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A review of the Alcohol Use Disorders Identification Test (AUDIT), AUDIT-C, and USAUDIT for screening in the United States: Past issues and future directions

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ABSTRACT

Background. The US Preventive Services Task Force recommends that clinicians screen all adults for alcohol misuse and provide brief counseling to those engaged in risky or hazardous drinking. The World Health Organization's (WHO's) Alcohol Use Disorders Identification Test (AUDIT) is the most widely tested instrument for screening in primary health care. **Objectives.** This paper describes the structural and functional features of the AUDIT and methodological problems with the validation of the alcohol consumption questions (AUDIT-C). The content, scoring, and rationale for a new version of the AUDIT (called the USAUDIT), adapted to US standard drink size and hazardous drinking guidelines, is presented. **Method.** Narrative review focusing on the consumption elements of the AUDIT. Four studies of the AUDIT-C are reviewed and evaluated. **Results.** The AUDIT has been used extensively in many countries without making the changes in the first three consumption questions recommended in the AUDIT User's Manual. As a consequence, the original WHO version is not compatible with US guidelines and AUDIT scores are not comparable with those obtained in countries that have different drink sizes, consumption units, and safe drinking limits. **Clinical and Scientific Significance.** The USAUDIT has adapted the WHO AUDIT to a 14 g standard drink, and US low-risk drinking guidelines. These changes provide greater accuracy in measuring alcohol consumption than the AUDIT-C.

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AUDIT; AUDIT-C; alcohol; screening; standard drink; low-risk guidelines

Background

Alcohol use is associated with considerable mortality and morbidity in the United States (1), and for this reason the U.S. Preventive Services Task Force recommends that clinicians screen all adults and provide brief counseling interventions to at-risk patients (2). The World Health Organization's (WHO's) Alcohol Use Disorders Identification Test (AUDIT) is the most widely tested instrument for screening in primary health care (3,4).

The AUDIT is designed to assist in the early identification of patients who drink in ways that are potentially or currently harmful to health. As explained in the original paper on the development of the instrument, the purpose was explicitly *not* to identify “alcoholism” or alcohol dependence, but rather to identify patients before they developed dependence on alcohol by focusing on hazardous alcohol consumption (5). While measures of alcohol use were adopted as the “reference standards” for the instrument, using only these measures as a screening or diagnostic instrument was rejected on the grounds that (1) neither alcohol intake nor the frequency of

intoxication are sole determinants of harm, (2) the validity of patients' self-reports of drinking was satisfactory but other symptoms (e.g., blackouts) were also important, and (3) the amount of alcohol required to cause many medical conditions was not known. Thus, in addition to questions about alcohol use, the AUDIT also asks about common alcohol-related problems that patients may experience as well as common symptoms of alcohol dependence, and these responses are incorporated into the patient's total score (6). **Box 1** provides a summary of the item content of the AUDIT in relation to its three major domains: (1) hazardous alcohol use, (2) dependence symptoms, and (3) harmful alcohol use. **Box 2** provides definitions of key terms used in the AUDIT manual that were formulated by a WHO committee (7).

Hazardous alcohol use

Although the developers of the AUDIT originally hoped to create an instrument that did not ask specifically about alcohol consumption, they found that such questions were essential to its validity (5). The AUDIT measures the frequency of drinking and the typical

Box 1. Domains and item content of the AUDIT.

Domains	Question number	Item content
Hazardous Alcohol Use	1	Frequency of drinking
	2	Typical quantity
	3	Frequency of heavy drinking
Dependence Symptoms	4	Impaired control over drinking
	5	Increased salience of drinking
	6	Morning drinking
Harmful Alcohol Use	7	Guilt after drinking
	8	Blackouts
	9	Alcohol-related injuries
	10	Others concerned about drinking

Box 2. World Health Organization terminology used in AUDIT manual

Hazardous Use: A pattern of alcohol use that increases the risk of harmful consequences for the user. Some would limit the consequences to physical and mental health (as in **harmful use**); some would also include social consequences. In contrast to harmful use, hazardous use refers to patterns of use that are of public health significance despite the absence of any current disorder in the individual user. The term is used currently by WHO but is not a diagnostic term in ICD-10.

