participants had unrestricted access and use of all primary care and specialty care offered by

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			Clinician's Guide, review of pharmacological treatments for alcohol addiction, motivational interviewing training, and working with the CM. A 15-page "Intervention Provider Manual" synthesized the recommended treatment steps for the PCPs and was provided to each. Two sessions were held prior to the study starting and 3 additional booster and review sessions were provided over the subsequent year. Intensive CM training (20 hours) was provided based on a study-developed CM treatment manual. The training included: information on the CM role for the study; collaborating with the PCPs; using the documentation templates in the EMR; assessing baseline history and services needs; motivational interviewing techniques; delivering trauma-informed care; the patient follow-up schedule; a structured format for each follow-up visit; patient education materials on safe alcohol consumption for women, problem alcohol use consequences for women, self-management goal setting; and up-to-date lists of local addiction services and AA groups that patients could be referred to. Intervention patients received the guideline-based PCP brief intervention for problem alcohol use and referral to the CM for ongoing follow-up visits for 6 months. It was expected that PCPs would provide 4–6 appointments after the brief intervention session, to encourage patient commitment to reducing or maintaining safe alcohol consumption, to encourage use of addiction medication when appropriate, and to follow-through with substance use treatments of the subject's choice during the 6-month study follow-up. The CM was asked to complete at least 15 phone or in-person follow-up sessions in 6 months.			the clinic, including mental health services (counseling and psychiatry); dental and vision services; laboratory and radiology; pharmacy; ob/gyn; medical respite care; hospital admissions; and general case management for benefits, employment, housing, transportation, and legal issues.
van der Wulp, 2014[222]	Pregnant women	IG1	The health-counseling intervention consisted of 7 steps addressed in 3 feedback sessions. The intervention was based on the I-Change model, which distinguishes 3 phases of health behavior change (awareness, motivation, and action). Feedback Session 1, approximately 2 weeks after baseline assessment, consisted of 5 steps taking approximately 10 minutes of the initial consultation. In step 1, the midwife assessed the amount and frequency of alcohol use of the participant before and during pregnancy, of her partner during pregnancy, and the participant's motivation to stop drinking alcohol. In step 2, participants strongly motivated to stop alcohol consumption during pregnancy were prompted to state the advantages of abstinence. Moderately or not motivated participants were asked to report on their perceived disadvantages of drinking during pregnancy. The midwife then advised them to stop drinking alcohol. In step 3, the barriers for successful abstinence and the mobilization of social support were discussed. In step 4, a self-help	Individual face-to-face sessions	TTM	Midwives recommended complete alcohol abstinence to participants who were using alcohol in the initial consultation.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			guide, adapted from an intervention on smoking in pregnancy, and relevant websites were mentioned. The midwife stimulated the participant to develop action plans for abstinence and coping with problems they might encounter when trying not to drink alcohol. If appropriate, access to alcohol addiction services was discussed. In step 5, participants were asked to set a date for stopping their alcohol use. Feedback session 2, approximately 8 weeks after baseline, consisted of step 6, which was addressed in approximately 1 minute. In this step, midwives again assessed the alcohol use of the participant and asked her if she needed additional support for not drinking alcohol. Feedback session 3, approximately 14 weeks after baseline, consisted of step 7, which was also addressed in approximately 1 minute. In this step, midwives discussed alcohol use and its implications for breastfeeding.			
	Pregnant women	IG2	Participants received usual care from their midwife (recommended complete alcohol abstinence) and computer-tailored feedback via the Internet, which was iterative and item based. The intervention was based on the I-Change model. The intervention consisted of 7 steps addressed in 3 feedback sessions. The intervention was based on the I-Change model, which distinguishes 3 phases of health behavior change (awareness, motivation, and action). distinguishes 3 phases of health behavior change (awareness, motivation, and action). Feedback 1, given immediately after baseline consisted of 4-5 pages. This feedback was tailored to several participant characteristics assessed in the baseline questionnaire (alcohol use, knowledge, risk perception, attitude, social influence, self-efficacy, intention, and action and coping plans. The first feedback letter contained the recommendation of complete alcohol abstinence during pregnancy and information on the possible consequences of prenatal alcohol use and the associated risk factors. In addition, participants received feedback on their risk perception of prenatal alcohol use; perceived social influence (not) to drink during pregnancy; self-efficacy to refrain from prenatal alcohol use in specific situations, including suggestions on how to cope with these situations; the extent to which participants were planning to undertake specific actions to abstain from prenatal alcohol use; and how to cope with certain difficult situations, including the formulation of personal plans in the shape of if-then statements. The second feedback letter, 6 weeks after baseline, included personalized information on the participants' choice of characteristics assessed with the baseline questionnaire (e.g., risk perception or attitude). Depending on the	Web-based	PHF, TTM	Midwives recommended complete alcohol abstinence to participants who were using alcohol in the initial consultation.

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			number of characteristics chosen by the participant, this feedback consisted of 1 or 2 pages. The third feedback letter, given immediately after T1, consisted of 3 to 4 pages of ipsative feedback tailored to changes in the respondent characteristics assessed at T1 in comparison to the baseline questionnaire. Feedback letters were visible on the computer screen and also sent to the respondent by email.			
Voogt, 2014[226] What Do You Drink (WDYD)	Young adults	IG1	After completing online screening test, participants were presented with personalized feedback (PF) tailored to their sex, alcohol intake, and perceived social norms. The PF provided advice about (1) drinking according to the guidelines of the Dutch National Health Council, recommending against drinking >2/1 [M/F] drinks per day; (2) the drinks participants consumed in the past year, with estimates of the number of calories consumed, the amount of weight added because of drinking, and the amount of money spent on drinking; and (3) a bar chart comparing the number of drinks per week that participants' same-sex peers actually consumed. After receiving PF, participants were offered access to the second part of the intervention via a registration and sign-up procedure. The second part of WDYD focused on the action phase of the behavior change process with a general goal of reducing heavy drinking. Participants were prompted to make decisions about the maximum number of drinks they wanted to consume on every day of the week at a given point in time, preferably within the limits of low-risk drinking. WDYD also focused on strengthening participants' drinking refusal self-efficacy by providing tips to resist alcohol in different drinking situations. Participants were asked to choose three out of the twelve provided drinking situations and were then asked to give a rationale why they found it hard to resist alcohol in the three chosen situations. Tips were offered for each of the chosen drinking situations to help participants cope with those situations in order to succeed and maintain drinking goals.	Web-based	MI, PNF	Assessment only
Wallace, 1988[174]	Adults	IG1	After assessment interview with GP, participants were shown a histogram based on figures from a national survey of drinking habits to illustrate how their weekly consumption compared with that of the general population. Participants received advice about the potential harmful effects of their current level of alcohol consumption, as well as the information booklet "That's the Limit." Participants were advised not to drink more than 18/9 [M/F] units per week. Where there was evidence of dependence on alcohol, GPs were encouraged to advise abstinence. Participants were given a drinking diary, the front cover of which was a facsimile of	Individual face-to-face sessions	PNF, PHF	Participants were given brief general health advice and booklet on heart disease. They received no advice from their GP about drinking except at their own request or if there was evidence that their alcohol consumption had already resulted in substantially

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			an EC1O prescription with the words "Cut Down on your Drinking!" The last page contained a guide to the alcohol content (in units) of a range of drinks. Participants were offered an initial followup appointment one month later and subsequent appointments at 4, 7, and 10 months were at the discretion of the GP. During the followup sessions, the participant's drinking diary was reviewed and feedback given on the results of blood test indicating evidence of damage due to alcohol.			impaired liver function (GGT >150 IU/l).
Watkins, 2017[246]	Adults	IG1	The intervention included a population-based management approach, measurement-based care, and integration of addiction expertise through a RAND-based clinical psychologist affiliated with the Motivational Interviewing Network of Trainers. Along with therapy, participants had the option to use medication-assisted treatment (MAT) with sublingual buprenorphine/naloxone for opioid use or long-acting injectable naltrexone for alcohol use disorders. Care coordinators met with participants and encouraged them to meet with a therapist for evaluation and treatment planning. All participants were entered into a registry that tracked treatment progress and prompted care coordinators to reach out to patients with missed visits. Care coordinators conducted regular assessments of substance use; results were entered into the registry and reviewed during team meetings.	Individual face-to-face sessions	CBT, MI, MAT	Participants were told by the research team that the clinic provided OAUD treatment and given a number for appointment scheduling and list of community referrals. They did not receive any additional outreach or contact.
Watson, 2013[230]	Older adults	IG1	The intervention consisted of three consecutive steps in which progression between steps was dependent upon the outcome of each previous step. Step 1 consisted of a 20-minute session of behavioral change counselling delivered by the practice/research nurse. This intervention utilized the technique of motivational interviewing and aimed to address the participant's motivation to change his/her drinking behavior. The counseling was protocol guided and the practice/research nurses were trained in the delivery. Four weeks after randomization, the participant was contacted by the nurse and a short telephone assessment was made regarding the participant's alcohol consumption in the previous 4 weeks using the AUDIT–C. If the participant was still consuming alcohol at hazardous levels, a referral was made to Step 2. Step 2 involved motivational interview therapy (MET) intervention by a trained therapist in the primary care environment. MET was provided through three 40-minute sessions on, preferably, a weekly basis if possible. The intervention was protocol guided and addressed six basic principles of increasing motivation for change. Feedback about individual alcohol consumption included: emphasis on the individual as being the agent	Individual face-to-face sessions	ME, PNF, Referral, SC	Minimal intervention consisted of a 5-minute brief advice intervention with the practice or research nurse involving feedback of the results of the screening and discussion regarding the health consequences of continued hazardous alcohol consumption. The participant also received a brief self-help booklet "Safer Drinking - a self help guide," outlining the consequences of excessive alcohol consumption and providing information on sources of help for drinking

Appendix I Table 23. Intervention Details of All Trials (KQ4)

Author, year Study name	Target pop	Int arm	IG detailed description	Delivery	Therapeutic approach	CG description
			responsible to change, advice on how to accomplish change, provision of alternative vehicles for change, maintenance of an empathetic therapeutic style and emphasis on enhancing the individual's self-efficacy. Four weeks after the final MET session, the nurse contacted the participant and a short telephone assessment was made regarding the participant's alcohol consumption in the previous 4 weeks using the extended AUDIT-C. If the participant was still consuming alcohol at hazardous levels, a referral was made to Step 3. Step 3 consisted of a referral to the local specialist alcohol services to receive specialist intervention, including, as necessary: detoxification, inpatient care, outpatient counselling, group therapy, relapse prevention treatment or medication. There was no limit on the intensity or duration of Step 3.			problems locally and nationally.
Wilson, 2014[224]	Adults	IG1	Participants received a 5-min structured advice session on their baseline alcohol consumption, tailored to their physical comorbidity. The brief advice consisted of personalized, structured feedback to participants about their level of alcohol-related risk or harm, a visual normative comparison of their drinking behavior in relation to population norms, health benefits associated with reducing alcohol consumption from their current levels, and practical suggestions on how to reduce drinking levels.	Individual face-to-face sessions	PNF	Participants received an advice leaflet produced by the British Heart Foundation (hypertension trial).

Abbreviations: AHW = alcohol health worker; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test – Consumption; BA = brief advice; BAC = blood alcohol content; BAL = blood alcohol level; BASICS = Brief Alcohol Screening and Intervention for College; BCC = behavior change counseling; BL = baseline; BMI = brief motivational intervention; CAGE = Cut down, Annoyed, Guilty, Eye-opener; CARET = Comorbidity Alcohol Risk Evaluation Tool; CBT = cognitive behavioral therapy; CG = control group; CM = care manager; DRAMS = drinking reasonable and moderately with self-control; EMR = electronic medical record; FAS = fetal alcohol syndrome; FASD = fetal alcohol spectrum disorders; FRAMES = Feedback, Responsibility, Advice, Menu, Empathy, Self-efficacy; GGT = glutamyl transpeptidase; GOAL = Guiding Older Adult Lifestyles; GP = general practitioner; HE = health educator; HLAYA = Healthy Living As You Age; IG = intervention group; Int = intervention; IU/l = international unit/liter; M/F = males/females; MAT = medication-assisted therapy; MC2 = Motivating Campus Change; ME = motivational enhancement; MET = motivational enhancement therapy; MI = motivational interview; MRC = Medical Research Council; NHMRC = National Health and Medical Research Council; NIAAA = National Institute on Alcohol Abuse and Alcoholism; ob/gyn = obstetrics and gynecology; PBA = personalized brief advice; PCP = primary care physician; PF = personalized feedback; PFI = personalized feedback intervention; PHF = personalized health feedback; PNF = personalized normative feedback; RA = research assistant; RAPI = Rutgers Alcohol Problem Index; RENEWAL = Research and Evaluation on NEW ALcohol Treatment Interventions for Homeless Women; RSOD = risky sexual occasion drinking; SC = stepped care; SDT = self-determination theory; SHEAR = Sexual Health and Excessive Alcohol: Randomized trial; SIPS = Screening and Intervention Programme for Sensible drinking; SMS = short message service; TCM = telephone care management; THRIVE = Tertiary Health Research Intervention via Email; T1 = time point 1; TLFB = timeline Followback; TTM = Transtheoretical Model; UK = United Kingdom; US = United States; WDYD = What Do You Drink; WEEP-F = Worry Evidence Educate Plan Followup; WHO = World Health Organization

Appendix I Table 24. Dichotomous Outcome Exceeds Drinking Limits, by Outcome Type and Subpopulation (KQ4)

Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Young adults	Kypri, 2009[195]	≤28/14 [M/F] drinks per week	Other/Generic	IG1	6	152/813 (18.7%)	192/767 (25%)	0.65 (0.46 to 0.92)*, <0.001†
	Larimer, 2007[197]	≥5 drinks in a row in the past 2 weeks	CORE	IG1	12	243/737 (33%)	300/751 (40%)	0.74 (0.6 to 0.91); p<0.05†
Adults	Crawford, 2014[185]	>8/6 [M/F] drinks on one occasion)	M-SASQ	IG1	6	221/291 (75.9%)	246/301 (81.7%)	0.7 (0.46 to 1.05)*; p=0.087†
	Curry, 2003[152]	≥2 drinks per day in the past month, ≥2 episodes of binge drinking [≥5 drinks on a single occasion], or ≥1 episodes of driving after consuming >2 drinks	Other/Generic	IG1	12	65/151 (43%)	89/156 (57%)	0.57 (0.36 to 0.89); p=0.012†
	Fleming, 1997[153]	>20/13 [M/F] drinks per week	TLFB	IG1	6	86/392 (21.9%)	124/382 (32.5%)	0.58 (0.42 to 0.81); p<0.01†
				IG1	12	79/392 (20.1%)	128/382 (33.5%)	0.5 (0.36 to 0.69); p<0.01†
				IG1	24	99/392 (25.3%)	126/382 (33%)	0.69 (0.5 to 0.94); p<0.01†
				IG1	36	91/392 (23.2%)	132/382 (34.6%)	0.57 (0.42 to 0.78); p<0.01†
				IG1	48	88/392 (22.4%)	101/382 (26.4%)	0.81 (0.58 to 1.12); NR, NS†
				IG1 (Men)	6	57/244 (23.4%)	71/238 (29.8%)	0.72 (0.48 to 1.08); NR, NS†
				IG1 (Men)	12	49/244 (20.1%)	76/238 (31.9%)	0.54 (0.35 to 0.81); p<0.01†
				IG1 (Men)	24	62/244 (25.4%)	77/238 (32.4%)	0.71 (0.48 to 1.06); NR, NS†
				IG1 (Men)	36	61/244 (25%)	80/238 (33.6%)	0.66 (0.44 to 0.98); p<0.05†
				IG1 (Men)	48	59/244 (24.2%)	57/238 (24%)	1.01 (0.67 to 1.54); NR, NS†
				IG1 (Women)	6	29/148 (19.6%)	53/144 (36.8%)	0.42 (0.25 to 0.71); p<0.01†
				IG1 (Women)	12	30/148 (20.3%)	52/144 (36.1%)	0.45 (0.27 to 0.76); p<0.01†
				IG1 (Women)	24	37/148 (25%)	49/144 (34%)	0.65 (0.39 to 1.07); p<0.10†
				IG1 (Women)	36	30/148 (20.3%)	52/144 (36.1%)	0.45 (0.27 to 0.76); p<0.01†
				IG1 (Women)	48	29/148 (19.6%)	44/144 (30.6%)	0.55 (0.32 to 0.95); p<0.05†
	Helstrom, 2014[240]	>21/14 [M/F] drinks over the past week or any episodes of binge drinking (≥5/4 [M/F] drinks on one occasion)	TLFB	IG1	8	35/68 (52%)	38/71 (54%)	0.92 (0.47 to 1.79); NR, NS
			TLFB	IG1	12	35/68 (51%)	40/71 (56%)	0.82 (0.42 to 1.6); NR, NS
	Ockene, 1999[165]	≥12/9 [M/F] drinks per week or binge drinking (≥5/4 [M/F] on 1 or more occasions in previous month)	TLFB	IG1	6	152/248 (61%)	167/233 (72%)	0.63 (0.43 to 0.92)*; p=0.02
			TLFB	IG1	12	137/235 (58%)	149/210 (71%)	0.63 (0.4 to 1.01)*; p=0.06†
	Richmond, 1995[175]	>28/14 [M/F] drinks in previous week	Other/Generic	IG1	6	71/96 (74%)	66/93 (71%)	1.17 (0.56 to 2.43); NS, NR
			Other/Generic	IG1	12	73/96 (76%)	73/93 (78.5%)	0.83 (0.38 to 1.82); NR, NS
			Other/Generic	IG2	6	71/96 (74%)	66/93 (71%)	1.17 (0.56 to 2.43); NR, NS
			Other/Generic	IG2	12	74/96 (77.1%)	73/93 (78.5%)	0.9 (0.41 to 1.97); NR, NS

Appendix I Table 24. Dichotomous Outcome Exceeds Drinking Limits, by Outcome Type and Subpopulation (KQ4)

Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Adults	Rubio, 2010[168]	>18/13 [M/F] drinks per week	TLFB	IG1	12	178/371 (48%)	254/381 (66.7%)	0.46 (0.34 to 0.62); p<0.001
			TLFB	IG1 (Men)	12	126/243 (51.9%)	167/248 (68.5%)	0.52 (0.36 to 0.75); p<0.01
			TLFB	IG1 (Women)	12	52/128 (40.6%)	87/133 (65.4%)	0.36 (0.22 to 0.6); p<0.001
	Saitz, 2003[169]	>14/7 drinks per week	TLFB	IG1 (Faculty physicians)	6	/ (50%)	/ (50%)	NR, NS†
			TLFB	IG1 (Resident physicians)	6	/ (53%)	/ (69%)	NR, NS†
	Senft, 1997[172]	≥3/2 [M/F] drinks daily, 6-7 days per week	AUDIT	IG1	6	42/201 (21%)	65/224 (29%)	0.65 (0.41 to 1.01); p=0.06
			AUDIT	IG1	12	39/196 (20%)	58/215 (27%)	0.67 (0.42 to 1.07); p=0.07
	Schulz, 2013[228]	≥2/1 [M/F] drinks per day and having ≤2 alcohol-free days per week	Other/Generic	IG1 + IG2	6	/313 (%)	/135 (%)	0.9 (0.51 to 1.59)*; p=0.72
	Wallace, 1988[174]	≥35/21 [M/F] units per week	Other/Generic	IG1 (Men)	6	188/318 (59.1%)	246/322 (76.4%)	0.45 (0.32 to 0.63); p<0.001
			Other/Generic	IG1 (Men)	12	179/318 (56.3%)	240/322 (74.5%)	0.44 (0.31 to 0.61); p<0.001
			Other/Generic	IG1 (Women)	6	69/130 (53.1%)	101/137 (73.7%)	0.4 (0.24 to 0.67); p<0.001
			Other/Generic	IG1 Women)	12	68/130 (52.3%)	97/137 (70.8%)	0.45 (0.27 to 0.75); p<0.05
Older adults	Ettner, 2014[183]	≥5/day at any frequency, 4/day at least 2 times/month, 3/day at least 4 times/week	CARET	IG1	6	91/453 (20%)	180/620 (29%)	0.62 (0.38 to 1.01); p≤0.01†
			CARET	IG1	12	79/439 (18%)	165/610 (27%)	0.59 (0.36 to 0.99); p≤0.01†
	Fleming, 1999[157]	≥21/14 [M/F] drinks per week) in previous 7 days	TLFB	IG1	6	12/87 (15.4%)	21/71 (31.3%)	0.38 (0.17 to 0.84); p<0.05†
			TLFB	IG1	12	12/87 (15.4%)	23/71 (34.3%)	0.33 (0.15 to 0.73); p<0.01†
			TLFB	IG1	24	13/87 (16.9%)	19/71 (30.6%)	0.48 (0.22 to 1.06); p<0.10†
	Moore, 2010[176]	Meeting at-risk criteria on CARET (score 1-7)	CARET	IG1	12	120/222 (54.1%)	179/299 (59.9%)	0.75 (0.42 to 1.36)*; NR, NS†