Harmful Use: A pattern of alcohol use that is causing damage to health. The damage may be physical (e.g., liver damage following chronic drinking) or mental (e.g., depressive episodes secondary to heavy alcohol intake). Harmful use commonly, but not invariably, has adverse social consequences; social consequences in themselves, however, are not sufficient to justify a diagnosis of harmful use.

The term was introduced into ICD-10 and supplanted “non-dependent use” as a diagnostic term.

Dependence Syndrome: A cluster of behavioural, cognitive, and physiological symptoms that may develop after repeated alcohol use. Typically, these phenomena include a strong desire to consume alcohol, impaired control over its use, persistent use despite harmful consequences, a higher priority given to alcohol use than to other activities and obligations, increased tolerance, and a physical withdrawal reaction when drinking use is discontinued. In ICD-10, the diagnosis of dependence syndrome is made if three or more of six specified criteria were experienced within a year.

Source: World Health Organization (7)

quantity consumed, which can determine weekly consumption, as well as the frequency of heavy drinking on occasions. Because the AUDIT was designed and initially tested as an international instrument for use in both developing and developed countries, it sought to identify accurately patients whose mean daily intake in a typical month was 40 g or more for men and 20 g or more for women (5). The three alcohol consumption questions included in the AUDIT were not validated at the time of the original psychometric study, but were only added later because the interview procedure used in original 1987 study was too detailed for a screening test. However, it became clear as additional studies were completed with these simplified questions that the cutoff point between low-risk and hazardous drinking might require adjustment depending upon national

and cultural standards as well as recommended maximum consumption allowances (6).

One such adjustment may be required because the typical serving size of drinks varies from country to country. Such variants result in a standard drink equaling 8 g of pure alcohol in the UK, but 14 g in the United States and 19.75 g in Japan (6). Moreover, recommendations of what constitutes drinking “too much” vary by national standards (8). For example, the UK recommends no more than 16–24 g per day for women and 24–32 g per day for men, with no weekly limits. However, the United States recommends no more than 42 and 56 g per day for women and men (under age 66), with weekly limits of 98 and 196 g, respectively. Japan recommends no more than 20 g per day for women and 40 g for men.

In order to produce an instrument with cross-national applicability, the creators of the AUDIT assumed that a standard drink contains 10 g of alcohol, which was approximately an average amount in the countries initially studied. Their recommended cutoff scores were based upon a low-risk drinking level of no more than 20 g of alcohol per day, 5 days per week, or a weekly level of no more than 100 g.

Because of this divergence in standard drink sizes and recommended levels of low-risk drinking among countries, the WHO AUDIT User’s Manual recommended that the AUDIT be adjusted for the standard drink alcohol content in the country in which it is used (6). Only with such adjustment will the AUDIT total score accurately reflect the amount of alcohol reported as consumed by the patient.

Symptoms of dependence

At the time of its development the AUDIT was unique in seeking to identify patients with hazardous and harmful alcohol consumption rather than solely patients with alcohol dependence. All questions were selected not on their capacity to identify alcohol dependence but based upon their correlation with alcohol intake (5). This approach allows the screening process to identify excessive drinking as a possible cause of presenting medical conditions. It also enables early intervention to prevent a pattern of drinking from progressing to dependence. However, the AUDIT also asks about symptoms that are often used to diagnose dependence. It is important to understand how this aspect of the AUDIT is intended to function.

Questions 4–6 of the AUDIT ask about impaired control over drinking, increased salience, and morning drinking. Responses to these questions provide a clinician with information useful for discussion of symptoms of alcohol

dependence and provide indicators of the need for a diagnostic assessment by a trained clinician. While a patient's affirmation of these symptoms may be an indicator of *possible* dependence, they do not constitute an adequate basis for such a diagnosis. The AUDIT is not a diagnostic instrument. A diagnosis of alcohol dependence requires administration of a well-tested diagnostic interview such as the Composite International Diagnostic Interview or by the evaluation of a trained specialist (6).