* Study-reported OR

† Study reported from adjusted model

Abbreviations: AUDIT = Alcohol Use Disorders Index Test; CARET = Comorbidity Alcohol Risk Evaluation Tool; CG = control group; CORE = Core Institute's Campus Assessment of Alcohol and Other Drug Norms; FU = followup; IG = intervention group; M/F = males/females; M-SASQ = Modified Single Alcohol Screening Question; NR = not reported; NS = not significant; OR = odds ratio; pop = population; TLFB = Timeline Followback

Appendix I Table 25. Dichotomous Heavy Use Episodes, by Subpopulation (KQ4)

Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Adolescents	Haug, 2016[210]	≥5/4 [M/F] drinks on a single occasion	Other/Generic	IG1 (High risk drinking)	6	61/80 (76.3%)	68/74 (91.9%)	0.29 (0.09 to 0.98)*; p=0.047†
				IG1 (Medium risk drinking)	6	117/181 (64.6%)	97/142 (68.3%)	0.76 (0.44 to 1.31)*; p=0.33†
Young adults	Bertholet, 2015[220]	≥6 drinks on a single occasion	Other/Generic	IG1	6	257/338 (76%)	262/329 (79.6%)	0.81 (0.46 to 1.59)*†
	Kypri, 2009[195]	6/4 [M/F] standard drinks on 1+ occasion	Other/Generic	IG1	6	430/813 (52.9%)	418/767 (54.5%)	0.81 (0.6 to 1.05)*; p=0.22†
Adults	Curry, 2003[152]	≥5 drinks per occasion at least twice in the past month	Other/Generic	IG1	12	21/151 (14%)	30/156 (19%)	0.68 (0.37 to 1.25); p=0.26†
	Fleming, 1997[153]	>5 drinks in previous 30 days	TLFB	IG1	6	237/392 (60.5%)	278/382 (72.8%)	0.57 (0.42 to 0.77); p<0.01†
					12	225/392 (57.4%)	273/382 (71.5%)	0.54 (0.4 to 0.73); p<0.01†
					24	245/392 (62.5%)	284/382 (74.4%)	0.58 (0.42 to 0.78); p<0.01†
					36	241/392 (61.5%)	270/382 (70.7%)	0.66 (0.49 to 0.89); p<0.01†
					48	250/392 (63.8%)	269/382 (70.4%)	0.74 (0.55 to 1); NR, NS†
				IG1 (Women)	6	79/148 (53.4%)	101/144 (70.1%)	0.49 (0.3 to 0.79); p<0.01†
					12	81/148 (54.7%)	97/144 (67.4%)	0.59 (0.36 to 0.94); p<0.05†
					24	91/148 (61.5%)	110/144 (76.4%)	0.49 (0.3 to 0.82); p<0.01†
					36	84/148 (56.8%)	108/144 (75%)	0.44 (0.27 to 0.72); p<0.01†
					48	91/148 (61.5%)	97/144 (67.4%)	0.77 (0.48 to 1.25); NR, NS†

Appendix I Table 25. Dichotomous Heavy Use Episodes, by Subpopulation (KQ4)

Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Adults	Fleming, 1997[153]	>5 drinks in previous 30 days	TLFB	IG1 (Men)	6	159/244 (65.2%)	177/238 (74.4%)	0.64 (0.44 to 0.95); p<0.05†
					12	145/244 (59.4%)	178/238 (74.8%)	0.49 (0.33 to 0.73); p<0.01†
					24	151/244 (61.9%)	173/238 (72.7%)	0.61 (0.42 to 0.9); p<0.05†
					36	150/244 (61.5%)	163/238 (68.5%)	0.73 (0.5 to 1.07); NR, NS†
					48	154/244 (63.1%)	173/238 (72.7%)	0.64 (0.44 to 0.95); p<0.05†
				IG1 (18-30 yrs)	6	76/114 (66.7%)	94/112 (83.9%)	0.38 (0.2 to 0.72); p=0.01
					12	75/114 (65.8%)	99/112 (88.4%)	0.25 (0.13 to 0.51); p=0.001
					24	87/114 (76.3%)	95/112 (84.8%)	0.58 (0.29 to 1.13); NR, NS
					36	80/114 (70.2%)	85/112 (75.9%)	0.75 (0.41 to 1.35); NR, NS
					48	75/114 (65.8%)	91/112 (81.3%)	0.44 (0.24 to 0.82); p=0.01
	Rose, 2017[245]	≥5/4 [M/F] drinks per occasion in previous 30 days	TLFB	IG1	6	239/678 (35.3%)	271/685 (39.5%)	0.83 (0.67 to 1.04); p=0.88
				IG1 (no AUD)	6	130/480 (27.1%)	131/488 (26.8%)	1.01 (0.76 to 1.34); NR, NS
				IG1 (AUD)	6	88/198 (44.4%)	106/197 (53.8%)	0.69 (0.46 to 1.02); NR, NS
	Rubio, 2010[168]	≥5/4 [M/F] drinks per occasion	TLFB	IG1	12	194/371 (52.3%)	256/381 (67.2%)	0.54 (0.4 to 0.72); p<0.001
				IG1 (Men)	12	140/243 (57.6%)	165/248 (66.5%)	0.68 (0.47 to 0.99); p<0.05
				IG1 (Women)	12	54/128 (42.2%)	91/133 (68.4%)	0.34 (0.2 to 0.56); p<0.001
Adults	Saitz, 2003[169]	>4/3 drinks per occasion [M/F or aged ≥65 years]	TLFB	IG1 (Faculty physicians)	6	NR/NR (51%)	NR/NR (42%)	NR, NS†
				IG1 (Resident physicians)	6	NR/NR (44%)	NR/NR (64%)	NR, NS†
	Scott, 1990[171]	≥140 g of alcohol on ≥2 occasions during previous 3 months	Other/Generic	IG1 (Men)	12	18/80 (22.5%)	29/74 (39.2%)	0.45 (0.22 to 0.91); p<0.05
				IG1 (Women)	12	4/33 (12.1%)	6/39 (15.4%)	0.76 (0.19 to 2.96); NR, NS

Appendix I Table 25. Dichotomous Heavy Use Episodes, by Subpopulation (KQ4)

Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
	Watkins, 2017[246]	≥5/4 [M/F] drinks per occasion in previous 30 days	TLFB	IG1	6	74/138 (53.9%)	69/123 (56.2%)	Effect size: 0.01 (-0.14 to 0.16); p=0.91
Older adults	Ettner, 2014[183]	≥4 drinks per occasion at least once/week	CARET	IG1	6	45/453 (10%)	112/620 (18%)	0.5 (0.35 to 0.72); p≤0.01†
				IG1	12	44/439 (10%)	98/610 (16%)	0.58 (0.4 to 0.85); p≤0.01†
	Fleming, 1999[157]	≥4/3 drinks per occasion [M/F] in previous 30 days	NR	IG1	6	25/78 (32%)	28/67 (41.8%)	0.66 (0.33 to 1.3); NR, NS
				IG1	12	24/78 (30.8%)	33/67 (49.3%)	0.46 (0.23 to 0.9); p<0.025
	Moore, 2010[176]	≥1 heavy drinking days (≥4 drinks/day) in past week	TLFB	IG1	12	23/213 (10.8%)	39/294 (13.3%)	0.88 (0.41 to 1.9)*; NR, NS†

* Study-reported OR

† Study reported from adjusted model

Abbreviations: CARET = Comorbidity Alcohol Risk Evaluation Tool; CG = control group; CI = confidence interval; IG = intervention group; Int = intervention; FU = followup; M/F = males/females; mos = months; NR = not reported; NS = not statistically significant; OR = odds ratio; pop = population; TLFB = Timeline Followback; yrs = years

Appendix I Table 26. Other Dichotomous Drinking and Behavioral Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Below scale cut-off	Adults	Hilbink, 2012[233]	Score 0-7 on the AUDIT	AUDIT	IG1	24	140/217 (35.5%)	132/249 (47%)	1.61 (1.11 to 2.33)*; p=0.01
	Adults	Kaner, 2013[186]	Proportion of participants with "negative" AUDIT score; ≥8 indicating non-hazardous or non-harmful drinking	AUDIT	IG1	6	146/205 (28.8%)	130/202 (35.6%)	1.28 (0.8 to 2.08)*; p=0.3†
	Adults			AUDIT	IG1	12	131/203 (35.5%)	116/190 (38.9%)	1.01 (0.62 to 1.67)*; p=0.96†
	Adults			AUDIT	IG2	6	147/208 (29.3%)	130/202 (35.6%)	1.18 (0.72 to 1.92)*; p=0.51†
	Adults			AUDIT	IG2	12	133/205 (35.1%)	116/190 (38.9%)	1.1 (0.64 to 1.89)*; p=0.73†
	Adults	Wilson, 2014[224]	AUDIT score <7	AUDIT	IG1	6	18/28 (35.7%)	29/39 (25.6%)	0.64 (0.12 to 3.41)
Above scale cut-off	Older adults	Watson, 2013[230]	AUDIT-C positive score ≥5	AUDIT-C	IG1	6	203/238 (85.3%)	205/231 (88.7%)	0.81 (0.48 to 1.37)*; p=0.427†
				AUDIT-C	IG1	12	194/229 (84.7%)	188/229 (82.1%)	1.37 (0.76 to 2.47)*; p=0.289†
	Young adults	Marlatt, 1998[198]	ADS positive	ADS	IG1 (ADS negative)	24	7/36 (19%)	5/34 (15%)	1.4 (0.4 to 4.92)
				ADS	IG1 (ADS positive)	48	3/30 (10%)	4/27 (14.8%)	0.64 (0.13 to 3.15)
	Adults	Hilbink, 2012[233]	Score ≥20 on the AUDIT	AUDIT	IG1	24	3/217 (1.4%)	4/249 (1.6%)	0.86 (0.19 to 3.88); p=0.84
		Scott, 1990[171]	Abnormal dependence score	Edinburgh Hospital study	IG1 (Men)	12	19/80 (23.8%)	27/74 (36.5%)	0.54 (0.27 to 1.09); NR, NS
				Edinburgh Hospital study	IG1 (Women)	12	13/33 (39.4%)	13/39 (33.3%)	1.3 (0.5 to 3.41); NR, NS
Other behavioral	Adults	Crawford, 2014[185]	Unprotected sex after drinking	Other/Generic	IG1	6	108/291 (37.1%)	136/301 (45.2%)	0.79 (0.33 to 1.75)*; p=0.174†
				Other/Generic	IG1	6	57/291 (19.6%)	56/301 (18.6%)	1.15 (0.17 to 2.14)*; p=0.504†
	Adults	Curry, 2003[152]	Drinking and driving (driving after >2 drinks in the past month)	Other/Generic	IG1	12	30/151 (20%)	55/156 (35%)	0.46 (0.27 to 0.76); p=0.009†
	Older adults	Ettner, 2014[183]	Driving within two hours of drinking ≥3 drinks	CARET	IG1	6	63/453 (14%)	105/620 (17%)	0.79 (0.44 to 1.4); p=0.27†
					IG1	12	48/439 (11%)	98/610 (16%)	0.65 (0.35 to 1.22); p=0.06†
	Pregnant women	Ondersma, 2015[217]	Seeking any services of any kind for alcohol use, including 12-step groups	MINI	IG1	6	1/20 (5%)	0/19 (0%)	3 (0.11 to 78.27)

Appendix I Table 26. Other Dichotomous Drinking and Behavioral Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Other drinking	Young adults	Marlatt, 1998[198]	Resolved dependence	ADS	IG1 (ADS positive)	24	25/117 (21%)	22/126 (17%)	1.28 (0.68 to 2.43)
					IG1 (ADS positive)	48	49/115 (42.6%)	38/116 (32.8%)	1.52 (0.89 to 2.6)
	Adults	Curry, 2003[152]	Chronic drinking (consuming an average of ≥2 alcoholic drinks per day in the past month)	Other/Generic	IG1	12	42/151 (28%)	44/156 (28%)	0.98 (0.6 to 1.61); p=0.27†
	Adults	Hilbink, 2012[233]	Score 8-15 on the AUDIT	AUDIT	IG1	24	127/217 (58.5%)	118/249 (47.4%)	1.57 (1.09 to 2.26); p=0.02
			Score 16-19 on the AUDIT		IG1	24	10/217 (4.6%)	10/249 (4%)	1.15 (0.47 to 2.83); p=0.31
Other drinking	Adults	Saitz, 2003[169]	Abstinence from alcohol/past month	TLFB	IG1 (Faculty physicians)	6	/ (22%)	/ (26%)	NR, NS†
				TLFB	IG1 (Resident physicians)	6	/ (18%)	/ (5%)	NR, NS†
	Adults	Upshur, 2015[218]	No alcohol consumption in the last 3 months	AUDIT-C	IG1	6	12/40 (30%)	14/36 (38.9%)	0.71 (0.25 to 2.04); NR, NS
	Adults	Watkins, 2017[246]	Abstinence from alcohol/past month	TLFB	IG1	6	44/138 (31.9%)	28/123 (22.8%)	1.59 (0.91 to 2.76); NR, NS
			Abstinence from any opioids, any alcohol, cocaine, methamphetamines and marijuana in past 30 days	TLFB	IG1	6	36/138 (26.3%)	19/123 (15.6%)	1.93 (1.04 to 3.59); p=0.01
			Abstinence from opioids or heavy drinking in past 30 days	TLFB	IG1	6	59/138 (42.7%)	50/123 (40.9%)	1.09 (0.67 to 1.79); p=0.50
	Older adults	Ettner, 2014[183]	Alcohol use with comorbidities (any amount of alcohol use with liver disease; ≥4/day at any frequency, 3/day at least 2 times/week, 2/day at least 4 times/week with gout or depression; or 5/day at any frequency, 4/day at least 2 times/ month with high blood pressure or diabetes)	CARET	IG1	6	104/453 (23%)	180/620 (29%)	0.72 (0.45 to 1.16); p≤0.01†
					IG1	12	92/439 (21%)	165/610 (27%)	0.71 (0.43 to 1.16); p=0.03†
			Alcohol use with medications (≥4/day at any frequency, 2-3/day at least 4 times/week with medications that may cause dizziness, bleeding, dizziness, sedation; ≥4/day at any frequency, 2-3/day at least 4 times/ week with medications used for	CARET	IG1	6	172/453 (38%)	304/620 (49%)	0.64 (0.42 to 0.96); p≤0.01†
				CARET	IG1	12	158/439 (36%)	281/610 (46%)	0.66 (0.43 to 1.01); p≤0.01†

Appendix I Table 26. Other Dichotomous Drinking and Behavioral Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
			gastroesophageal reflux, ulcer disease, depression; ≥5/day at any frequency, 4/day at least 2 times/ week, 3/day at least 4 times/week with medications for hypertension						
Other drinking	Older adults	Ettner, 2014[183]	Alcohol use with symptoms of medical or psychiatric conditions (e.g., >4 drinks per week and frequently experiencing problems sleeping, memory problems, stomach pain or vomiting)	CARET	IG1	6	104/453 (23%)	217/620 (35%)	0.55 (0.34 to 0.87); p≤0.01†
				CARET	IG1	12	97/439 (22%)	195/610 (32%)	0.61 (0.38 to 0.98); p≤0.01†
	Pregnant women	O'Connor, 2007[202]	Abstinence from alcohol (time frame NR)	Other/Generic	IG1	4	/117 (%)	/138 (%)	5.39 (1.59 to 18.25)*; p<0.05†
	Pregnant women	Ondersma, 2015[217]	Abstinence from alcohol, past 90 days	TLFB	IG1	6	18/20 (90%)	14/19 (73.7%)	3.4 (0.5 to 21)*; p=0.19†
	Pregnant women	Reynolds, 1995[203]	Percentage abstinence from alcohol, past month	Other/Generic	IG1	2	28/39 (71.8%)	23/33 (69%)	1.11 (0.4 to 3.06); p<0.058
			Percentage abstinence from alcohol, past month	Other/Generic	IG1 (African-American)	2	26/29 (91%)	16/23 (68%)	3.79 (0.86 to 16.81); p<0.05
			Percentage abstinence from alcohol, past month	Other/Generic	IG1 (White)	2	10/13 (80%)	9/13 (71%)	1.48 (0.26 to 8.5); NS, NR
	Pregnant women	Rubio, 2014[184]	Abstinence from alcohol (time frame NR)	Other/Generic	IG1	8	22/125 (17.6%)	14/126 (11.1%)	1.71 (0.83 to 3.52); p=0.084
			Abstinence from alcohol (time frame NR)	Other/Generic	IG1	12.5	15/125 (12.0%)	9/126 (7.1%)	1.77 (0.75 to 4.22); p=0.087
			Abstinence from alcohol (time frame NR)	Other/Generic	IG1	18.5	9/125 (7.2%)	5/126 (4.0%)	2 (0.92 to 4.35)*; p=0.08†
Other drinking	Pregnant women	van der Wulp, 2014[222]	Abstinence from alcohol, past 3 months	QFV	IG1	3	64/99 (64.6%)	49/108 (45.4%)	2.2 (1.26 to 3.85); p=0.79
			Abstinence from alcohol, past 3 months	QFV	IG1	6	62/86 (72.1%)	51/93 (54.8%)	1.68 (0.68 to 4.18)*; p=0.26†
			Abstinence from alcohol, past 3 months	QFV	IG2	3	54/77 (70.1%)	49/108 (45.4%)	2.83 (1.52 to 5.24); p=0.15
			Abstinence from alcohol, past 3 months	QFV	IG2	6	53/68 (77.9%)	51/93 (54.8%)	2.77 (1.05 to 7.34)*; p=0.04†
	Postpartum women	Ondersma, 2016[212]	Abstinence from alcohol, past week	TLFB	IG1	6	17/61 (27.9%)	17/62 (27.4%)	1 (0.46 to 2.25)*; NR, NS

* Study-reported OR
† Study reported from adjusted model

Abbreviations: ADS = Alcohol Dependence Scale; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test – Consumption; CARET =

Appendix I Table 26. Other Dichotomous Drinking and Behavioral Outcomes, by Subpopulation (KQ4)

Comorbidity Alcohol Risk Evaluation Tool; CG = control group; CI = confidence interval; CORE = Core Institute's Campus Assessment of Alcohol and Other Drug Norms; FU = followup; IG = intervention group; Int = intervention; M/F = males/females; MINI = Mini International Neuropsychiatric Interview; mos = months; M-SASQ = Modified Single Alcohol Screening Question; NR = not reported; NS = not statistically significant; OR = odds ratio; pop = population; QFV = Quantity Frequency-Variability questionnaire; TLFB = Timeline Followback

Appendix I Table 27. Drinks per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Adole-scents	Haug, 2016[210]	IG1 (High risk drinking)	6	80	17.8 (11.7)	-8 (10.5)	74	15.1 (9.2)	-3.5 (8.8)	-4.4 (-7.5, -1.4); p=0.11*
		IG1 (Medium risk drinking)	6	181	7.1 (6.9)	-0.9 (6.6)	142	6.6 (5.5)	-1.3 (5)	0.3 (-0.9, 1.6); p=0.33*
Young adults	Bertholet, 2015[220]	IG1	6	338	10.1 (7.9)	-1.7 (7.8)	329	9.5 (7.8)	-0.4 (7.6)	-1.3 (-2.5, -0.1)
	Carey, 2006[189]	IG1	6	63	19.2 (13)	-1.6 (13.1)	66	19.4 (12.4)	-2 (11.6)	0.4 (-3.9, 4.7)
		IG1	12	65	19.2 (13)	-3.6 (12.1)	59	19.4 (12.4)	-4.4 (11.6)	0.8 (-3.4, 5)
		IG2	6	68	20.7 (16)	-6.7 (14.1)	66	19.4 (12.4)	-2 (11.6)	-4.7 (-9.1, -0.3)
		IG2	12	64	20.7 (16)	-7.9 (14)	59	19.4 (12.4)	-4.4 (11.6)	-3.5 (-8, 1)
		IG3	6	66	18.7 (13.2)	-4.1 (12.5)	66	19.4 (12.4)	-2 (11.6)	-2.1 (-6.2, 2)
		IG3	12	68	18.7 (13.2)	-2.2 (13.1)	59	19.4 (12.4)	-4.4 (11.6)	2.2 (-2.1, 6.5)
		IG4	6	62	19.6 (12.4)	-5.8 (11.5)	66	19.4 (12.4)	-2 (11.6)	-3.8 (-7.8, 0.2)
		IG4	12	68	19.6 (12.4)	-5.1 (16.3)	59	19.4 (12.4)	-4.4 (11.6)	-0.7 (-5.6, 4.2)
	Collins, 2014[223]	IG1	6	205	10.1 (8.5)	-1.8 (8.5)	190	9.8 (8.8)	-1.7 (8.5)	-0.2 (-1.9, 1.5); p=0.1
		IG1	12	183	10.1 (8.5)	-1.8 (8.3)	173	9.8 (8.8)	-2.7 (7.8)	0.9 (-0.8, 2.6)
		IG2	6	211	10.3 (9.3)	-2.5 (8.6)	190	9.8 (8.8)	-1.7 (8.5)	-0.9 (-2.5, 0.8); p=0.01
	Collins, 2014[223]	IG2	12	181	10.3 (9.3)	-2.8 (8.5)	173	9.8 (8.8)	-2.7 (7.8)	-0.1 (-1.8, 1.6)
	Daeppen, 2011[192]	IG1	6	110	11.3 (11)	-1.5 (13.2)	125	9.9 (10.9)	0.8 (10.8)	-2.3 (-5.4, 0.8); p=0.03*
	Fleming, 2010[160]	IG1	6	493	17.8 (8.8)	-4.5 (9.9)	493	17.3 (8)	-3 (9.1)	-1.5 (-2.7, -0.3)
		IG1	12	493	17.8 (8.8)	-4.8 (9.5)	493	17.3 (8)	-3.6 (9.2)	-1.2 (-2.4, 0); p=0.018*
	Kypri, 2004[161]	IG1	6	47	NR	NR	47	NR	NR	RR†=(0, 0.6); p=0.46
	Kypri, 2008[162]	IG1	6	122	NR	NR	124	NR	NR	(0, 0.5); p=0.02
		IG1	12	121	NR	NR	126	NR	NR	(0, 0.5); p=0.16
		IG2	6	114	NR	NR	124	NR	NR	(0, 0.5); p=0.02
		IG2	12	113	NR	NR	126	NR	NR	(0, 0.5); p=0.01
	Kypri, 2009[195]	IG1	6	1251	NR	NR	1184	NR	NR	RR=0.9 (0.8 0.9); p<0.001*
	LaBrie, 2009[196]	IG1	6	140	4.7 (NR)	-0.6 (NR)	110	3.5 (NR)	1.2 (NR)	NR, NS
	LaBrie, 2013[227]	IG1	6	143	10.7 (8.1)	-1.3 (8.2)	142	10.4 (9.5)	-1.0 (9.9)	-0.3 (-2.4, 1.8)
		IG1	12	144	10.7 (8.1)	-2.2 (8.4)	143	10.4 (9.5)	-1.4 (9.0)	-0.8 (-2.8, 1.2)
		IG2	6	143	10.3 (9.4)	-0.8 (9.3)	142	10.4 (9.5)	-1 (9.9)	0.2 (-2, 2.4)
Young adults	LaBrie, 2013[227]	IG2	12	139	10.3 (9.4)	-1.8 (9.3)	143	10.4 (9.5)	-1.4 (9.0)	-0.4 (-2.5, 1.7)
	Larimer, 2007[197]	IG1	12	737	4.6 (7.4)	0.2 (7.2)	751	4.6 (6.3)	1 (6.3)	-0.8 (-1.5, -0.1); p<0.05*
	Leeman, 2016[211]	IG1	6	48	8.3 (8.3)	-1.7 (9.3)	42	5.8 (4.8)	2.7 (12.8)	-4.4 (-9.1, 0.3); p<0.05*
		IG2	6	45	8 (9)	-0.4 (9.4)	42	5.8 (4.8)	2.7 (12.8)	-3.1 (-7.8, 1.6); NR, NS
		IG3	6	48	7.8 (8.9)	-1.3 (8.3)	42	5.8 (4.8)	2.7 (12.8)	-4 (-8.5, 0.5); p<0.05*
	Lewis, 2014[225]	IG1	6	119	13.1 (11.1)	-5.2 (10.1)	121	13 (9.8)	-3.7 (9.2)	-1.6 (-4, 0.9)
		IG2	6	119	13.1 (11.2)	-5.2 (10.2)	121	13 (9.8)	-3.7 (9.2)	-1.5 (-4, 0.9)
	Neighbors, 2004[200]	IG1	6	126	12.1 (9.2)	-3.6 (9)	126	10.9 (9.5)	-0.8 (9.5)	-2.8 (-5.1, -0.5)
		IG1	6	164	12 (NR)	-1 (NR)	164	10.4 (NR)	-0.7 (NR)	β=-0.01 (SE=0.01); p=0.02

Appendix I Table 27. Drinks per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Young adults	Neighbors, 2010[201]	IG1	12	164	12 (NR)	-1.8 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.02
		IG1	18	164	12 (NR)	-2.5 (NR)	164	10.4 (NR)	-1.9 (NR)	β=-0.01 (SE=0.01); p=0.02
		IG1	24	164	12 (NR)	-3.2 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.02
		IG2	6	163	11.3 (NR)	-1.9 (NR)	164	10.4 (NR)	-0.7 (NR)	β=-0.01 (SE=0.01); p=0.32
		IG2	12	163	11.3 (NR)	-0.7 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.32
	Neighbors, 2010[201]	IG2	18	163	11.3 (NR)	-1.6 (NR)	164	10.4 (NR)	-1.9 (NR)	β=-0.01 (SE=0.01); p=0.32
		IG2	24	163	11.3 (NR)	-1.7 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.32
		IG3	6	163	11.8 (NR)	-1.8 (NR)	164	10.4 (NR)	-0.7 (NR)	β=-0.01 (SE=0.01); p=0.31
		IG3	12	163	11.8 (NR)	-1.8 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.31
		IG3	18	163	11.8 (NR)	-1.7 (NR)	164	10.4 (NR)	-1.9 (NR)	β=-0.01 (SE=0.01); p=0.31
		IG3	24	163	11.8 (NR)	-2.2 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.31
		IG4	6	164	12.8 (NR)	-1 (NR)	164	10.4 (NR)	-0.7 (NR)	β=-0.01 (SE=0.01); p=0.23
		IG4	12	164	12.8 (NR)	-0.3 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.23
		IG4	18	164	12.8 (NR)	-1.3 (NR)	164	10.4 (NR)	-1.9 (NR)	β=-0.01 (SE=0.01); p=0.23
		IG4	24	164	12.8 (NR)	-1.3 (NR)	164	10.4 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.23
	Neighbors, 2016[239]	IG1	6	177	10.1 (9.2)	-2.5 (8.7)	180	9.4 (6.9)	-2.1 (6.9)	-0.4 (-2, 1.3); NR, NS
		IG2	6	173	10.6 (10.1)	-3 (10)	180	9.4 (6.9)	-2.1 (6.9)	-0.9 (-2.7, 0.9); NR, NS
	Schaus, 2009[170]	IG1	6	181	8.4 (7.4)	-2.2 (7.4)	182	9.6 (8.4)	-0.7 (9.2)	-1.5 (-3.3, 0.2); p=0.007*
		IG1	9	181	8.4 (7.4)	-2.3 (7.3)	182	9.6 (8.4)	-2.1 (8.5)	-0.1 (-1.8, 1.5); p=0.134*
		IG1	12	181	8.4 (7.4)	-1.9 (7.4)	182	9.6 (8.4)	-2.3 (8.4)	0.4 (-1.2, 2); p=0.7*
	Turrisi, 2009[205]	IG1	10	278	3.7 (5.8)	3.6 (5.8)	305	4 (5.8)	4.4 (6)	-0.8 (-1.8, 0.1); p<0.05*
		IG2	10	228	3.6 (5.8)	3.8 (5.8)	305	4 (5.8)	4.4 (6)	-0.6 (-1.6, 0.4); p<0.05
		IG3	10	279	3.6 (5.8)	4.9 (6)	305	4 (5.8)	4.4 (6)	0.5 (-0.5, 1.5)
	Voogt, 2014[226]	IG1	6	456	22.2 (12.9)	0.7 (13)	451	22.1 (13.8)	1.9 (13.8)	-1.2 (-2.9, 0.5); p=0.04*
Adults	Aalto, 2000[206]	IG1 (Men)	36	97	28.4 (26.2)	0.6 (26.8)	84	30.8 (33.7)	3 (35.5)	-2.4 (-11.7, 6.9); NR, NS
		IG1 (Women)	36	37	17.6 (16.3)	6.7 (29.3)	39	15.6 (14)	-0.5 (14.8)	7.2 (-3.3, 17.7); NR, NS
	Bischof, 2008[149]	IG1 + IG2	12	269	33.6 (NR)	-8.8 (26.4)	139	28.7 (35.2)	-4.4 (24.6)	-4.4 (-9.6, 0.8); p=0.048
		IG1	12	131	34.3 (35.9)	-9.1 (26)	139	28.7 (35.2)	-4.4 (24.6)	-4.7 (-10.7, 1.4)
		IG2	12	138	32.8 (34.5)	-8.5 (26.8)	139	28.7 (35.2)	-4.4 (24.6)	-4.1 (-10.2, 1.9)
	Burge, 1997[188]	IG1	12	47	38.9 (32.4)	NR	46	35.6 (44.2)	NR	NR, NS*
		IG1	18	47	38.9 (32.4)	NR	46	35.6 (44.2)	NR	NR, NS*
		IG2	12	42	34 (41.6)	NR	46	35.6 (44.2)	NR	NR, NS*
		IG2	18	42	34 (41.6)	NR	46	35.6 (44.2)	NR	NR, NS*
	Burge, 1997[188]	IG3	12	40	27 (31.4)	NR	46	35.6 (44.2)	NR	NR, NS*
		IG3	18	40	27 (31.4)	NR	46	35.6 (44.2)	NR	NR, NS*
	Crawford, 2014[185]	IG1	6	290	NR	NR	301	NR	NR	-2.3 (NR); p=0.053*
	Cunningham, 2012[231]	IG1	6	589	12.3 (11.9)	-0.5 (11.5)	589	11.6 (11.1)	0.3 (11.1)	-0.8 (-2.1, 0.5); NR, NS
	Curry, 2003[152]	IG1	12	151	14.9 (10.1)	-4.3 (NR)	156	13.6 (10.4)	-3 (NR)	NR; p=0.33*

Appendix I Table 27. Drinks per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
	Drummond, 2009[208]	IG1	6	39	64.6 (54.4)	-15.5 (30.4)	52	54.1 (32.8)	-9 (26.3)	-6.5 (-18.5, 5.4), NS*
	Emmen, 2005[193]	IG1	6	61	29.1 (15)	5.7 (14)	62	25.9 (18.7)	5.9 (18.3)	-0.2 (-6, 5.5); 0.46*
		IG1 (Men)	6	43	NR	7.5 (13.9)	50	NR	6.9 (19.3)	0.6 (-6.2, 7.3), NS*
		IG1 (Women)	6	18	NR	1.3 (13.4)	12	NR	1.2 (12.7)	0.1 (-9.4, 9.7), NS*
	Fleming, 1997[153]	IG1	6	392	19.1 (12.3)	-7.6 (11.6)	382	18.9 (11.8)	-4 (11.5)	-3.6 (-5.2, -2); p<0.001
		IG1	12	392	19.1 (12.3)	-7.7 (11.8)	382	18.9 (11.8)	-3.5 (12.4)	-4.2 (-5.9, -2.5); p<0.001
		IG1	24	392	19.1 (12.3)	-6.7 (NR)	382	18.9 (11.8)	-3 (NR)	NR; p<0.05
		IG1	36	392	19.1 (12.3)	-6.6 (NR)	382	18.9 (11.8)	-3.9 (NR)	NR; p<0.05
		IG1	48	392	19.1 (12.3)	-7 (NR)	382	18.9 (11.8)	-5.2 (NR)	NR; p<0.05
		IG1 (Men)	6	244	21.7 (12.8)	-7.8 (12.4)	238	22 (12.4)	-4.8 (12.5)	-3 (-5.2, -0.8); p<0.005
		IG1 (Men)	12	244	21.7 (12.8)	-8.1 (12.6)	238	22 (12.4)	-5.1 (13)	-3 (-5.2, -0.7); p<0.005
		IG1 (Women)	6	148	15 (10)	-7.1 (9.1)	144	15.7 (10.1)	-4.2 (9)	-3 (-5.1, -0.9); p<0.001
Adults		IG1 (Women)	12	148	15 (10)	-7 (9.3)	144	15.7 (10.1)	-2.5 (11)	-4.5 (-6.9, -2.2); p<0.001
	Fleming, 1997[153]	IG1 (18-30 yrs)	6	114	16.2 (11.2)	-6.8 (10.8)	112	18.3 (12.1)	-4 (11.6)	-2.8 (-5.7, 0.1); p=0.001
		IG1 (18-30 yrs)	12	114	16.2 (11.2)	-7.4 (10.2)	112	18.3 (12.1)	-3.3 (12.7)	-4.1 (-7.1, -1.1); p=0.001
		IG1 (18-30 yrs)	24	114	16.2 (11.2)	-7.3 (10.5)	112	18.3 (12.1)	-3.8 (14.9)	-3.5 (-6.9, -0.1); p=0.002
		IG1 (18-30 yrs)	36	114	16.2 (11.2)	-6.8 (12)	112	18.3 (12.1)	-4.4 (14.7)	-2.4 (-5.9, 1.1); p=0.02
		IG1 (18-30 yrs)	48	114	16.2 (11.2)	-7.6 (10.7)	112	18.3 (12.1)	-6.7 (12.4)	-0.9 (-3.9, 2.1); p=0.06
	Hansen, 2012[234]	IG1	6	476	27.7 (NR)	NR	454	26.7 (NR)	-4.6 (16.3)	-1.8 (-4, 0.3); NR, NS
		IG1	12	476	27.7 (NR)	NR	454	26.7 (NR)	-5.5 (15.8)	-1.4 (-3.4, 0.6); NR, NS
		IG1 (Men)	6	271	32.8 (16.9)	-7.7 (16.6)	244	31.3 (10.3)	-4.6 (12.3)	-3.1 (-5.6, -0.6); NR, NS
		IG1 (Men)	12	271	32.8 (16.9)	-8 (15.9)	244	31.3 (10.3)	-6 (12.5)	-2 (-4.5, 0.5); NR, NS
		IG1 (Women)	6	205	20.9 (7)	-4.9 (11.7)	210	21.3 (8.2)	-4.6 (13.1)	-0.3 (-2.7, 2.1); NR, NS
		IG1 (Women)	12	205	20.9 (7)	-5.5 (13.3)	210	21.3 (8.2)	-4.9 (11.3)	-0.6 (-3, 1.8); NR, NS
	Hansen, 2012[234]	IG2	6	450	27.6 (NR)	NR	454	26.7 (NR)	-4.6 (16.3)	-0.5 (-2.7, 1.6); NR, NS
		IG2	12	450	27.6 (NR)	NR	454	26.7 (NR)	-5.5 (15.8)	-1.2 (-3.3, 0.9); NR, NS
		IG2 (Men)	6	246	32.7 (14)	-5.8 (14.9)	244	31.3 (10.3)	-4.6 (12.3)	-1.2 (-3.6, 1.2); NR, NS
		IG2 (Men)	12	246	32.7 (14)	-7.3 (14.9)	244	31.3 (10.3)	-6 (12.5)	-1.3 (-3.7, 1.1); NR, NS
		IG2 (Women)	6	204	21.5 (9)	-4.5 (15.5)	210	21.3 (8.2)	-4.6 (13.1)	0.1 (-2.7, 2.9); NR, NS
		IG2 (Women)	12	204	21.5 (9)	-6.1 (11.6)	210	21.3 (8.2)	-4.9 (11.3)	-1.2 (-3.4, 1); NR, NS
	Heather, 1987[209]	IG1	6	29	42.6 (22.2)	-8.4 (21.7)	32	57.9 (39.2)	-9.1 (37.7)	0.8 (-14.5, 16); NR, NS
		IG2	6	30	44.5 (24)	-7.6 (28.1)	32	57.9 (39.2)	-9.1 (37.7)	1.5 (-15, 18); NR, NS
	Maisto, 2001[163]	IG1	6	73	16.2 (14.1)	-5.1 (13.3)	85	17.1 (15.2)	-3.4 (15.2)	-1.7 (-6.2, 2.8); NR, NS
		IG1	12	73	16.2 (14.1)	-5.5 (11.3)	85	17.1 (15.2)	-3.6 (11.8)	-1.9 (-5.5, 1.7); NR, NS