The levels of risk suggested by the WHO AUDIT manual (6) provide a way to communicate with patients about their alcohol-related risks. The affirmation of one or more dependence symptoms or an overall score on the AUDIT of 20 or greater indicates the possibility of dependence, which means only that the patient should receive an assessment to determine whether s/he meets standard diagnostic criteria for an alcohol use disorder. It is not a substitute for such a diagnosis. It is not, moreover, required that such a diagnosis be made to deliver an effective brief intervention or a referral to treatment.

Alcohol-related problems/harm

Questions 7–10 of the AUDIT ask about situations in which alcohol use contributed to the patient's experience of physical harm. While a patient's affirmations of such experience do not alone provide the basis for a diagnosis of harmful alcohol use, as opposed to hazardous use, they can contribute to an effective brief intervention. Responses to these questions provide a clinician with information useful in discussing what patients do not like about their current alcohol use, which may motivate them to consider reducing their consumption. Moreover, questions about being injured as a result of drinking and having had others express concern were given a "lifetime" response option ("Yes, but not in the past year") in order to identify persons with prior alcohol problems so that this information could be taken into account in any intervention or referral decisions, including the suspicion of relapse after an episode of alcohol dependence. These problem measures also capture social and physical harms that might be somewhat independent of the amount of alcohol consumed. For example, younger drinkers may be more susceptible to harm than older drinkers because the former lack tolerance.

The AUDIT's content was designed to provide measures of typical alcohol consumption, indicators of possible dependence useful for counseling a patient and referring to specialty care, and evidence of harm or problems useful in counseling the patient to reduce or

cease drinking. While excessive consumption is essential to identifying hazardous or harmful use, all three domains are important to determine whether a patient is at risk and to counsel the patient to reduce the risk.

The AUDIT-C and its validation

Although the option of using only the first three questions of the AUDIT for screening was considered and rejected by the creators of the instrument, before the end of the twentieth century other researchers returned to this alternative by seeking to validate the three consumption questions alone as a screening instrument under the name AUDIT-C. Four studies testing the accuracy of the AUDIT-C, including the three most highly cited validation studies, illustrate how this process has been conducted, how it diverges from the purpose of the original AUDIT, and whether the studies are well founded.

The original study of the AUDIT-C (9) examined a sample of 243 males in the US Veterans Administration medical system (VA) selected to contain twice the average number of patients who drank more than 14 drinks per week and 5 drinks per day. They completed a health history questionnaire, a survey containing the AUDIT (with modifications of wording), a retrospective drinking diary, and other questions. In addition, they were interviewed by telephone using the detailed alcohol consumption procedure used in the original AUDIT development study, as well as a diagnostic interview schedule for DSM-III-R.

The authors found the AUDIT-C identified heavy drinkers more accurately than the full AUDIT, but the full AUDIT performed slightly better in identifying patients with active alcohol abuse or dependence. Both instruments performed similarly in identifying heavy drinking and/or alcohol abuse (9). In reaching the conclusion that the three questions of the AUDIT-C "appear to be a practical, valid primary care test for heavy drinking and/or active alcohol abuse or dependence," the ground under the AUDIT's original intent was subtly but significantly shifted.

Two limitations in this study's design have contributed to subsequent misunderstanding of the AUDIT. The WHO team that created the AUDIT took great pains to assure that alcohol consumption was measured in grams, with a mean daily consumption of 40 g or more by men and 20 g or more by women serving as the threshold for potential harm. The Bush et al. study (9), however, assumed the US guideline of >14 drinks per week and ≥ 5 drinks per occasion. No consideration was given to how much alcohol there is in a US drink compared to the precise measure used by WHO. Perhaps more importantly, by adding the identification of "active abuse or dependence" as a standard for

validity, this study changed the purpose of the AUDIT, which was specifically *not* to identify a diagnosable alcohol-related disorder. Moreover, the DSM-III-R description of “alcohol abuse” included any impairment in social or occupational functioning. The authors recommended a cutoff score of 3 points (out of 12) to identify 90% of patients with abuse or dependence and 98% of heavy drinkers or a cutoff of 4 points that identified 86% of patients with either heavy drinking or abuse/dependence. However, the cutoffs of 3 and 4 points produced specificity rates of 40% and 28%, respectively. As described below, whether this constitutes an acceptable test of validity can be questioned.