Appendix I Table 27. Drinks per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
		IG2	6	74	20.6 (19.9)	-7.7 (17.6)	85	17.1 (15.2)	-3.4 (15.2)	-4.3 (-9.4, 0.9); NR, NS
		IG2	12	74	20.6 (19.9)	-8.3 (16.4)	85	17.1 (15.2)	-3.6 (11.8)	-4.7 (-9.2, -0.2); <0.05
	Ockene, 1999[165]	IG1	6	248	18.7 (14.6)	-6 (11.2)	233	16.4 (12.1)	-3.1 (10.2)	-2.4 (-4.2, -0.6); p=0.001*
		IG1	12	235	18.7 (14.6)	-5.7 (11.3)	210	16.4 (12.1)	-3.2 (11.4)	-2.6 (-4.5, -0.3); p=0.03*
		IG1	48	248	18.7 (14.6)	-4.8 (NR)	233	16.4 (12.1)	-6 (NR)	β=1.1 (0, 1.3); p>0.05
Adults	Ockene, 1999[165]	IG1 (Men)	6	186	20.8 (16.4)	-5.6 (12.5)	157	19.4 (14.4)	-2.9 (11.9)	-2.7 (-5.3, -0.1); p=0.05
		IG1 (Women)	6	88	14.4 (8.6)	-6.8 (8)	99	12.2 (5.6)	-3.5 (7)	-3.3 (-5.5, -1.1); p=0.003
	Richmond, 1995[175]	IG1	6	69	39.4 (26.3)	-7 (25.2)	66	32.5 (27.7)	-4.9 (27.2)	-2.1 (-12.2, 8); NR, NS*
		IG1	12	66	39.4 (26.3)	-6.3 (26.2)	61	32.5 (27.7)	-3.5 (25)	-2.8 (-12.9, 7.3); NR, NS*
		IG1 (Men)	6	37	51.2 (28.5)	-12.5 (26.9)	34	43.5 (34.3)	-8.8 (34.2)	-3.7 (-20.2, 12.8); NR, NS*
		IG1 (Men)	12	35	51.2 (28.5)	-9.6 (29.9)	31	43.5 (34.3)	-7.3 (30.6)	-2.3 (-19, 14.4); NR, NS*
		IG1 (Women)	6	32	25.9 (14.6)	-0.7 (18.6)	32	20.9 (9.3)	-0.9 (11.1)	0.2 (-8.5, 8.9), NR, NS*
		IG1 (Women)	12	31	25.9 (14.6)	-2.4 (14.6)	30	20.9 (9.3)	0.6 (11.4)	-3 (-10.5, 4.5); NR, NS*
		IG2	6	70	35 (21.4)	-4 (22.9)	66	32.5 (27.7)	-4.9 (27.2)	0.9 (-8.7, 10.5); NR, NS*
		IG2	12	70	35 (21.4)	-2.4 (21.3)	61	32.5 (27.7)	-3.5 (25)	1.1 (-8, 10.2); NR, NS*
		IG2 (Men)	6	40	43.5 (23)	-5.5 (25.7)	34	43.5 (34.3)	-8.8 (34.2)	3.3 (-12.7, 19.3); NS*
		IG2 (Men)	12	39	43.5 (23)	-4.2 (22.5)	31	43.5 (34.3)	-7.3 (30.6)	3.1 (-11.6, 17.8); NS*
		IG2 (Women)	6	30	23.6 (11.9)	-1.9 (12.8)	32	20.9 (9.3)	-0.9 (11.1)	-1 (-7.9, 5.9); NS*
		IG2 (Women)	12	31	23.6 (11.9)	0.6 (15)	30	20.9 (9.3)	0.6 (11.4)	0 (-7.6, 7.6); NS*
	Rose, 2017[245]	IG1	6	678	9.2 (10.2)	-0.5 (9.9)	685	9.7 (10.2)	-0.9 (10.0)	0.4 (-0.7, 1.5); p=0.41
		IG1 (no AUD)	6	480	5.5 (9.4)	-0.1 (9.1)	488	5.9 (0.4)	0.0 (9.1)	-0.1 (-1.2, 1.1); NR, NS
		IG1 (AUD)	6	198	13.0 (9.4)	-0.8 (9.1)	197	13.5 (9.3)	-1.7 (9.0)	0.8 (-0.9, 2.6); NR, NS
	Rubio, 2010[168]	IG1	12	371	27.4 (9.4)	-8.2 (9.3)	381	26.9 (9.8)	-4.66 (NR)	NR; p<0.001
		IG1 (Men)	12	243	28.9 (9.8)	-7 (9.7)	248	28.2 (10)	-4.5 (9.3)	-2.6 (-4.3, -0.9); p<0.05
		IG1 (Women)	12	128	24.5 (8)	-10.3 (7)	133	24.5 (8.8)	-5.1 (8.1)	-5.2 (-7, -3.4); p<0.001
	Schulz, 2013[228]	IG1+IG2	6	313	12.1 (NR)	NR	135	14.8 (NR)	NR	β=-1.2 (0, 1.7); p=0.43
		IG1	6	132	12.8 (NR)	NR	135	14.8 (NR)	NR	0.3 (NR); NR, NS
		IG2	6	181	11.9 (9.7)	NR	NR	NR	NR	NR
	Scott, 1990[171]	IG1 (Men)	12	80	52 (12.5)	-15.7 (19.4)	74	53.2 (14.6)	-9.2 (22.4)	-6.5 (-13.1, 0.1); p<0.06
		IG1 (Women)	12	33	35.3 (9.2)	-11.6 (13)	39	36.6 (10.6)	-10 (15.3)	-1.6 (-8.1, 4.9); NR, NS
	Senft, 1997[172]	IG1	6	201	NR	NR	224	NR	NR	NR; p=0.04
		IG1	12	196	NR	NR	215	NR	NR	NR; p=0.13
		IG1 (Men)	6	148	NR	NR	153	NR	NR	NR; p=0.03
		IG1 (Men)	12	143	NR	NR	147	NR	NR	NR; p=0.08
		IG1 (Women)	6	53	NR	NR	71	NR	NR	NR; p=0.29

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Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Adults	Senft, 1997[172]	IG1 (Women)	12	53	NR	NR	68	NR	NR	NR; p=0.43
	Upshur, 2015[218]	IG1	6	40	NR	NR	36	NR	NR	NR, NS
	Wallace, 1988[174]	IG1 (Men)	6	318	62.2 (28.5)	-15.5 (26.7)	322	63.7 (34.1)	-8.2 (26.9)	-7.3 (-11.5, -3.1); p<0.001
		IG1 (Men)	12	318	62.2 (28.5)	-18.2 (26.7)	322	63.7 (34.1)	-8.1 (28.7)	-10.1 (-14.4, -5.8); p<0.001
		IG1 (Women)	6	130	35.1 (17.1)	-10.3 (14.8)	137	36.8 (19.9)	-8 (18.7)	-2.3 (-6.3, 1.7); NS
		IG1 (Women)	12	130	35.1 (17.1)	-11.5 (18.2)	137	36.8 (19.9)	-6.3 (23.4)	-5.2 (-10.2, -0.2); p<0.05
Older adults	Ettner, 2014[183]	IG1	6	453	13.3 (7.9)	-3.5 (NR)	620	13.9 (8)	-1.7 (NR)	-2.4 (NR); p<0.01
		IG1	12	439	13.3 (7.9)	-3.9 (NR)	610	13.9 (8)	-2.3 (NR)	-2.2 (NR); p<0.01
	Fleming, 1999[157]	IG1	6	87	15.5 (7.5)	-5.3 (7.5)	71	16.7 (11.3)	-0.2 (12.7)	-5.1 (-8.4, -1.8); p<0.001*
		IG1	12	87	15.5 (7.5)	-5.4 (7.3)	71	16.7 (11.3)	-0.1 (12.2)	-5.3 (-8.5, -2.1); p<0.001*
		IG1	24	87	15.5 (7.5)	-5 (7.8)	71	16.7 (11.3)	-2 (11.5)	-3 (-6.1, 0.1); p<0.001
	Moore, 2010[176]	IG1	12	213	15.1 (7.2)	-5.7 (7.6)	294	15.2 (7.4)	-4.5 (7.9)	-1.2 (-2.6, 0.2); p<0.05*
Pregnant women	Tzilos, 2011[235]	IG1	1	27	9 (9.1)	NR	23	8.3 (14.7)	NR	NR; p=0.71
Post-partum women	Fleming, 2008[158]	IG1	6	122	8.5 (5.7)	-3.6 (5.3)	113	8 (4)	-1.3 (5)	-2.3 (-3.6, -1); P=0.013
	Ondersma, 2016[212]	IG1	6	41	NR	NR	46	NR	NR	Effect size=0.5; p=0.988

* Study reported from adjusted model
† RR calculated using negative binomial model

Abbreviations: BL = baseline; CG = control group; CI = confidence interval; FU = followup; IG = intervention group; mos = months; n = number of participants; NR = not reported; NS = not significant; pop = population; RR = relative risk; sd = standard deviation; SE = standard error; yrs = years

Appendix I Table 28. Heavy Use Episodes per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Adolescents	Haug, 2016[210]	IG1 (High risk drinking)	6	80	0.7 (0.4)	-0.4 (0.4)	74	0.7 (0.3)	-0.2 (0.3)	-0.2 (-0.3, 0); p=0.01*
		IG1 (Medium risk drinking)	6	181	0.2 (0.1)	0 (0.2)	142	0.2 (0.1)	0 (0.2)	0 (0, 0); p=0.31*
Young adults	Carey, 2006[189]	IG1	6	63	1.8 (1)	0 (1.2)	66	1.9 (1)	-0.1 (1.2)	0.1 (-0.3, 0.5)
		IG1	12	65	1.8 (1)	-0.3 (1)	59	1.9 (1)	-0.7 (1)	0.3 (0, 0.7)
		IG2	6	68	1.9 (1.3)	-0.3 (1.3)	66	1.9 (1)	-0.1 (1.2)	-0.3 (-0.7, 0.1)
		IG2	12	64	1.9 (1.3)	-0.7 (1.1)	59	1.9 (1)	-0.7 (1)	0 (-0.4, 0.4)
		IG3	6	66	1.7 (1)	-0.2 (1)	66	1.9 (1)	-0.1 (1.2)	-0.2 (-0.5, 0.2)
		IG3	12	68	1.7 (1)	-0.1 (1.2)	59	1.9 (1)	-0.7 (1)	0.6 (0.2, 1)
		IG4	6	62	1.8 (1.2)	-0.5 (1.2)	66	1.9 (1)	-0.1 (1.2)	-0.5 (-0.9, 0)
		IG4	12	68	1.8 (1.2)	-0.6 (1.2)	59	1.9 (1)	-0.7 (1)	0.1 (-0.3, 0.5)
	Daeppen, 2011[192]	IG1	6	110	1 (0.9)	-0.8	125	0.8 (0.8)	-0.8	(1, 0.3); p=0.12*
	Fleming, 2010[160]	IG1	6	493	1.8 (0.9)	-0.5 (1)	493	1.8 (0.8)	-0.3 (0.9)	-0.2 (-0.3, 0.0)
		IG1	12	493	1.8 (0.9)	-0.5 (1)	493	1.8 (0.8)	-0.4 (0.9)	-0.1 (-0.2, 0); p=0.148
	Kypri, 2004[161]	IG1	6	47	(NR)	(NR)	47	(NR)	(NR)	(0.0, 0.6)
	Kypri, 2008[162]	IG1	6	122	NR	NR	124	NR	NR	(0.0, 0.5)
		IG1	12	121	NR	NR	126	NR	NR	(0.0, 0.5)
		IG2	6	114	NR	NR	124	NR	NR	(0.0, 0.6)
		IG2	12	113	NR	NR	126	NR	NR	(0.0, 0.5)
	LaBrie, 2009[196]	IG1	6	140	2.5 (4.1)	-1.9 (3.8)	110	1.8 (3.2)	-1.2 (2.9)	-0.6 (-1.5, 0.2); NR, NS
	Leeman, 2016[211]	IG1	6	53	1.1 (1.2)	-0.3 (1)	50	1.5 (1.7)	-0.3 (1.6)	0 (-0.5, 0.6); NR, NS
		IG2	6	53	1.2 (1.3)	-0.3 (1.2)	50	1.5 (1.7)	-0.3 (1.6)	0 (-0.5, 0.6); NR, NS
		IG3	6	52	1 (0.9)	0 (0.9)	50	1.5 (1.7)	-0.3 (1.6)	0.3 (-0.2, 0.8); NR, NS
	Neighbors, 2010[201]	IG1	6	164	6.6 (NR)	-0.7 (NR)	164	6.3 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.28
		IG1	12	164	6.6 (NR)	-1.3 (NR)	164	6.3 (NR)	-1 (NR)	β=-0.01 (SE=0.01); p=0.28
		IG1	18	164	6.6 (NR)	-1 (NR)	164	6.3 (NR)	-1.8 (NR)	β=-0.01 (SE=0.01); p=0.28
	Neighbors, 2010[201]	IG1	24	164	6.6 (NR)	-2.3 (NR)	164	6.3 (NR)	-1.6 (NR)	β=-0.01 (SE=0.01); p=0.28
		IG2	6	163	6.4 (NR)	-1 (NR)	164	6.3 (NR)	-0.9 (NR)	β=0.0 (SE=0.01); p=0.64
		IG2	12	163	6.4 (NR)	-0.8 (NR)	164	6.3 (NR)	-1 (NR)	β=0.0 (SE=0.01); p=0.64
		IG2	18	163	6.4 (NR)	-1.6 (NR)	164	6.3 (NR)	-1.8 (NR)	β=0.0 (SE=0.01); p=0.64
		IG2	24	163	6.4 (NR)	-1.2 (NR)	164	6.3 (NR)	-1.6 (NR)	β=0.0 (SE=0.01); p=0.64
		IG3	6	163	6.5 (NR)	-0.7 (NR)	164	6.3 (NR)	-0.9 (NR)	β=-0.01 (SE=0.01); p=0.38
		IG3	12	163	6.5 (NR)	-0.7 (NR)	164	6.3 (NR)	-1 (NR)	β=-0.01 (SE=0.01); p=0.38
		IG3	18	163	6.5 (NR)	-0.9 (NR)	164	6.3 (NR)	-1.8 (NR)	β=-0.01 (SE=0.01); p=0.38
		IG3	24	163	6.5 (NR)	-1.8 (NR)	164	6.3 (NR)	-1.6 (NR)	β=-0.01 (SE=0.01); p=0.38
		IG4	6	164	6.9 (NR)	-0.9 (NR)	164	6.3 (NR)	-0.9 (NR)	β=0.0 (SE=0.01); p=0.73

Appendix I Table 28. Heavy Use Episodes per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
		IG4	12	164	6.9 (NR)	-0.8 (NR)	164	6.3 (NR)	-1 (NR)	β=0.0 (SE=0.01); p=0.73
		IG4	18	164	6.9 (NR)	-1.2 (NR)	164	6.3 (NR)	-1.8 (NR)	β=0.0 (SE=0.01); p=0.73
		IG4	24	164	6.9 (NR)	-1.4 (NR)	164	6.3 (NR)	-1.6 (NR)	β=0.0 (SE=0.01); p=0.73
Young adults	Schaus, 2009[170]	IG1	6	181	1.3 (1.1)	-0.3 (1.3)	182	1.4 (1.2)	0 (1.7)	-0.3 (-0.6, 0); p=0.031*
		IG1	9	181	1.3 (1.1)	-0.3 (1.3)	182	1.4 (1.2)	-0.2 (1.6)	-0.1 (-0.4, 0.2); p=0.534*
		IG1	12	181	1.3 (1.1)	-0.2 (1.3)	182	1.4 (1.2)	-0.3 (1.4)	0.1 (-0.2, 0.4); p=0.942*
	Voogt, 2014[226]	IG1	6	456	1.8 (1)	0 (1)	451	1.7 (1.1)	0.1 (1)	-0.1 (-0.2, 0); p=0.045
Adults	Chang, 2011[190]	IG1	12	239	0.3 (0.9)	-0.1 (0.9)	252	0.2 (0.6)	-0.1 (0.5)	0 (-0.1, 0.2); p=0.11ǂ
	Fleming, 1997[153]	IG1	6	392	1.4 (1.5)	-0.7 (1.4)	382	1.3 (1.3)	-0.4 (1.2)	-0.3 (-0.5, -0.2); p<0.005
		IG1	12	392	1.4 (1.5)	-0.6 (1.4)	382	1.3 (1.3)	-0.3 (1.3)	-0.4 (-0.6, -0.2); p<0.005
		IG1	24	392	1.4 (1.5)	-0.3 (NR)	382	1.3 (1.3)	0.2 (NR)	NR; p<0.05
		IG1	36	392	1.4 (1.5)	-0.3 (NR)	382	1.3 (1.3)	0.1 (NR)	NR; p<0.05
		IG1	48	392	1.4 (1.5)	-0.4 (NR)	382	1.3 (1.3)	-0.1 (NR)	NR; p<0.05
		IG1 (Men)	6	244	1.5 (1.6)	-0.7 (1.5)	238	1.4 (1.2)	-0.3 (1.3)	-0.4 (-0.7, -0.2); p<0.025
		IG1 (Men)	12	244	1.5 (1.6)	-0.7 (1.5)	238	1.4 (1.2)	-0.2 (1.3)	-0.4 (-0.7, -0.2); p<0.05
		IG1 (Women)	6	148	1.2 (1.2)	-0.7 (1.1)	144	1.3 (1.3)	-0.5 (1.2)	-0.2 (-0.4, 0.1); p<0.02
		IG1 (Women)	12	148	1.2 (1.2)	-0.6 (1.2)	144	1.3 (1.3)	-0.4 (1.3)	-0.2 (-0.5, 0); p<0.02
		IG1 (18-30 yrs)	6	114	1.5 (1)	-0.7 (1.1)	112	1.6 (1.1)	-0.3 (1.1)	-0.4 (-0.6, -0.1); p=0.01*
	Fleming, 1997[153]	IG1 (18-30 yrs)	12	114	1.5 (1)	-0.8 (1)	112	1.6 (1.1)	-0.2 (1.1)	-0.5 (-0.8, -0.2); p=0.001*
		IG1 (18-30 yrs)	24	114	1.5 (1)	-0.4 (1.1)	112	1.6 (1.1)	-0.2 (1.2)	-0.2 (-0.6, 0.1); p=0.03*
		IG1 (18-30 yrs)	36	114	1.5 (1)	-0.4 (1.3)	112	1.6 (1.1)	-0.2 (1.4)	-0.2 (-0.6, 0.1); NR, NS*
		IG1 (18-30 yrs)	48	114	1.5 (1)	-0.6 (1.1)	112	1.6 (1.1)	-0.4 (1.3)	-0.2 (-0.5, 0.1); p=0.08*
	Helstrom, 2014[240]	IG1	8	68	2.8 (2.6)	-1.2 (2.5)	71	2.2 (2.3)	-0.9 (2.2)	-0.4 (-1.1, 0.4), NR, NS
		IG1	12	68	2.8 (2.6)	-1 (2.6)	71	2.2 (2.3)	-1 (2.2)	0 (-0.8, 0.8); NR, NS
	Ockene, 1999[165]	IG1	6	248	1.2 (1.6)	-1.2	233	1 (1.4)	-1.2	0.8 (0.7, 0); p=0.09*
		IG1	12	235	1.2 (1.6)	-0.5 (1.2)	210	1 (1.4)	-0.4 (1.2)	0.9 (0.7, -0.1); p=0.36*
		IG1	48	235	1.2 (1.6)	NR	210	1 (1.4)	NR	β=1 (0, 1.2); p>0.05
	Rubio, 2010[168]	IG1	12	371	0.7 (0.6)	-0.5 (0.5)	381	0.7 (0.6)	-0.3 (0.5)	-0.1 (-0.2, 0); p<0.001
		IG1 (Men)	12	243	0.9 (0.6)	-0.6 (0.5)	248	0.9 (0.6)	-0.4 (0.5)	-0.1 (-0.2, 0); p<0.05
		IG1 (Women)	12	128	0.6 (0.4)	-0.4 (0.4)	133	0.6 (0.5)	-0.3 (0.4)	-0.1 (-0.2, 0); p<0.001
	Saitz, 2003[169]	IG1 (Faculty physicians)	6	NR	NR	NR	NR	NR	NR	NR, NS
	Saitz, 2003[169]	IG1 (Resident physicians)	6	NR	NR	NR	NR	NR	NR	NR, NS

Appendix I Table 28. Heavy Use Episodes per Week, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Older adults	Fleming, 1999[157]	IG1	6	87	0.8 (1.7)	-0.4 (1.5)	71	1.2 (2.2)	0 (2.2)	-0.3 (-0.9, 0.3); p<0.05*
		IG1	12	87	0.8 (1.7)	-0.6 (1.5)	71	1.2 (2.2)	0.2 (2.3)	-0.8 (-1.4, -0.1); p<0.001*
		IG1	24	87	0.8 (1.7)	-0.3 (1.5)	71	1.2 (2.2)	-0.2 (2.2)	-0.2 (-0.8, 0.5); NR, NS*
Postp-artum women	Fleming, 2008[158]	IG1	6	122	0.9 (1)	-0.4 (0.8)	113	0.8 (0.8)	-0.1 (0.8)	-0.3 (-0.5, -0.1); p=0.019
	Ondersma, 2016[212]	IG1	6	41	NR	NR	46	NR	NR	Effect size=0.5 (NR); p=0.499

* Study reported from adjusted model

Abbreviations: BL = baseline; CG = control group; CI = confidence interval; FU = followup; IG = intervention group; Int = intervention; mos = months; n = number of participants; NR = not reported; NS = not statistically significant; pop = population; sd = standard deviation; SE = standard error; yrs = years

Appendix I Table 29. Drinks per Drinking Day, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI)
Young adults	Carey, 2006[189]	IG1	6	63	5.8 (3.3)	-1 (2.9)	66	5.8 (2.6)	-0.4 (2.5)	-0.6 (-1.5, 0.3)
		IG1	12	65	5.8 (3.3)	-1.3 (2.9)	59	5.8 (2.6)	-1.2 (2.6)	-0.1 (-1.1, 0.9)
		IG2	6	68	5.7 (3.4)	-1.4 (3)	66	5.8 (2.6)	-0.4 (2.5)	-1 (-1.9, -0.1)
		IG2	12	64	5.7 (3.4)	-1.6 (3.1)	59	5.8 (2.6)	-1.2 (2.6)	-0.4 (-1.4, 0.6)
		IG3	6	66	5.7 (2.5)	-1.1 (2.6)	66	5.8 (2.6)	-0.4 (2.5)	-0.7 (-1.6, 0.2)
		IG3	12	68	5.7 (2.5)	-0.8 (2.7)	59	5.8 (2.6)	-1.2 (2.6)	0.4 (-0.5, 1.3)
		IG4	6	62	5.5 (2.3)	-1.2 (2.4)	66	5.8 (2.6)	-0.4 (2.5)	-0.8 (-1.6, 0)
		IG4	12	68	5.5 (2.3)	-1.4 (2.9)	59	5.8 (2.6)	-1.2 (2.6)	-0.2 (-1.2, 0.8)
	Kypri, 2008[162]	IG1	6	122	NR	NR	124	NR	NR	RR=0.8 (0,1), p=0.002
		IG1	12	121	NR	NR	126	NR	NR	RR=0.9 (0,1), p=0.06
		IG2	6	114	NR	NR	124	NR	NR	RR=0.9 (NR), p=0.33
		IG2	12	113	NR	NR	126	NR	NR	RR=1 (0, 1.1), p=0.47
	Kypri, 2009[195]	IG1	6	1251	8.5 (5.2)	NR	1184	8.5 (4.6)	NR	RR*=0.9 (0.9, 1.0); p=0.02†
	Lewis, 2014[225]	IG1	6	119	5 (3.3)	-1.3 (2.9)	121	4.4 (2)	-0.5 (2.1)	-0.9 (-1.5, -0.2)
		IG2	6	119	4.5 (2.8)	-1 (2.6)	121	4.4 (2)	-0.5 (2.1)	-0.5 (-1.1, 0.1)
	Marlatt, 1998[198]	IG1	12	143	4.7 (2.3)	-0.7 (2.5)	156	4.2 (2.7)	0 (2.7)	-0.7 (-1.3, -0.1); NR, NS
		IG1	24	143	4.7 (2.3)	-1.1 (2.4)	156	4.2 (2.7)	-0.2 (2.8)	-0.9 (-1.5, -0.3); NR, NS
	Schaus, 2009[170]	IG1	6	181	4.7 (2.3)	-0.9 (2.9)	182	4.9 (2.4)	-0.3 (3)	-0.5 (-1.1, 0.1); p=0.027†
		IG1	9	181	4.7 (2.3)	-0.7 (3.4)	182	4.9 (2.4)	-0.9 (2.7)	0.2 (-0.4, 0.8); p=0.928†
		IG1	12	181	4.7 (2.3)	-0.7 (2.7)	182	4.9 (2.4)	-0.9 (2.8)	0.1 (-0.4, 0.7); p=0.757†
Adults	Aalto, 2000[206]	IG1 (Men)	36	97	13.1 (8)	-0.6 (7.8)	84	13 (8.3)	0.7 (8.3)	-1.3 (-3.7, 1.1); NR, NS
		IG1 (Women)	36	37	9.5 (4.7)	1.7 (6.6)	39	8.2 (5)	-0.5 (4.7)	2.2 (-0.4, 4.8); NR, NS
	Chang, 2011[190]	IG1	12	239	2.1 (1.4)	-0.2 (1.4)	252	2.2 (1.5)	-0.3 (1.4)	-0.1 (-0.3, 0.2); p=0.63†
	Crawford, 2014[185]	IG1	6	291	NR	NR	301	NR	NR	-1.1 (-2, -0.3); p=0.009†
	Drummond, 2009[208]	IG1	6	39	15.2 (8.1)	-2.4 (5)	52	12.9 (6.1)	-1 (5.8)	-1.4 (-3.6, 0.8); NR, NS†
	Helstrom, 2014[240]	IG1	8	68	4.9 (2.7)	-0.1 (3)	71	4.8 (3)	0 (2.9)	-0.1 (-1.1, 0.9); NR, NS
		IG1	12	68	4.9 (2.7)	-0.3 (2.7)	71	4.8 (3)	-0.7 (2.8)	0.4 (-0.5, 1.3); NR, NS
	Maisto, 2001[163]	IG1	6	73	5.3 (3.3)	-0.9 (3.4)	85	6 (3.8)	-0.9 (4.5)	0 (-1.2, 1.2)
		IG1	12	73	5.3 (3.3)	-1.3 (2.9)	85	6 (3.8)	-1.5 (3)	0.2 (-0.7, 1.1); NR, NS
		IG2	6	74	5.6 (4.2)	-1.3 (3.9)	85	6 (3.8)	-0.9 (4.5)	-0.4 (-1.7, 0.9)
	Maisto, 2001[163]	IG2	12	74	5.6 (4.2)	-1.6 (3.4)	85	6 (3.8)	-1.5 (3)	-0.1 (-1.1, 0.9); NR, NS
	Rose, 2017[245]	IG1	6	650	2.8 (2.3)	-0.1 (2.2)	648	3 (2.2)	-0.1 (2.1)	0 (-0.2, 0.2); p=0.86
		IG1 (AUD)	6	193	3.3 (2.0)	-0.2 (2.0)	184	3.7 (2.0)	-0.1 (1.9)	-0.1 (-0.5, 0.3); NR, NS
		IG1 (no AUD)	6	457	2.3 (1.9)	0 (1.9)	464	2.3 (1.9)	0 (1.9)	0.1 (-0.2, 0.3); NR, NS
	Saitz, 2003[169]	IG1 (Faculty physicians)	6	168	5.6 (5.3)	0.4 (9.7)	144	5.5 (4.2)	1 (11.4)	NR, NS
		IG1 (Resident physicians)	6	168	5.6 (5.3)	-1.8 (10.9)	144	5.5 (4.2)	6.1 (35.7)	NR; p=0.054
	Senft, 1997[172]	IG1	6	202	5 (3.3)	-1.7 (NR)	226	4.7 (3.5)	-1.2 (NR)	NR; p=0.13
		IG1	12	198	5 (3.3)	-1.4 (NR)	216	4.7 (3.5)	-1.4 (NR)	NR; p=0.2

Appendix I Table 29. Drinks per Drinking Day, by Subpopulation (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI)
		IG1 (Men)	6	149	NR	NR	154	NR	NR	NR; p=0.05
		IG1 (Men)	12	145	NR	NR	148	NR	NR	NR; p=0.37
		IG1 (Women)	6	53	NR	NR	72	NR	NR	NR; p=0.38
		IG1 (Women)	12	53	NR	NR	68	NR	NR	NR; p=0.17
Pregnant women	Chang, 1999[181]	IG1	5	123	0.6 (1.1)	-0.3 (NR)	127	0.9 (1.5)	-0.4 (NR)	NR, NS
	Chang, 2005[191]	IG1	5	152	1.6 (NR)	NR	152	1.6 (NR)	NR	β=0 (1, 0.2)
	Osterman, 2014[221]	IG1	1	44	0.2 (0.6)	-0.1 (0.5)	49	0.2 (0.9)	-0.2 (0.8)	0.1 (-0.2, 0.3)
		IG1	5	49	0.2 (0.6)	0.2 (0.7)	49	0.2 (0.9)	-0.1 (0.8)	0.2 (-0.1, 0.5); NR, NS
	Rubio, 2014[184]	IG1	8	125	0.2 (0.8)	0.1 (0.7)	126	0.5 (3.4)	-0.1 (3.1)	0.2 (-0.3, 0.8); p=0.072
		IG1	13	125	0.2 (0.8)	0.4 (0.7)	126	0.5 (3.4)	0.2 (3.1)	0.2 (-0.4, 0.7); p=0.069
		IG1	19	125	0.2 (0.8)	0.7 (1.6)	126	0.5 (3.4)	0.6 (3)	0.1 (-0.5, 0.7); p=0.069

* RR calculated with negative binomial model
† Study reported from adjusted model

Abbreviations: BL = baseline; CG = control group; CI = confidence interval; FU = followup; IG = intervention group; Int = intervention; mos = months; n = number of participants; NR = not reported; NS = not statistically significant; pop = population; RR = relative risk; sd = standard deviation

Appendix I Table 30. Other Continuous Drinking Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	nstrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
% days abstinent, alcohol	Adults	Drummond, 2009[208]	TLFB; NA	IG1	6	39	37.9 (27.9)	4 (18.1)	52	36.6 (25.9)	6.2 (20.9)	-2.2 (-10.2, 5.8); NR, NS*
Days abstinent in past 30 days, alcohol	Adults	Maisto, 2001[163]	TLFB; NA	IG1	6	73	16.5 (9.2)	3.1 (9.3)	85	17.2 (9.2)	1.8 (9.5)	1.3 (-1.6, 4.2)
			TLFB; NA	IG1	12	73	16.5 (9.2)	3.6 (8.7)	85	17.2 (9.2)	1.2 (7.1)	2.4 (-0.1, 4.9); NR, NS
			TLFB; NA	IG2	6	74	15.4 (26.8)	2.7 (23.4)	85	17.2 (9.2)	1.8 (9.5)	0.9 (-4.8, 6.6)
			TLFB; NA	IG2	12	74	15.4 (26.8)	2.5 (8.8)	85	17.2 (9.2)	1.2 (7.1)	1.4 (-1.1, 3.9); NR, NS
Cons-umption Index	Young adults	Neighbors, 2004[200]	ACI; 0-6; worse	IG1	6	126	2 (1.3)	-0.4 (1.3)	126	1.9 (1.3)	-0.1 (1.4)	-0.4 (-0.7, 0)
Depen d-ence	Adults	Drummond, 2009[208]	ADQ; 0-60; worse	IG1	6	39	8.2 (6.6)	-1.5 (3.7)	52	8.8 (9.1)	-1.2 (5.8)	-0.3 (-2.3, 1.7); NR, NS*
	Young adults	Marlatt, 1998[198]	ADS; 0.47; worse	IG1	12	143	7.9 (3.8)	-0.8 (4)	156	8.2 (3.9)	-0.2 (4.2)	-0.6 (-1.5, 0.3); NR, NS
				IG1	24	143	7.9 (3.8)	-1.4 (3.7)	156	8.2 (3.9)	-0.4 (4.2)	-1 (-1.9, -0.1); NR, NS
Alcohol severity	Young adults	Bertholet, 2015[220]	AUDIT; 0-12; worse	IG1	6	338	10.7 (4.3)	-1.7 (3.6)	329	10.5 (4)	-0.9 (3.5)	-0.8 (-1.3, -0.3)
	Young adults	Johnsson, 2006[194]	AUDIT; 0-40; worse	IG1	12	89	12.4 (3.6)	-1.7 (4.6)	88	12.8 (3.8)	-2.7 (4.5)	-1 (-2.5, 0.4); NR, NS
				IG1 (Men)	12	67	13.7 (3.1)	-1.7 (5.2)	66	13.9 (3.3)	-3.1 (5)	-1.4 (-3.2, 0.4)
				IG1 (Women)	12	22	9 (2.6)	-1.8 (2.3)	22	9.7 (3.5)	-1.9 (3.5)	-0.1 (-2, 1.9); NR, NS
			AUDIT-C; 0-12; worse	IG1	12	89	7 (1.6)	-0.8 (1.7)	88	6.9 (1.8)	-0.8 (1.7)	0 (-0.6, 0.9)
	Young adults	Johnsson, 2006[194]	AUDIT-C; 0-12; worse	IG1 (Men)	12	67	7.6 (1.3)	-0.8 (1.7)	66	7.6 (1.6)	-0.9 (2.1)	-0.1 (-0.7, 0.6)
				IG1 (Women)	12	22	5.5 (1.2)	-0.8 (1)	22	5.3 (1.1)	-0.3 (1.1)	0.5 (-0.3, 1.2)
	Young adults	Kypri, 2008[162]	AUDIT; 0-40; worse	IG1	12	121	14.7 (4.7)	(NR)	126	15.1 (5.5)	(NR)	β=-2 (0, -1); p<0.001
				IG2	12	113	14.9 (5.1)	(NR)	126	15.1 (5.5)	(NR)	β=-2.2 (0, -1.1); p<0.001
	Adults	Burge, 1997[188]	ASI; 0-1; worse	IG1	12	47	0.2 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*
				IG1	18	47	0.2 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*
				IG2	12	42	0.2 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*

Appendix I Table 30. Other Continuous Drinking Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	nstrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Alcohol severity	Adults	Burge, 1997[188]	ASI; 0-1; worse	IG2	18	42	0.2 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*
				IG3	12	40	0.1 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*
				IG3	18	40	0.1 (0.2)	(NR)	46	0.2 (0.2)	(NR)	NR, NS*
	Adults	Kaner, 2013[186]	AUDIT; 0-40; worse	IG1	6	205	13.1 (6.9)	-2.1 (7)	202	12.3 (6.4)	-0.9 (5.7)	-1.2 (-2.4, 0.1); p=0.5*
				IG1	12	203	13.1 (6.9)	-2.6 (6.4)	195	12.3 (6.4)	-1.6 (5.5)	-1 (-2.2, 0.2); p=0.59*
				IG2	6	208	12.6 (5.9)	-1.2 (5.1)	202	12.3 (6.4)	-0.9 (5.7)	-0.2 (-1.3, 0.8); p=0.87*
				IG2	12	205	12.6 (5.9)	-2.1 (5.1)	195	12.3 (6.4)	-1.6 (5.5)	-0.5 (-1.5, 0.5); p=0.53*
	Adults	Wilson, 2014[224]	AUDIT; 0-40; worse	IG1	6	28	12 (4.7)	-1.8 (2.9)	39	12 (4.7)	-1.5 (5.2)	-0.3 (-3.4, 2.8)
	Adults	Butler, 2013[242]	AUDIT-C; 0-12; worse	IG1	12	227	(NR)	0.5 (NR)	267	(NR)	0.6 (NR)	-0.1 (-0.4, 0.2)
	Adults	Cunningham, 2012[231]	AUDIT-C; 0-12; worse	IG1	6	589	7.7 (1.9)	-0.9 (2.2)	589	7.7 (1.9)	-0.7 (2.1)	-0.2 (-0.4, 0); p=0.043
	Older adults	Watson, 2013[230]	Extended AUDIT-C; 0-12; worse	IG1	6	238	8.3 (2.2)	-1.2 (2.3)	231	8.2 (2.3)	-0.9 (2.4)	-0.4 (-0.8, 0.1); NR, NS*
			Extended AUDIT-C; 0-12; worse	IG1	12	229	8.3 (2.2)	-1.2 (2.3)	229	8.2 (2.3)	-1.3 (2.5)	0.1 (-0.3, 0.5); NR, NS*
	Older adults	Moore, 2010[176]	CARET; 0-7; worse	IG1	12	222	2.9 (1.7)	-1.5 (1.8)	299	3 (1.7)	-1.4 (1.8)	-0.1 (-0.5, 0.2); NR, NS*
	Pregnant women	Osterman, 2014[221]	AUDIT; 0-40; worse	IG1	1	44	4.9 (5)	-4.4 (4.6)	49	5.6 (4.9)	-5.2 (4.4)	0.8 (-1, 2.7)
				IG1	5	49	4.9 (5)	-4.3 (4.5)	49	5.6 (4.9)	-5.2 (4.5)	0.9 (-0.9, 2.6); NR, NS
Daily alcohol use	Adults	Helstrom, 2014[240]	TLFB; NA	IG1	8	68	3.1 (2.1)	-0.8 (2.6)	71	3.3 (2.7)	-0.8 (2.9)	0 (-0.9, 0.9); NR, NS
				IG1	12	68	3.1 (2.1)	-0.6 (2.4)	71	3.3 (2.7)	-1 (2.6)	0.4 (-0.5, 1.2); NR, NS
Drinks per day item	Older adults	Watson, 2013[230]	Extended AUDIT-C; 0-6; worse	IG1	6	236	3.4 (2.2)	-0.9 (2.1)	229	3.4 (2.2)	-0.6 (2.1)	-0.3 (-0.7, 0.1); NR, NS*
				IG1	12	228	3.4 (2.2)	-0.8 (2.2)	228	3.4 (2.2)	-0.9 (2.1)	0.1 (-0.3, 0.5); NR, NS*
Drinks per drinking day	Young adults	Marlatt, 1998[198]	DDQ; NR; worse	IG1	12	143	0.91 (0.92)	NR	156	0.73 (0.90)	NR	0.15 (0.10); NR, NS
				IG1	24	143	0.91 (0.92)	NR	156	0.73 (0.90)	NR	0.12 (0.10); NR, NS
				IG1	36	143	0.91 (0.92)	NR	156	0.73 (0.90)	NR	0.03 (0.09); NR, NS
				IG1	48	143	0.91 (0.92)	NR	156	0.73 (0.90)	NR	0.10 (0.09); p<0.01
				IG1	12	143	0.78 (0.88)	NR	156	0.74 (0.88)	NR	0.20 (0.10); NR, NS