Five years later Bradley et al. (10) examined the validity of the AUDIT-C in a sample of women in the VA system. Recognizing that the US-recommended drinking limits for women were >7 drinks per week and ≥4 drinks per occasion, they included two versions of question 3 of the AUDIT to ask about the frequency of occasions on which 4 or more drinks were consumed in addition to the 6 drinks of the WHO AUDIT. They also modified the wording of the AUDIT questions and the scoring of the response alternatives. To validate patient responses, they administered the Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS) (11), a structured diagnostic interview that also includes information on average daily alcohol intake.

The reference standard used in this study was a combination of two different elements—hazardous drinking (consumption above the US-recommended limits) and/or “active DSM-IV alcohol abuse or dependence.” With a cutoff score of 2 or more, the AUDIT-C was found to have identified both groups at sensitivities and specificities greater than 0.80. Data were not presented on each element of the reference standard, suggesting that the purpose of the instrument was to identify only both groups together. Thus, instead of validating the consumption questions of the AUDIT, this study changed the purpose of the instrument from measuring consumption to identifying not just alcohol dependence but also alcohol abuse, as described by DSM-IV.

Similar methods were used by Bradley et al. (12) to evaluate the AUDIT-C in a sample of 392 men and 927 women recruited from a Texas private practice. The AUDADIS interview was used again as a diagnostic standard to evaluate the AUDIT, the CAGE, and the AUDIT-C. Here the AUDIT questions were restored to their original WHO wording, but the AUDADIS consumption questions referred to the past 30 days instead of the past year. What the authors sought to identify was even more

complicated. While self-reported consumption as measured by questions 1–3 was reported, the US drinking limits were combined with a DSM-IV Alcohol Use Disorder and any single symptom thereof within the past year to constitute “alcohol misuse.” They concluded that the AUDIT-C performed better than the other instruments in identifying alcohol misuse at cutoff of 4 for men and 3 for women.

These three studies shifted the reference standard from the amount of alcohol consumed to symptoms associated with criteria for a diagnosis of an alcohol use disorder. A more recent study of the AUDIT-C by Delaney et al. (13) found what the authors termed “inconsistencies” between the results of the instrument at the recommended cutoffs and the amount of drinking actually reported by patients. Up to 21% of patients had AUDIT-C results that were inconsistent with their drinking as reported on the same instrument. The questions designed to measure alcohol consumption were considered no longer to do so accurately. Rather than questioning the methodological limitations of prior validation studies, the authors concluded that clinicians should take into account *both* the AUDIT-C score and reported consumption. They offered no means for clinicians to know whether any patient’s reports were inconsistent with the total score or why a clinician should have to interpret the instrument in two separate ways.

These studies show that attempts to validate the AUDIT-C have changed the purpose of the original AUDIT instrument, creating multiple problems that make the scientific basis of the instrument recommended by the studies questionable in terms of its use in clinical practice. First, questions clearly formulated to measure alcohol consumption were used as indicators of alcohol use disorders or individual symptoms thereof. Second, cutoffs were recommended that identified not excessive consumption but a binary classification of one or more of those disorders, with no attention devoted to the consumption pattern reported by the patient (e.g., binge drinking). Third, while some efforts were made to adapt the instrument to the standard drink size and recommended limits of the country in which the studies were conducted (the United States), those efforts were not consistent with the original intent of the instrument. Finally, as an international screening test, the AUDIT was developed through research conducted in many countries, and any changes in its

use should have been based on a broader range of drinking cultures.

Appropriate adjustment of the AUDIT-C for use in the United States

Understanding the need for adjustment

As the framers of the original AUDIT recognized, screening for alcohol use in primary care first requires a measure of a patient's alcohol consumption pattern in comparison to a recommended standard. While drinking above-recommended guidelines does not automatically equate with hazardous and harmful use, risk and harm rarely occur without it. The United States Department of Agriculture (USDA) defines alcohol risk only in terms of consumption. The USDA recommends moderation, i.e., no more than one drink per day for women and two for men, and defines high-risk drinking as consumption of 4 or more drinks on any day or 8 or more drinks per week for women and 5 or more drinks on any day or 15 drinks per week for men (USDA Dietary Guidelines (14)). The Centers for Disease Control and Prevention (CDC) call drinking above these weekly limits "heavy drinking" and cites the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in calling drinking beyond the daily limits "binge drinking" if consumption occurs within 2 h (15). The NIAAA also specifies limits for men by age, recommending men over age 65 have no more than three drinks on any day and seven per week (16). Both the USDA and NIAAA/CDC report that a typical drink in the United States contains 14 g or 0.6 fl oz of pure alcohol.