Appendix I Table 30. Other Continuous Drinking Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	nstrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Drinks per week factor score	Young adults	Marlatt, 1998[198]	DDQ; NR; worse	IG1	24	143	0.78 (0.88)	NR	156	0.74 (0.88)	NR	0.09 (0.10); NR, NS
				IG1	36	143	0.78 (0.88)	NR	156	0.74 (0.88)	NR	0.13 (0.11); NR, NS
				IG1	48	143	0.78 (0.88)	NR	156	0.74 (0.88)	NR	0.06 (0.12); p<0.01
Drinks per weekend	Young adults	Turrisi, 2009[205]	DDQ; NR; worse	IG1	10	278	3.3 (4.9)	2.3 (4.7)	305	3.5 (4.9)	3.1 (4.9)	-0.8 (-1.6, 0); p<0.05*
				IG2	10	228	3.1 (4.9)	2.7 (4.8)	305	3.5 (4.9)	3.1 (4.9)	-0.4 (-1.3, 0.4)
				IG3	10	279	3.2 (118.8)	3.6 (116.5)	305	3.5 (4.9)	3.1 (4.9)	0.4 (-13.3, 14.1); p=0.05*
Drunk times/week	Young adults	Schaus, 2009[170]	TLFB; NA	IG1	6	181	1.1 (1.2)	-0.4 (1.1)	182	1.1 (1.2)	0 (1.2)	-0.4 (-0.6, -0.2); p=0.003*
				IG1	9	181	1.1 (1.2)	-0.2 (1.3)	182	1.1 (1.2)	0.2 (1.4)	-0.4 (-0.7, -0.2); p=0.078*
				IG1	12	181	1.1 (1.2)	0.2 (1.8)	182	1.1 (1.2)	0.6 (1.8)	-0.4 (-0.8, 0); p=0.727*
Days used, past month	Adolescents	Mason, 2015[215]	YRBS; 0-7; worse	IG1 (Men)	6	15	0.5 (NR)	-0.3 (NR)	20	0.5 (NR)	0.3 (NR)	0.5 (0,); p<0.05
				IG1 (Women)	6	44	0.7 (NR)	0.1 (NR)	40	1.2 (NR)	-0.4 (NR)	NR, NS
Quantity-Frequency Scale	Young adults	Larimer, 2007[197]	Quantity/ Frequency/Peak Alcohol Use Index; 0-6; worse	IG1	12	737	1.4 (1.3)	0.2 (1.3)	751	1.5 (1.3)	0.3 (1.3)	-0.1 (-0.2, 0); p<0.01*
Drinking days/week, past month	Adults	Rose, 2017[245]	TLFB; NA	IG1	6	678	3.2 (2.6)	-0.1 (2.5)	685	3.2 (2.6)	-0.1 (2.5)	-0.1 (-0.3, 0.2); p=0.64
			TLFB; NA	IG1 (AUD)	6	198	3.9 (2.3)	-0.2 (2.2)	197	3.7 (2.4)	-0.2 (2.2)	0 (-0.5, 0.4); NR, NS
			TLFB; NA	IG1 (no AUD)	6	480	2.5 (2.2)	-0.1 (2.2)	488	2.6 (2.2)	0 (2.2)	-0.1 (-0.4, 0.2); NR, Ns

Appendix I Table 30. Other Continuous Drinking Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	nstrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Drinking days/month, factor score	Young adults	LaBrie, 2013[227]	Quantity/ Frequency/Peak Alcohol Use Index; 0-7; worse	IG1	6	143	1.7 (1.2)	-0.2 (1.1)	142	1.6 (1.1)	-0.1 (1.1)	-0.1 (-0.4, 0.1); NR, NS
	Young adults			IG1	12	144	1.7 (1.2)	-0.2 (1.2)	143	1.6 (1.1)	0 (1.1)	-0.1 (-0.4, 0.1); NR, NS
	Young adults			IG2	6	143	1.6 (1.2)	-0.1 (1.2)	142	1.6 (1.1)	-0.1 (1.1)	0 (-0.3, 0.3); NR, NS
	Young adults			IG2	12	139	1.6 (1.2)	-0.1 (1.2)	143	1.6 (1.1)	0 (1.1)	-0.1 (-0.4, 0.2); NR, NS
Drinking days, past 3 months	Young adults	Lewis, 2014[225]	Quantity/ Frequency/Peak Alcohol Use Index; 0-30; worse	IG1	6	119	2.2 (1.5)	-0.8 (1.4)	121	2.2 (1.5)	-0.6 (1.5)	-0.2 (-0.5, 0.2)
	Young adults			IG2	6	119	2.2 (1.7)	-0.8 (1.5)	121	2.2 (1.5)	-0.6 (1.5)	-0.2 (-0.6, 0.2)
Peak drinks/day	Adults	Cunningham, 2012[231]	Other/Generic; NA	IG1	6	589	9.6 (5.7)	-1.1 (5.4)	589	9.2 (5.3)	-0.7 (5.2)	-0.4 (-1, 0.2); NR, NS
	Young adults	LaBrie, 2009[196]	Retrospective Diary; NA	IG1	6	140	4.1 (4.4)	-1.7 (3.9)	110	3.5 (3.9)	-0.5 (3.5)	-1.2 (-2.1, -0.3)
	Young adults	LaBrie, 2013[227]	Quantity/ Frequency/Peak Alcohol Use Index; NA	IG1	6	143	8.6 (3.7)	-1.8 (4)	142	8.8 (3.9)	-1.4 (4.2)	-0.4 (-1.3, 0.5); NR, NS
				IG1	12	144	8.6 (3.7)	-1.6 (4)	143	8.8 (3.9)	-1.7 (3.9)	0.1 (-0.8, 1); NR, NS
				IG2	6	143	8.5 (4)	-1.3 (4.1)	142	8.8 (3.9)	-1.4 (4.2)	0.1 (-0.9, 1.1); NR, NS
				IG2	12	139	8.5 (4)	-1.9 (4.2)	143	8.8 (3.9)	-1.7 (3.9)	-0.2 (-1.1, 0.7); NR, NS
	Young adults	Leeman, 2016[211]	NR	IG1	6	48	6.9 (3.7)	-1.2 (4.4)	42	5.4 (2.2)	0.7 (4.8)	-1.9 (-3.8, 0); p<0.05*
			NR	IG2	6	45	6.7 (4.3)	-0.4 (5.4)	42	5.4 (2.2)	0.7 (4.8)	-1.1 (-3.2, 1.1); NR, NS
			NR	IG3	6	48	6.5 (3)	-1.2 (3.6)	42	5.4 (2.2)	0.7 (4.8)	-1.9 (-3.6, -0.1); p<0.05*
	Young adults	Schaus, 2009[170]	TLFB; NA	IG1	6	181	8.2 (4.4)	-1.6 (4.9)	182	8.7 (4.4)	-0.7 (4.9)	-0.9 (-1.9, 0.1); p=0.005*
				IG1	9	181	8.2 (4.4)	-1.4 (5.1)	182	8.7 (4.4)	-1.8 (4.4)	0.3 (-0.7, 1.3); p=0.626*
				IG1	12	181	8.2 (4.4)	-1.4 (4.9)	182	8.7 (4.4)	-1.8 (4.5)	0.3 (-0.6, 1.3); p=0.7*
Peak quantity	Young adults	Neighbors, 2004[200]	ACI; 0-6; worse	IG1	6	126	9.1 (4.5)	-1.4 (4.9)	126	8.9 (4.6)	-0.3 (5)	-1.2 (-2.4, 0)
% of days used alcohol	Adults	Chang, 2011[190]	TLFB; NA	IG1	12	239	NR	-4.3 (0.2)	252	NR	-1.3 (1.7)	3 (-0.1, 6); p=0.07*
	Pregnant women	Chang, 2005[191]	TLFB; NA	IG1	5	152	NR	NR	152	NR	NR	β=0.8 (1, 2); NR, NS

Appendix I Table 30. Other Continuous Drinking Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	nstrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference (95% CI); study reported p-value
Severity NOS	Adults	Heather, 1987[209]	Other/Generic; NR; better	IG1	6	29	420 (133.6)	-0.3 (142.4)	32	420.3 (122.8)	-25.9 (134.5)	25.6 (-44.1, 95.3); NR, NS
				IG2	6	30	457.4 (99.2)	-9.4 (105.9)	32	420.3 (122.8)	-25.9 (134.5)	16.5 (-43.6, 76.6); NR, NS
Weeks >sensible drinking limits	Adults	Chang, 2011[190]	TLFB; NA	IG1	12	239	4.2 (7.9)	-0.8 (5.8)	252	3.5 (7.1)	-0.7 (0.6)	0.3 (-1.2, 0.6); p=0.57*

* Study reported from adjusted model

Abbreviations: ACI = Alcohol Consumption Index; ADQ = Alcohol Dependence Questionnaire; ADS = Alcohol Dependence Scale; ASI = Addiction Severity Index; AUDIT = Alcohol Use Disorders Index Test; AUDIT-C = Alcohol Use Disorders Index Test – Consumption; BL = baseline; CARET = Comorbidity Alcohol Risk Evaluation Tool; CG = control group; CI = confidence interval; DDQ = Daily Drinking Questionnaire; FU = followup; IG = intervention group; Int = intervention; mos = months; n = number of participants; NA = not applicable; NOS = not otherwise specified; NR = not reported; NS = not statistically significant; pop = population; sd = standard deviation; TLFB = Timeline Followback; YRBS = Youth Risk Behavior Survey

Appendix I Table 31. Continuous Nondrinking Behavioral Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	Instrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean	CG mean change	Between-group difference (95% CI); study reported p-value
Cannabis-related consequences	Young adults	Neighbors, 2010[201]	RAPI*; 0-125; worse	IG1	6	164	7 (NR)	0.9 (NR)	164	7 (NR)	-1.7 (NR)	β=-0.01 (SE=0.01); p=0.19
				IG1	12	164	7 (NR)	-1.4 (NR)	164	7 (NR)	-2.5 (NR)	β=-0.01 (SE=0.01); p=0.19
				IG1	18	164	7 (NR)	0.1 (NR)	164	7 (NR)	-2.1 (NR)	β=-0.01 (SE=0.01); p=0.19
				IG1	24	164	7 (NR)	-1.3 (NR)	164	7 (NR)	-2 (NR)	β=-0.01 (SE=0.01); p=0.19
				IG2	6	163	6.6 (NR)	-0.6 (NR)	164	7 (NR)	-1.7 (NR)	β=-0.01 (SE=0.01); p=0.38
				IG2	12	163	6.6 (NR)	-0.4 (NR)	164	7 (NR)	-2.5 (NR)	β=-0.01 (SE=0.01); p=0.38
				IG2	18	163	6.6 (NR)	-1.1 (NR)	164	7 (NR)	-2.1 (NR)	β=-0.01 (SE=0.01); p=0.38
				IG2	24	163	6.6 (NR)	-1.6 (NR)	164	7 (NR)	-2 (NR)	β=-0.01 (SE=0.01); p=0.38
				IG3	6	163	6.7 (NR)	-0.4 (NR)	164	7 (NR)	-1.7 (NR)	β=-0.02 (SE=0.01); p=0.11
	Young adults	Neighbors, 2010[201]	RAPI*; 0-125; worse	IG3	12	163	6.7 (NR)	0 (NR)	164	7 (NR)	-2.5 (NR)	β=-0.02 (SE=0.01); p=0.11
				IG3	18	163	6.7 (NR)	-0.9 (NR)	164	7 (NR)	-2.1 (NR)	β=-0.02 (SE=0.01); p=0.11
				IG3	24	163	6.7 (NR)	-1.7 (NR)	164	7 (NR)	-2 (NR)	β=-0.02 (SE=0.01); p=0.11
				IG4	6	164	7.2 (NR)	-0.1 (NR)	164	7 (NR)	-1.7 (NR)	0.0 (SE=0.01); p=0.79
				IG4	12	164	7.2 (NR)	0.5 (NR)	164	7 (NR)	-2.5 (NR)	0.0 (SE=0.01); p=0.79
				IG4	18	164	7.2 (NR)	1.4 (NR)	164	7 (NR)	-2.1 (NR)	0.0 (SE=0.01); p=0.79
				IG4	24	164	7.2 (NR)	0.7 (NR)	164	7 (NR)	-2 (NR)	0.0 (SE=0.01); p=0.79
No. times drinking and driving/past 3 months	Young adults	Schaus, 2009[170]	Drinking Inventory of Consequences-2L; NA; NA	IG1	6	181	4.7 (9.9)	-3.8 (8.9)	182	7.8 (17.3)	-6.6 (15.8)	2.8 (0.2, 5.5); p=0.549†
				IG1	9	181	4.7 (9.9)	-3.7 (9)	182	7.8 (17.3)	-6.4 (15.9)	2.8 (0.1, 5.4); p=0.998†
				IG1	12	181	4.7 (9.9)	-2.4 (8.7)	182	7.8 (17.3)	-4.2 (15.3)	1.8 (-0.8, 4.3); p=0.542†

Appendix I Table 31. Continuous Nondrinking Behavioral Outcomes, by Subpopulation (KQ4)

Outcome	Target pop	Author, year	Instrument; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean	CG mean change	Between-group difference (95% CI); study reported p-value
Drugs, past 3 months	Adults	Upshur, 2015[218]	TLFB; NA; NA	IG1	6	37	43.3 (48)	-26.5 (41.9)	36	25.9 (38.2)	-22 (34.4)	-4.5 (-24, 15); NR, NS
Marijuana days used, past month	Adoles-cents	Mason, 2015[215]	YRBS; 0-7; worse	IG1 (Men)	6	15	1.6 (NR)	-0.3 (NR)	20	1.1 (NR)	0.3 (NR)	0.4 (NR)
				IG1 (Women)	6	44	1.1 (NR)	0.1 (NR)	40	1.8 (NR)	-0.5 (NR)	NR

* Modified version (2 questions added, frequency coded 1-5 (1 = never, 5 = >10 times)
† Study reported from adjusted model

Abbreviations: BL = baseline; CG = control group; CI = confidence interval; FU = followup; IG = intervention group; Int = intervention; mos = months; n = number of participants; NA = not applicable; No. = number; NR = not reported; NS = not statistically significant; pop = population; RAPI = Rutgers Alcohol Problem Inventory; sd = standard deviation; SE = standard error; TLFB = Timeline Followback; YRBS = Youth Risk Behavior Survey

Appendix I Table 32. All-Cause Mortality Outcomes (KQ4)

Target pop	Author, year	Int arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Young adults	Kypri, 2004[161]	IG1	6	0/47 (0%)	1/47 (2.1%)	0.33 (0.01 to 8.22)
Adults	Drummond, 2009[208]	IG1	6	1/54 (1.8%)	0/58 (0%)	3.28 (0.13 to 82.27)
	Bischof, 2008[149]	IG1	12	2/269 (0%)	2/139 (1.4%)	0.51 (0.07 to 3.68)
		IG2	12	1/138 (0.7%)	2/139 (1.4%)	0.5 (0.04 to 5.58)
	Fleming, 1997[153]	IG1	48	3/392 (0.8%)	7/382 (1.8%)	0.41 (0.11 to 1.61), NS
	Wallace, 1988[174]	IG1	12	2/450 (0.4%)	0/459 (0%)	5.12 (0.25 to 107)
	Watkins, 2017[246]	IG1	6	1/138 (0.7%)	2/199 (1.0%)	0.72 (0.06 to 8.01)
Older Adults	Ettner, 2014[183]	IG1	12	4/546 (0.7%)	6/640 (0.9%)	0.78 (0.22 to 2.78)
	Moore, 2010[176]	IG1	12	2/246 (0.8%)	3/309 (1%)	0.84 (0.14 to 5.04)
	Fleming, 1999[157]	IG1	24	1/87 (1.1%)	4/71 (5.6%)	0.19 (0.02 to 1.78)

Abbreviations: CG = control group, CI = confidence interval, FU = followup, IG = intervention group, Int = intervention; pop = population, mos = months, NS = not statistically significant; OR = odds ratio

Appendix I Table 33. Other Dichotomous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Recall	Study arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Accident/Injury	Adults	Fleming, 1997[153]	Motor vehicle crash w/fatalities (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1	48	0/392 persons	2/382 persons	NR, NS
					4 years	IG1 (18-30 yrs)	48	0/392 persons	1/382 persons	NR, NS
			Motor vehicle crash w/non-fatal injuries (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1	48	20/392 persons	31/382 persons	NR, NS
					4 years	IG1 (18-30 yrs)	48	9/392 persons	20/382 persons	NR; p<0.05
			Motor vehicle crash w/property damage only (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1	48	67/392 persons	72/382 persons	NR, NS
	Adults	Fleming, 1997[153]	Motor vehicle crash w/property damage only (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1 (18-30 yrs)	48	19/392 persons	28/382 persons	NR, NS
			Total motor vehicle events (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1 (18-30 yrs)	48	114/392 persons	149/382 persons	NR; p<0.05
	Adults	Scott, 1990[171]	Participants with abnormal accident score	Edinburgh Hospital study	1 year	IG1 (Women)	12	0/33 (0%)	1/39 (2.6%)	0.38 (0.02 to 9.72); NR, NS
				Edinburgh Hospital study	1 year	IG1 (Men)	12	2/80 (2.5%)	6/74 (8.1%)	0.29 (0.06 to 1.49); NR, NS
Illness	Adults		Participants with abnormal health score	Edinburgh Hospital study	1 year	IG1 (Women)	12	15/32 (46.9%)	18/38 (47.4%)	0.98 (0.38 to 2.52); NR, NS
				Edinburgh Hospital study	1 year	IG1 (Men)	12	31/74 (41.9%)	27/70 (38.6%)	1.15 (0.59 to 2.24); NR, NS

Appendix I Table 33. Other Dichotomous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Recall	Study arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Legal	Adults	Fleming, 1997[160]	Assault/Battery/Child abuse (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	8	11	NR, NS
					4 years	IG1 (18-30 yrs)	48	6	6	NR, NS
			Controlled substance, liquor violation (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	2	11	NR; p<0.05
					4 years	IG1 (18-30 yrs)	48	0	8	NR; p<0.01
			Criminal damage, property damage (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	2	1	NR, NS
				NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1 (18-30 yrs)	48	1	3	NR, NS
			Operating vehicle while intoxicated (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1	48	25	25	NR, NS
	Adults	Fleming, 1997[160]	Operating vehicle while intoxicated (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1 (18-30 yrs)	48	8	10	NR, NS
			Other arrests (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	5	9	NR, NS
				NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1 (18-30 yrs)	48	2	3	NR, NS
			Other moving violations (driving)	NR (Wisconsin Department of Justice Crime Information Bureau and	4 years	IG1	48	169	177	NR, NS

Appendix I Table 33. Other Dichotomous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Recall	Study arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Legal			(number of events)	Wisconsin Department of Transportation)						
				NR (Wisconsin Department of Justice Crime Information Bureau and Wisconsin Department of Transportation)	4 years	IG1 (18-30 yrs)	48	78	81	NR, NS
			Resist/Obstruct officer/Disorderly conduct (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	8	6	NR, NS
	Adults	Fleming, 1997[160]	Resist/Obstruct officer/Disorderly conduct (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1 (18-30 yrs)	48	6	3	NR, NS
			Theft/Robbery (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1	48	3	3	NR, NS
				NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1 (18-30 yrs)	48	1	3	NR, NS
			Total legal events (number of events)	NR (Wisconsin Department of Justice Crime Information Bureau)	4 years	IG1 (18-30 yrs)	48	16	26	NR, NS
Mortality	Adults	Fleming, 1997[160]	All-cause mortality	NR (Patient follow-up procedures, family member contacts, Social Security Death Index, and Wisconsin Department of Administration Records Management Section)	4 years	IG1	48	3/392 (0.8%)	7/382 (1.8%)	0.41 (0.11 to 1.61); NR, NS