Thus, the size of a US standard drink is 40% larger than that used by WHO in the creation of the AUDIT, and the US-recommended limit for men

under age 66 is almost twice the WHO AUDIT cut-off. If an American clinician wants to measure whether a patient is drinking excessively and is at risk by the US government standards, the consumption questions of the AUDIT will not provide an accurate measure. It may be assumed that a patient understands that a drink consists of 14 g of alcohol, which is standard for many (but not all) served beverages. But the response alternatives for questions 1 and 2 do not allow a practical measure of weekly drinking, and question 3 (asking about consumption of six or more drinks) exceeds the US-recommended daily limit for both men and women. A useful screening instrument should measure reported consumption and determine whether it is above the US-recommended limits for each specified group. It is especially important that there be no false positives in order to avoid having clinicians accuse patients who have reported drinking within recommended levels of drinking too much.

Given its widespread use and extensive validation research, the AUDIT could serve this purpose in the United States if scoring cutoffs could be established to differentiate between those who drink below and above the US-recommended levels. The WHO manual (6) recommends this kind of adaptation:

In the AUDIT, Questions 2 and 3 assume that a standard drink equivalent is 10 grams of alcohol. You may need to adjust the number of drinks in the response categories for these questions in order to fit the most common drink sizes and alcohol strength in your country. (6, p. 32)

Unfortunately, no adjustment of the cutoffs alone will adequately and accurately distinguish those whose reported drinking is low risk from those drinking above the recommended level.

Box 3. Comparison of WHO AUDIT and USAUDIT modifications to questions 1–3

Questions	0	1	2	3	4	5	6	Score
WHO AUDIT 1. How often do you have a drink containing alcohol?	Never	Monthly or less	2–4 times a month	2–3 times a week	4 or more times a week			
USAUDIT 1. How often do you have a drink containing alcohol?	Never	Less than monthly	Monthly	Weekly	2–3 times a week	4–6 times a week	Daily	
WHO AUDIT 2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 or 2	3 or 4	5 or 6	7 to 9	10 or more			
USAUDIT 2. How many drinks containing alcohol do you have on a typical day when you are drinking?	1 drink	2 drinks	3 drinks	4 drinks	5–6 drinks	7–9 drinks	10 or more drinks	
WHO AUDIT 3. How often do you have six or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily			
USAUDIT 3. How often do you have X (5 for men; 4 for women and men over age 65) or more drinks on one occasion?	Never	Less than monthly	Monthly	Weekly	2–3 times a week	4–6 times a week	Daily	

Adjustments of the AUDIT-C for US settings

A simple expansion of the response alternatives of the AUDIT’s questions 1–3 and a modification of the wording of question 3 produces an adaptation that can function accurately and efficiently to measure US patients’ alcohol consumption. Such an adaptation of the AUDIT-C for US settings was first published as the AUDIT 1–3 (US) by CDC in *Planning and Implementing Screening and Brief Intervention for Risky Alcohol Use: A Step-by-Step Guide for Primary Care Practices* (17). A manual on the use of the instrument was subsequently published as *USAUDIT: The Alcohol Use Disorder Identification Test, Adapted for Use in the United States: A Guide for Primary Care Practitioners* (18). The instrument contains the modifications to the WHO AUDIT described in Box 3. To summarize:

- Question 1 remains the same but the number of response alternatives is expanded from 5 to 7 to allow a more precise measurement of drinking frequency.
- Question 2 remains the same but the number of response alternatives is expanded again from 5 to 7 for a more precise measurement of drinking quantities.
- Question 3 is revised based upon Smith et al. (2009) and the response alternatives are expanded from 5 to 7 as with questions 1 and 2 for a more precise measure of frequency.