Appendix I Table 33. Other Dichotomous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Recall	Study arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Other Health	Young adults	Marlatt, 1998[198]	Classification of participants by individual change based on RAPI score	RAPI	6 months	IG1 (RAPI negative)	24	3/45 (7%)	8/38 (21%)	0.27 (0.07 to 1.09)
					6 months	IG1 (RAPI positive)	24	52/108 (48%)	46/122 (38%)	1.53 (0.91 to 2.6)
Pregnancy Outcomes	Pregnant women	O'Connor, 2007[202]	Fetal mortality rate	NR		IG1	5	1/117 (0.9%)	4/138 (2.9%)	0.29 (0.03 to 2.62)
		Ondersma, 2015[217]	A live birth of >2,500g with no admission to neonatal intensive care unit	NR	NR	IG1	6	19/23 (82.6%)	14/23 (60.9%)	3.3 (0.8 to 13.8)*; p=0.09†
Social	Adults	Scott, 1990[171]	Participants with abnormal social score	Edinburgh Hospital study	1 year	IG1 (Men)	12	12/80 (15%)	14/74 (18.9%)	0.76 (0.32 to 1.76); NR, NS
					1 year	IG1 (Women)	12	5/33 (15.2%)	3/39 (7.7%)	2.14 (0.47 to 9.74); NR, NS
Utilization	Young adults	Fleming, 2010[160]	Hospitalization, ED visit, urgent care visit, or admission to local detox unit in the previous 6 months	TLFB	6 months	IG1	6	99/493 (20.1%)	98/493 (19.9%)	1.01 (0.74 to 1.38); p=0.937†
						IG1	12	91/493 (18.5%)	90/493 (18.3%)	1.01 (0.73 to 1.4); p=0.934†
	Adults	Fleming, 1997[153]	Days of hospitalization (number of events)	Other/Generic	4 years	IG1	48	420	664	NR; p<0.05
				Other/Generic		IG1 (18-30 yrs)	48	131	150	NR, NS
			Emergency department visits over 48 months (number of events)	Other/Generic	4 years	IG1	48	302	376	NR, NS

Appendix I Table 33. Other Dichotomous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome	Target pop	Author, year	Description	Instrument	Recall	Study arm	FU (mos)	IG results	CG results	OR (95% CI); study reported p-value
Utilization	Adults	Fleming, 1997[153]	Emergency department visits over 48 months (number of events)	Other/Generic	4 years	IG1 (18-30 yrs)	48	103	177	NR; p<0.01
	Adults	Senft, 1997[172]	Number of participants hospitalized in past 2 years	NR	2 years	IG1	12	29/196 (15%)	30/215 (14%)	1.07 (0.62 to 1.86); p=0.7
						IG1	24	55/260 (21.2%)	56/254 (22%)	0.95 (0.62 to 1.44); p=0.81
						IG1 (Women)	24	10/73 (13.7%)	20/79 (25.3%)	0.47 (0.2 to 1.08); p=0.07
						IG1 (Men)	24	45/187 (24.1%)	36/175 (20.6%)	1.22 (0.74 to 2.01); p=0.43
	Adults	Watkins, 2017[246]	Had an emergency department visit or hospitalization in past 3 months	Other/Generic	3 months	IG1	6	27/138 (19.6%)	28/123 (22.8%)	0.83 (0.46 to 1.5); NR, NS
	Older adults	Ettner, 2014[183]	Had an emergency department visit in past year	Other/Generic	1 year	IG1	12	70/439 (16%)	153/610 (25%)	0.56 (0.33 to 0.96); p≤0.01†
			Had hospitalization in past year	Other/Generic	1 year	IG1	12	57/439 (13%)	98/610 (16%)	0.79 (0.44 to 1.44); p=0.09†

* Study-reported OR

† Study reported from adjusted model

Abbreviations: CG = control group; CI = confidence interval; FU = followup; IG= intervention group; mos = months; NR = not reported; NS = not statistically significant; OR = odds ratio; pop = population; RAPI = Rutgers Alcohol Problem Inventory; TLFB = Timeline Followback

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
Academic	Young adults	Kypri, 2004[161]	AREAS; 0-35; NR	IG1	6	47	NR	NR	47	NR	NR	RoGM = 0.72 (0.51-1.02); p=0.06†
	Young adults	Kypri, 2008[162]	AREAS; 0-35; NR	IG1	6	122	NR	NR	124	NR	NR	RR=0.8 (0, 0.9); p=0.005‡
				IG1	12	121	NR	NR	126	NR	NR	RR=0.8 (0, 0.9); p=0.002‡
				IG2	6	114	NR	NR	124	NR	NR	RR=0.8 (0, 0.9); p=0.003‡
				IG2	12	113	NR	NR	126	NR	NR	RR=0.8 (0, 1); p=0.02‡
	Young adults	Kypri, 2009[195]	ASI – Academic; 0-15; worse	IG1	6	1251	NR	NR	1184	NR	NR	RR=0.9 (0, 1.1); p=0.87†‡
Cardio-metabolic	Adults	Wilson, 2014[224]	DBP; NA	IG1	6	28	87 (8.8)	2.2 (10.6)	39	88 (10.1)	1.8 (9.1)	0.4 (-7.4, 8.2); NR, NS
			SBP; NA	IG1	6	28	149 (16.1)	-2 (17.7)	39	153 (19.4)	-3.2 (16.8)	1.2 (-12.3, 14.7); NR, NS
Employment	Adults	Burge, 1997[188]	ASI – Employment; 0-1; worse	IG1	12	47	0.7 (0.2)	NR	46	0.6 (0.3)	NR	NR, NS†
				IG1	18	47	0.7 (0.2)	NR	46	0.6 (0.3)	NR	NR, NS†
				IG2	12	42	0.6 (0.3)	NR	46	0.6 (0.3)	NR	NR, NS†
				IG2	18	42	0.6 (0.3)	NR	46	0.6 (0.3)	NR	NR, NS†
				IG3	12	40	0.7 (0.3)	NR	46	0.6 (0.3)	NR	NR, NS†
				IG3	18	40	0.7 (0.3)	NR	46	0.6 (0.3)	NR	NR, NS†
Family/ social	Adults		ASI – Family; 0-1; worse	IG1	12	47	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR, NS†
				IG1	18	47	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR, NS†
				IG2	12	42	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR, NS†
				IG2	18	42	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR, NS†
				IG3	12	40	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR; p=0.003†
				IG3	18	40	0.2 (0.2)	NR	46	0.2 (0.2)	NR	NR; p=0.003†
General consequences	Adults	Drummond, 2009[208]	APQ; 0-23; worse	IG1	6	39	5.6 (4.4)	-1.5 (1.9)	52	4.7 (3)	-1.1 (2.9)	-0.4 (-1.4, 0.6); NR, NS†
		Helstrom, 2014[240]	SIP; NR; worse	IG1	8	68	4.3 (5.5)	-1.5 (5.6)	71	4.7 (5.5)	-2.4 (4.8)	0.8 (-0.9, 2.6); NR, NS
				IG1	12	68	4.3 (5.5)	-1.9 (NR)	71	4.7 (5.5)	-2.0 (NR)	NR, NS
		Upshur, 2015[218]	Consequences NOS; 0-11; worse	IG1	6	40	4.6 (2.9)	-2.4 (2.8)	36	4.3 (3)	-2.4 (2.7)	0 (-1.4, 1.3); NR, NS
	Older adults	Watson, 2013[230]	DPI; 0-17; worse	IG1	6	238	2.6 (2.9)	-0.8 (2.8)	233	3.1 (3.3)	-0.7 (3.3)	-0.2 (-0.7, 0.4); NR, NS†
				IG1	12	229	2.6 (2.9)	-0.7 (3)	230	3.1 (3.3)	-0.8 (3.2)	0.1 (-0.5, 0.7); NR, NS†

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
General consequences	Young adults	Bertholet, 2015[220]	Consequences NOS; 0-12; worse	IG1	6	338	2.8 (2)	-0.7 (1.7)	329	2.8 (1.9)	-0.6 (1.7)	-0.1 (-0.4, 0.1)
	Young adults	Carey, 2006[189]	RAPI; 0-69; worse	IG1	6	63	7.3 (5.5)	-0.8 (5.8)	66	8.3 (5.7)	-0.1 (7.1)	-0.7 (-2.9, 1.5)
				IG1	12	65	7.3 (5.5)	-1.8 (5.9)	59	8.3 (5.7)	-3 (5.4)	1.2 (-0.8, 3.2)
				IG2	6	68	6.6 (6)	-0.3 (6.6)	66	8.3 (5.7)	-0.1 (7.1)	-0.2 (-2.5, 2.1)
				IG2	12	64	6.6 (6)	-1.9 (5.6)	59	8.3 (5.7)	-3 (5.4)	1.1 (-0.9, 3.1)
				IG3	6	66	6.6 (6.2)	-1.9 (5.7)	66	8.3 (5.7)	-0.1 (7.1)	-1.8 (-4, 0.4)
				IG3	12	68	6.6 (6.2)	-1.5 (6)	59	8.3 (5.7)	-3 (5.4)	1.5 (-0.5, 3.5)
				IG4	6	62	8 (7.8)	-2.7 (6.8)	66	8.3 (5.7)	-0.1 (7.1)	-2.6 (-5, -0.2)
				IG4	12	68	8 (7.8)	-3.7 (6.8)	59	8.3 (5.7)	-3 (5.4)	-0.7 (-2.8, 1.4)
	Young adults	Collins, 2014[223]	RAPI§; 0-92; worse	IG1	6	205	5.6 (7)	-0.2 (7.7)	190	5 (5.3)	-0.6 (5.9)	0.4 (-0.9, 1.7); p=0.48
	Young adults	Collins, 2014[223]	RAPI§; 0-92; worse	IG1	12	183	5.6 (7)	-0.7 (6.9)	173	5 (5.3)	-0.8 (5.8)	0.1 (-1.2, 1.4)
				IG2	6	211	5.8 (7.5)	-1.8 (6.9)	190	5 (5.3)	-0.6 (5.9)	-1.2 (-2.5, 0); p=0.01
				IG2	12	181	5.8 (7.5)	-2.1 (6.6)	173	5 (5.3)	-0.8 (5.8)	-1.3 (-2.6, 0)
	Young adults	Fleming, 2010[160]	RAPIǁ; 0-23; worse	IG1	6	493	15.2 (10.4)	-5.5 (9.7)	493	15.9 (10.7)	-4.9 (10.1)	-0.6 (-1.8, 0.6); p=0.319
				IG1	12	493	15.2 (10.4)	-7.4 (9.3)	493	15.9 (10.7)	-6.8 (9.9)	-0.6 (-1.8, 0.6); p=0.033
	Young adults	Kypri, 2004[161]	APS; 0-14; worse	IG1	6	47	NR	NR	47	NR	NR	RR=0.8 (0, 1); p=0.03
	Young adults	Kypri, 2008[162]	APS; 0-14; worse	IG1	6	122	NR	NR	124	NR	NR	RR=0.9 (0, 1.1); p=0.2
				IG1	12	121	NR	NR	126	NR	NR	RR=0.8 (0, 1); p=0.05
				IG2	6	114	NR	NR	124	NR	NR	RR=0.9 (0, 1.1); p=0.17
				IG2	12	113	NR	NR	126	NR	NR	RR=0.8 (0, 1); p=0.07
	Young adults	Kypri, 2009[195]	APS; 0-15; worse	IG1	6	1251	NR	NR	1184	NR	NR	0 (0, 0)
	Young adults	LaBrie, 2013[227]	RAPI; 0-100; worse	IG1	6	143	4.4 (5.8)	0.4 (7.6)	142	3.3 (3.4)	-0.5 (4.7)	0.9 (-0.6, 2.4); NR, NS
				IG1	12	144	4.4 (5.8)	-0.7 (6.9)	143	3.3 (3.4)	-0.7 (4.4)	0 (-1.3, 1.3); NR, NS
				IG2	6	143	3.4 (3.6)	-0.8 (3.8)	142	3.3 (3.4)	-0.5 (4.7)	-0.3 (-1.3, 0.7); NR, NS
				IG2	12	139	3.4 (3.6)	-1.1 (4.1)	143	3.3 (3.4)	-0.7 (4.4)	-0.4 (-1.4, 0.6); NR, NS
	Young adults	Larimer, 2007[197]	RAPI¶; 0-75; worse	IG1	12	737	2.8 (3.8)	0.1 (4)	751	2.5 (3.8)	0.4 (4)	-0.3 (-0.7, 0.1); NR, NS†
	Young adults	Leeman, 2016[211]	RAPI; 0-69; worse	IG1	6	48	4 (4.5)	-1.1 (4.3)	42	3.8 (3.2)	-0.3 (4.1)	-0.8 (-2.5, 0.9); NR, NS
				IG2	6	45	4.1 (4.8)	-0.4 (4.7)	42	3.8 (3.2)	-0.3 (4.1)	-0.1 (-2, 1.7); NR, NS
				IG3	6	48	3.6 (4.2)	0.4 (4.6)	42	3.8 (3.2)	-0.3 (4.1)	0.6 (-1.2, 2.4); NR, NS

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
	Young adults	Lewis, 2014[225]	BYAACQ; 0-24; worse	IG1	6	119	7.6 (4.7)	-1.5 (5.1)	121	8.3 (5.5)	-1.7 (5.4)	0.2 (-1.1, 1.5)
				IG2	6	119	8.5 (5.3)	-2.4 (5.6)	121	8.3 (5.5)	-1.7 (5.4)	-0.7 (-2.1, 0.7)
	Young adults	Marlatt, 1998[198]	RAPIǁ; 0-23; worse	IG1	12	143	7.5 (6)	-3.5 (5.3)	156	7.6 (6)	-2.1 (5.4)	-1.4 (-2.6, -0.2); p<0.05
				IG1	24	143	7.5 (6)	-4.2 (5.2)	156	7.6 (6)	-2.9 (5.4)	-1.3 (-2.5, -0.1); p<0.05
			RAPI + ADS; NR; worse	IG1	36		NR	NR		NR	NR	0.3 (NR); p<0.05
				IG1	48		NR	NR		NR	NR	0.3 (NR); p<0.01
	Young adults	Martens, 2010[199]	BYAACQ; 0-24; worse	IG1	6	77	NR	NR		NR	NR	NR; p=0.63†
				IG1 (Heavy Drinkers)	6	57	NR	NR		NR	NR	NR; p=0.16†
	Young adults	Neighbors, 2004[200]	RAPI¶; 0-100; worse	IG1	6	126	7.2 (6.3)	-1.5 (6.8)	126	7.3 (7.5)	-0.8 (7.6)	-0.6 (-2.4, 1.1)
	Young adults	Neighbors, 2016[239]	YAAPST; 0-37; worse	IG1	6	177	4.3 (3.2)	-0.7 (3.6)	180	4.3 (3.1)	-1 (3.1)	0.3 (-0.4, 1); NR, NS
				IG2	6	173	4.3 (3.2)	-1.4 (3.1)	180	4.3 (3.1)	-1 (3.1)	-0.4 (-1, 0.3); NR, NS
General consequences	Young adults	Schaus, 2009[170]	RAPI§; 0-92; worse	IG1	6	181	14.1 (13.1)	-9.1 (11.4)	182	16.1 (13.3)	-9.6 (11.6)	0.4 (-2, 2.8); p=0.028†
				IG1	9	181	14.1 (13.1)	-9.5 (11.4)	182	16.1 (13.3)	-9.9 (11.7)	0.4 (-2, 2.8); p=0.041†
				IG1	12	181	14.1 (13.1)	-8.3 (11.4)	182	16.1 (13.3)	-8.7 (11.6)	0.4 (-1.9, 2.8); p=0.556†
	Young adults	Turrisi, 2009[205]	RAPI§; 0-92; worse	IG1	10	278	2.3 (3.2)	0.6 (3.1)	305	2.5 (3.2)	1 (3.2)	-0.5 (-1, 0.1); p<0.05†
				IG2	10	228	2.4 (3.2)	1 (3.1)	305	2.5 (3.2)	1 (3.2)	0 (-0.6, 0.5)
				IG3	10	279	2.1 (3.2)	1.5 (3.1)	305	2.5 (3.2)	1 (3.2)	0.5 (-0.1, 1); p<0.05
	Adults	Watkins, 2017[246]	SIP; 0-15; worse	IG1	6	138	9.1 (4.9)	7 (5.9)	-2.1 (5.5)	123	9.6 (4.8)	6.2 (5.5); p=0.08
Legal	Adults	Burge, 1997[188]	ASI – Legal; 0-1; worse	IG1	12	47	0.1 (0.2)	NR	46	0.1 (0.1)	NR	NR, NS†
				IG1	18	47	0.1 (0.2)	NR	46	0.1 (0.1)	NR	NR, NS†
				IG2	12	42	0.1 (0.1)	NR	46	0.1 (0.1)	NR	NR, NS†
				IG2	18	42	0.1 (0.1)	NR	46	0.1 (0.1)	NR	NR, NS†
				IG3	12	40	0.1 (0.1)	NR	46	0.1 (0.1)	NR	NR, NS†
				IG3	18	40	0.1 (0.1)	NR	46	0.1 (0.1)	NR	NR, NS†

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
Liver Enzymes	Adults	Aalto, 2000	ALT; NA	IG1 (Men)	36	99	38 (21)	9 (70.9)	88	49.1 (45.9)	-1.8 (43.8)	10.8 (-5.9, 27.5); NR, NS
				IG1 (Women)	36	38	33 (23.2)	-5.8 (20.8)	40	25.6 (19.3)	0.4 (21)	-6.2 (-15.5, 3.1); NR, NS
			AST; NA	IG1 (Men)	36	99	30.9 (12.6)	6.2 (45.8)	88	36.4 (29)	0.9 (27.5)	5.3 (-5.4, 16); NR, NS
				IG1 (Women)	36	38	31.5 (29.4)	-1.4 (28.5)	40	24.4 (11.8)	1.5 (17.2)	-2.9 (-13.4, 7.6); NR, NS
			CDT; NA	IG1 (Men)	36	97	22.6 (13.7)	-0.9 (13.7)	88	21 (16.1)	-0.2 (14.9)	-0.7 (-4.8, 3.4); NR, NS
			CDT; NA	IG1 (Women)	36	38	23.8 (12.3)	-1.6 (12.2)	40	21.2 (7.8)	-0.6 (7.7)	-1 (-5.6, 3.6); NR, NS
			GGT; NA	IG1 (Men)	36	88	81.9 (72)	8.3 (88.1)	88	94.5 (183.5)	-14 (159)	22.3 (-15.7, 60.3); NR, NS
				IG1 (Women)	36	38	79.8 (135)	-24.5 (117.9)	40	35.7 (24.6)	3.1 (28.4)	-27.6 (-66.1, 10.9); NR, NS
			MCV; NA	IG1 (Men)	36	98	94.2 (4.2)	-1 (4.2)	88	94.5 (4)	-1.3 (4)	0.3 (-0.9, 1.5); NR, NS
				IG1 (Women)	36	40	96.9 (4.2)	-1 (3.9)	38	94.4 (3.9)	-0.8 (4)	-0.2 (-2, 1.6);NR, NS
		Burge, 1997[188]	ALT; NA	IG1	12	47	36.6 (27.2)	NR	46	49.9 (56.1)	NR	NR, NS†
				IG1	18	47	36.6 (27.2)	NR	46	49.9 (56.1)	NR	NR, NS†
				IG2	12	42	56.5 (97.6)	NR	46	49.9 (56.1)	NR	NR, NS†
				IG2	18	42	56.5 (97.6)	NR	46	49.9 (56.1)	NR	NR, NS†
				IG3	12	40	68.6 (175.2)	NR	46	49.9 (56.1)	NR	NR, NS†
				IG3	18	40	68.6 (175.2)	NR	46	49.9 (56.1)	NR	NR, NS†
			AST; NA	IG1	12	47	43 (37.2)	NR	46	55.3 (104.5)	NR	NR, NS†
				IG1	18	47	43 (37.2)	NR	46	55.3 (104.5)	NR	NR, NS†
				IG2	12	42	57.1 (109.7)	NR	46	55.3 (104.5)	NR	NR, NS†
				IG2	18	42	57.1 (109.7)	NR	46	55.3 (104.5)	NR	NR, NS†

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
				IG3	12	40	54 (79.1)	NR	46	55.3 (104.5)	NR	NR, NS†
Liver Enzymes	Adults	Burge, 1997[188]	AST; NA	IG3	18	40	54 (79.1)	NR	46	55.3 (104.5)	NR	NR, NS†
			GGT; NA	IG1	12	47	90.7 (88.2)	NR	46	142.5 (205.5)	NR	NR, NS†
				IG1	18	47	90.7 (88.2)	NR	46	142.5 (205.5)	NR	NR, NS†
				IG2	12	42	162.6 (408)	NR	46	142.5 (205.5)	NR	NR, NS†
				IG2	18	42	162.6 (408)	NR	46	142.5 (205.5)	NR	NR, NS†
				IG3	12	40	133.7 (180.1)	NR	46	142.5 (205.5)	NR	NR, NS†
				IG3	18	40	133.7 (180.1)	NR	46	142.5 (205.5)	NR	NR, NS†
			MCV MCV; NA	IG1	12	47	91.5 (4.8)	NR	46	90 (6.3)	NR	NR, NS†
				IG1	18	47	91.5 (4.8)	NR	46	90 (6.3)	NR	NR, NS†
				IG2	12	42	90.1 (4.7)	NR	46	90 (6.3)	NR	NR, NS†
				IG2	18	42	90.1 (4.7)	NR	46	90 (6.3)	NR	NR, NS†
				IG3	12	40	91.4 (5.3)	NR	46	90 (6.3)	NR	NR, NS†
				IG3	18	40	91.4 (5.3)	NR	46	90 (6.3)	NR	NR, NS†
	Adults	Emmen, 2005[193]	CDT; NA	IG1	6	54	2.6 (1)	0.1 (0.3)	55	2.4 (1.1)	0.1 (0.9)	0 (-0.2, 0.2); p=0.69†
	Adults	Scott, 1990[171]	GGT; NA	IG1 (Men)	12	80	29.6 (29.5)	6.6 (51.1)	74	35.5 (34.4)	-1.8 (36.7)	8.4 (-5.6, 22.4); NR, NS
Liver Enzymes	Adults	Scott, 1990[171]	GGT; NA	IG1 (Women)	12	33	16.4 (18.4)	0.1 (21.4)	39	22 (25)	-4.2 (22.9)	4.3 (-6, 14.6); NR, NS
			MCV; NA	IG1 (Men)	12	80	93.7 (4.5)	0.2 (4.5)	74	93.5 (3.4)	-0.3 (3.9)	0.5 (-0.8, 1.8); NR, NS
				IG1 (Women)	12	33	93.5 (3.4)	-1.1 (4.1)	39	93.7 (4.4)	-0.4 (4.4)	-0.7 (-2.7, 1.3); NR, NS
	Adults	Wallace, 1988[174]	GGT; NA	IG1 (Men)	6	306	27.8 (24.5)	-1 (27.5)	304	26.7 (22.7)	0 (21.8)	-1 (-4.9, 2.9)
				IG1 (Men)	12	306	27.8 (24.5)	-2.4 (15.7)	304	26.7 (22.7)	1.1 (17.4)	-3.5 (-6.1, -0.9); p<0.01
				IG1 (Women)	6	126	13.7 (15.7)	0.3 (16.3)	132	12 (11.5)	0.7 (10.5)	-0.4 (-3.8, 3)
				IG1 (Women)	12	126	13.7 (15.7)	0.3 (5.6)	132	12 (11.5)	0.5 (6.9)	-0.2 (-1.7, 1.3); NR, NS

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
Medical/physical	Adults	Aalto, 2000[206]	Physical health status; 1-5; better	IG1 (Men)	36	94	3.3 (0.8)	-0.1 (0.9)	84	3.3 (0.8)	-0.1 (0.8)	0 (-0.2, 0.2); NR, NS
				IG1 (Women)	36	36	3.3 (1)	-0.1 (1)	39	3.3 (0.8)	0 (0.9)	-0.1 (-0.5, 0.3); NR, NS
		Burge, 1997	ASI – Medical; 0-1; worse	IG1	12	47	0.3 (0.3)	NR	46	0.3 (0.3)	NR	NR; p=0.047†
				IG1	18	47	0.3 (0.3)	NR	46	0.3 (0.3)	NR	NR; p=0.047†
				IG2	12	42	0.4 (0.3)	NR	46	0.3 (0.3)	NR	NR, NS†
				IG2	18	42	0.4 (0.3)	NR	46	0.3 (0.3)	NR	NR, NS†
				IG3	12	40	0.4 (0.3)	NR	46	0.3 (0.3)	NR	NR, NS†
				IG3	18	40	0.4 (0.3)	NR	46	0.3 (0.3)	NR	NR, NS†
		Crawford, 2014[185]	QALYs; 0-0.5; better	IG1	6	290	NR	0.46 (0.06)#	301	NR	-0.45 (0.07)#	-0.01 (-0.02, 0.003)
		Drummond, 2009[208]	Quality of Life, Physical Health; 0-100; better	IG1	6	39	40.5 (7.3)	-0.1 (3.7)	52	40.6 (7.6)	0.1 (4.3)	-0.2 (-1.9, 1.5); NR, NS†
		Heather, 1987[209]	Physical health status; NR; better	IG1	6	29	357.1 (136.7)	53.7 (132.2)	32	341.7 (140.5)	36.4 (128)	17.3 (-48.1, 82.7); NR, NS
				IG2	6	29	387.6 (94.5)	30.7 (121.1)	32	341.7 (140.5)	36.4 (128)	-5.7 (-68.2, 56.8); NR, NS
		Upshur, 2015[218]	Quality of Life, Physical Health; NR; better	IG1	6	40	41.9 (10.8)	0.9 (11.2)	36	40 (9)	1 (9.2)	-0.1 (-5.2, 5)
	Older adults	Ettner, 2014[183]	SF-12 PCS; 0-100; better	IG1	6	439	48.9 (9.7)	1.4 (9.4)	610	48.8 (9.3)	1.2 (8.9)	0.2 (-0.9, 1.3); NR, NS
				IG1	12	439	48.9 (9.7)	0.9 (9.3)	610	48.8 (9.3)	1.1 (9.1)	-0.2 (-1.3, 0.9); NR, NS
		Watson, 2013[230]	SF-12 PCS; 0-100; better	IG1	6	237	47.7 (11.2)	-0.3 (11.3)	233	47.3 (11)	0.4 (11.1)	-0.7 (-2.8, 1.3); NR, NS
				IG1	12	228	47.7 (11.2)	-0.4 (11.6)	228	47.3 (11)	0.1 (11)	-0.6 (-2.6, 1.5); NR, NS
Mental health	Adults	Aalto, 2000[206]	Mental health status; 1-5; better	IG1 (Men)	36	94	2.9 (0.9)	0.1 (0.9)	84	3 (0.9)	-0.1 (0.9)	0.2 (-0.1, 0.5); NR, NS
				IG1 (Women)	36	37	3.2 (1)	-0.3 (1)	39	3.1 (1)	-0.1 (1.1)	-0.2 (-0.7, 0.3); NR, NS
	Adults	Burge, 1997[188]	ASI – Psychiatric; 0-1; worse	IG1	12	47	0.2 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
				IG1	18	47	0.2 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
				IG2	12	42	0.1 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
				IG2	18	42	0.1 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
				IG3	12	40	0.2 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
				IG3	18	40	0.2 (0.2)	NR	46	0.2 (0.3)	NR	NR, NS†
	Adults	Drummond, 2009[208]	Quality of Life, Mental Health; 0-11; better	IG1	6	39	45.6 (13.2)	3.2 (9.4)	52	49.2 (10.7)	1.2 (7.2)	2 (-1.5, 5.5); NR, NS†

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Outcome type	Target pop	Author, year	Instrument or measure; scale range; higher outcome is (better/worse)	Int arm	FU (mos)	IG n	IG BL mean (sd)	IG mean change (sd)	CG n	CG BL mean (sd)	CG mean change (sd)	Between-group difference* (95% CI); study reported p-value
	Adults	Upshur, 2015[218]	Quality of Life, Mental Health; NR; better	IG1	6	40	35.6 (10.8)	3.9 (11.7)	36	34.8 (11)	4.3 (10.8)	-0.4 (-6, 5.2); NR, NS
Mental health	Adults	Watkins, 2017[246]	PHQ-8; 0-24; worse	IG1	6	138	11 (6.5)	-3 (6.4)	123	12 (6.2)	-3 (6.3)	0 (-1.5, 1.5); NR, NS
	Older adults	Ettner, 2014[183]	GDS; 0-5; better	IG1	12	439	NR	NR	610	NR	NR	β=0.1 (0, 0.3); p<0.05
			SF-12 MCS; 0-100; better	IG1	6	439	44.5 (6.8)	-0.3 (7)	610	44.3 (6.7)	-0.7 (6.7)	0.4 (-0.4, 1.2); p<0.10
				IG1	12	439	44.5 (6.8)	-0.5 (6.8)	610	44.3 (6.7)	-0.5 (6.8)	0 (-0.8, 0.8); NR, NS
		Watson, 2013[230]	SF-12 MCS; 0-100; better	IG1	6	237	51.8 (9.5)	-0.1 (9.7)	233	50.2 (10.7)	0.3 (10.7)	-0.4 (-2.2, 1.5); NR, NS
				IG1	12	228	51.8 (9.5)	0.1 (9.6)	228	50.2 (10.7)	1.4 (10.3)	-1.2 (-3.1, 0.6); p=0.466
	Pregnant women	Osterman, 2014[221]	Basic psychological need satisfaction; NR; better	IG1	1	44	5.7 (0.8)	0.4 (0.8)	49	5.4 (0.9)	0.3 (0.9)	0.1 (-0.2, 0.4)
				IG1	5	49	5.7 (0.8)	0.5 (0.7)	49	5.4 (0.9)	0.6 (0.9)	-0.1 (-0.4, 0.3); NR, NS
Other health/ related outcome	Young adults	Schaus, 2009[170]	Risk-taking behaviors; NR; worse	IG1	6	181	5.4 (10.1)	-3.9 (8.8)	182	6.6 (12.1)	-4.9 (10.6)	1 (-1, 3); p=0.685†
				IG1	9	181	5.4 (10.1)	-4 (8.8)	182	6.6 (12.1)	-4.4 (13.7)	0.3 (-2.1, 2.7); p=0.485†
				IG1	12	181	5.4 (10.1)	-2.3 (10.3)	182	6.6 (12.1)	-1.8 (15.2)	-0.5 (-3.2, 2.2); p=0.261†
Pregnancy outcomes	Pregnant women	Chang, 1999[181]	Birth weight; NA	IG1	5	123	NR	3360 (NR)	127	NR	3406 (NR)	NR, NS
		Tzilos, 2011[235]	Birth weight; NA	IG1	1	27	NR	3189.6 (328.0)	23	NR	2965.3 (387.7)	NR; p=0.03†
			Gestational age; NA	IG1	1	27	NR	NR	23	NR	NR	NR; p=0.17†
			Head circumference; NA	IG1	1	27	NR	NR	23	NR	NR	NR; p=0.72†
Quality of life	Adults	Crawford, 2014[185]	EQ-SD; 0-1; better	IG1	6	290	0.9 (0.15)	0.02 (0.16)	301	0.90 (0.16)	0.02 (0.15)	0.00 (-0.02, 0.03)
	Adults	Watkins, 2017[246]	SF-12 MCS; 0-100; better	IG1	6	138	40.1 (10.8)	0.9 (11.7)	123	39.5 (10.9)	1.3 (11.6)	1.0 (-1.6, 3.6); p=0.41
	Adults	Watkins, 2017[246]	SF-12 PCS; 0-100; better	IG1	6	138	47.6 (9.9)	0.5 (10.8)	123	47.2 (10.2)	--0.5 (10.5)	Effect size: 1.49 (-2.05 to 5.03); p=0.41

* Mean difference in change unless otherwise indicated
† Study reported from adjusted model
‡ RR calculated using negative binomial model
§ Frequency coded 0-4 (0 = none, 1 = 1-2 times, 2 = 3-5 times, 3 = 6-10 times, 4 = >10 times)
‖ Frequency coded 0-1 (0 = none, 1 = ≥ 1-2 times)
¶ Modified version
# Post-test score

Appendix I Table 34. Continuous Health Outcomes, by Outcome Type and Subpopulation (KQ4)

Abbreviations: ALT = Alanine aminotransferase; APQ = Alcohol Problems Questionnaire; APS = Addiction Potential Scale; AREAS = Academic Role Expectations and Alcohol Scale; ASI = Addiction Severity Index; AST = Aspartate aminotransferase; BL = baseline; BYAACQ = Brief Young Adult Alcohol Consequences Questionnaire; CDT = Carbohydrate-deficient transferrin; CG = control group; CI = confidence interval; DBP = Diastolic blood pressure; DPI = Drinking Problems Index; EQ-5D = European Quality of Life-5 Dimensions; FU = followup; GDS = Geriatric Depression Scale; GGT = Gamma-glutamyl transferase; IG = intervention group; MCS = Mental component score; MCV = Mean corpuscular volume; mos = months; n = number of participants; NA = not applicable; NOS = not otherwise specified; NR = not reported; NS = not statistically significant; PCS = Physical component score; pop = population; QALYs = Quality-adjusted life years; RAPI = Rutgers Alcohol Problem Inventory; RoGM = Ratio of geometric means; RR = Relative risk; SBP = Systolic blood pressure; SIP = Short Index of Problems; YAAPST = Young Adult Alcohol Problems Screening Test

Table 35. Harms Outcomes, by Outcome Type and Subpopulation (KQ4)

Target pop	Author, year	Description	Int arm	FU (mos)	IG results	CG results	OR (95% CI)
Young adults	Larimer, 2007[197]	Any adverse events	IG1	12	0/737 (0%)	0/751 (0%)	NR, NS
	Lewis, 2014[225]	Any adverse events	IG1	6	0/119 (0%)	0/121 (0%)	NR, NS
		Any adverse events	IG2	6	0/119 (0%)	0/121 (0%)	NR, NS
	Neighbors, 2010[201]	Any adverse events	IG1	24	0/164 (0%)	0/164 (0%)	NR, NS
		Any adverse events	IG2	24	0/163 (0%)	0/164 (0%)	NR, NS
		Any adverse events	IG3	24	0/163 (0%)	0/164 (0%)	NR, NS
		Any adverse events	IG4	24	0/164 (0%)	0/164 (0%)	NR, NS
Adults	Bischof, 2008[149]	Adverse effects of the intervention	IG0	12	1/269 (0.4%)	2/139 (1.4%)	NR, NS
		Adverse effects of the intervention	IG1	12	0/131 (0%)	2/139 (1.4%)	NR, NS
		Adverse effects of the intervention	IG2	12	1/138 (0.7%)	2/139 (1.4%)	NR, NS
Older adults	Watson, 2013[230]	Any adverse events	IG1	12	0/263 (0%)	0/259 (0%)	NR, NS
Pregnant women	Ondersma, 2015[217]	Any adverse events	IG1	6	0/20 (0%)	0/19 (0%)	NR, NS

Abbreviations: CG = control group; CI = confidence interval; IG = intervention group; Int = intervention; mos = months; NR = not reported; NS = not statistically significant; OR = odds ratio; pop = population

Appendix J. Ongoing Studies

Study reference Trial identifier	Study name	Location	Estimated n	Description	2018 Status
NCT01881841	Computer Adaptation of Screening, Brief MET Intervention to Reduce Teen Drinking	US	150	The goal of this project is to evaluate the feasibility, acceptability, and effect size of a new computerized Motivational Enhancement Therapy (cMET) intervention for alcohol-involved adolescents in primary care.	Ongoing: Est. Completion Date Aug 2017
NCT02642757	Alcohol Brief Counseling in Primary Care	Chile	262	This study evaluates the effectiveness of a brief intervention for the reduction of alcohol use among risky alcohol users in primary care delivered by paramedics.	Completed. No published results yet.
NCT02860442	Project Guard: Reducing Alcohol Misuse/Abuse in the National Guard	US	750	The overall goal for the study is to test the efficacy of a smartphone app which includes an alcohol brief intervention (SP-BI) versus an Enhanced Usual Care (EUC) condition for National Guard members in the State of Ohio who meet criteria for at-risk drinking in the previous 3 months.	Ongoing: Est. Completion Date Jun 2020
NCT02671019	Effectiveness and Costs of Internet-based Treatment for Harmful Alcohol Use and Face-to-face Treatment in Addiction Care	Sweden	350	The purpose of this trial is to compare the effectiveness and costs of a five-module Internet-based treatment program (including therapist support) for harmful alcohol use with the effectiveness and cost of the same treatment content delivered face-to-face in specialized addiction treatment.	Ongoing: Est. Completion Date Nov 2019
NCT02645721	Internet Based Cognitive Behavior Treatment for Alcohol Use Disorders (ICBT-AUD)	Sweden	166	The purpose of this study is to determine whether extensive internet based cognitive behavior treatment program with guidance is a more effective method to treat individuals with alcohol use disorders than a briefer cognitive behavior treatment program without guidance	Ongoing: Est. Completion Date Jun 2019
NCT02703116	Reducing Hazardous Alcohol Use in Social Networks Using Targeted Intervention	US	450	The purpose of this study is to assess the feasibility, acceptability and test the initial efficacy of eSBI compared with a nutrition intervention for at-risk youth.	Ongoing: Est. Completion Date Jul 2019
NCT01797835	Alcohol Screening in an Ethnically Diverse Sample of Adolescents in Primary Care	US	1573	The current study tests the new NIAAA screening guide questions, which ask about friend and adolescent drinking, to see how well these questions work to predict subsequent alcohol use, problems, and involvement in other risk behaviors, such as sexual risk-taking and delinquency. In addition, the investigators plan to provide a brief motivational intervention for some at-risk teens and see whether alcohol use differs for those teens who receive the intervention and those teens who receive enhanced usual care.	Ongoing: Est. Completion Date Aug 2018

Appendix J. Ongoing Studies

Study reference Trial identifier	Study name	Location	Estimated n	Description	2018 Status
NCT02584621	Web-Based Adolescent Motivational Enhancement Study (Web-AME)	US	150	This study is a randomized controlled trial that compares the effectiveness of an electronic personalized health screening app incorporating motivational feedback (i.e. "Check Yourself") to usual care among moderate to high risk alcohol users.	Ongoing: Est. Completion Date Feb 2017, no published results yet
NCT02337361	Computerized Tool for Preventing Prenatal Drinking	US	200	The purpose of the study is to test the efficacy of an innovative, self-administered computerized screening and brief intervention (SBI) for drinking during pregnancy will be adapted for use with non-pregnant childbearing age women.	Ongoing: Est. Completion Date Aug 2018
NCT02187887	Online Program for Young Adult Veteran Drinkers	US	793	The primary objective of the research study is to test the feasibility of a brief Internet-based intervention to reduce heavy alcohol use among young adult veterans of wars in Iraq and Afghanistan.	Ongoing: Est. Completion Date Apr 2016, no published results yet
NCT02834949	Improving Brief Alcohol Interventions with a Behavioral Economic Supplement	US	393	The purpose of this study is to evaluate the efficacy of a Substance-Free Activity Session (SFAS) as a supplement to a brief motivation intervention (BMI) in reducing alcohol use and alcohol-related consequences in college students.	Ongoing: Est. Completion Date Aug 2017, no published results yet
NCT01400581	Considering Healthier Drinking Options in Collaborative Care (CHOICE)	US	304	The proposed study will evaluate the effectiveness of a collaborative care intervention for evidence-based management of alcohol use disorders in primary care settings.	Completed. No published results yet.
NCT02978027	Mentored Research on Improving Alcohol Brief Interventions in Medical Settings	US	300	The purpose of the study is to delineate the degree to which adding motivational interviewing components to a brief intervention for unhealthy alcohol use improves outcomes.	Ongoing: Est. Completion Date Sep 2017, no published results yet