With the exception of question 3, all the questions in the USAUDIT are identical to those of the original WHO AUDIT, which have been widely tested and shown to be understood and answerable by patients of many cultural backgrounds (3). Testing

of the adjusted question 3 (with slight differences) showed it to be understood and effective as a single-question screening instrument (19). It has been adopted by the NIAAA and recommended by the United States Preventive Services Task Force. The expansion of response alternatives to questions 1–3 allows more choices for the patient to characterize their drinking patterns, and by assigning points to each choice the scoring system becomes more precise in measuring the frequency of drinking, the number of drinks typically consumed, and the frequency of heavy drinking occasions.

The reference standard and scoring validation

The purpose of the USAUDIT-C is to compare patient-reported alcohol consumption to the reference standard of the US-recommended guidelines. Simply adding the points associated with each response alternative provides a total score. The higher the total score, the greater the patient’s alcohol consumption and related risk. Clinicians may also determine the number of drinks per week by multiplying frequency of drinking (question 1) by the number of drinks typically consumed (question 2). The response to question 3 indicates the frequency of binge drinking, which increases the risk of many injuries and social problems.

A patient’s actual drinking pattern is not needed for valid screening results. While some patients who drink excessively may hide or underreport their consumption, most people who drink near the recommended levels are willing to respond honestly to questions about their alcohol use (20) and do so with sufficient accuracy for this purpose, as evidenced by multiple validation studies of the AUDIT (3,4). While it may now be possible to test the accuracy of patient self-reported drinking by the

Table 1. Scoring for women and men over age 65, cutoff of 7 (# drinks in black; score in bold)

Q1Points→		<1/month	1/month	1/week	2-3/week	4-6/week	7/week
Q2Points↓	0	1	2	3	4	5	6
1 drink	Never	<1/mo	1/mo	1	2-3	4-6	7
0		1	2	3	4	5	6
2 drinks		<2/mo	4/mo	2	4-6	8-12	14
1		2	3	4	5	6	7
3 drinks	Never	<3/mo	6/mo	3	6-9	12-18	21
2		3	4	5	6	7	8
Q3 Points →	0	1	2	3	4	5	6
4 drinks		<4/mo	8/mo	4	8-12	16-24	28
3		5	7	9	11	13	15
5-6 drinks		<5-6/mo	10-12/mo	5-6	10-18	20-36	35-42
4		6	8	10	12	14	16
7-9 drinks		<7-9/mo	14-18/mo	7-9	14-27	28-54	49-63
5		7	9	11	13	15	17
10+drinks		<10/mo	20+/mo	10+	20-30+	40-60+	70+
6		8	10	12	14	16	18

- **Green:** Fewer drinks per week and per occasion than U.S. recommended guidelines
- **Yellow:** False Negatives–Cases in which reported drinking may or does exceed recommended levels but do not screen positive
- **Red:** Cases in reported drinking will screen positive

Table 2. Scoring for men (ages 18–65), cutoff of 8 (# drinks in black; score in bold).

Q1Points→		<1/month	1/month	1/week	2-3/week	4-6/week	7/week
Q2Points↓	0	1	2	3	4	5	6
1 drink	Never	<1/mo	1/mo	1	2-3	4-6	7
0		1	2	3	4	5	6
2 drinks		<2/mo	4/mo	2	4-6	8-12	14
1		2	3	4	5	6	7
3 drinks	Never	<3/mo	6/mo	3	6-9	12-18	21
2		3	4	5	6	7	8
4 drinks		<4/mo	8/mo	4	8-12	16-24	28
3		4	5	6	7	8	9
Q3 Points →	0	1	2	3	4	5	6
5-6 drinks		<5-6/mo	10-12/mo	5-6	10-18	20-36	35-42
4		6	8	10	12	14	16
7-9 drinks		<7-9/mo	14-18/mo	7-9	14-27	28-54	49-63
5		7	9	11	13	15	17
10+drinks		<10/mo	20+/mo	10+	20-30+	40-60+	70+
6		8	10	12	14	16	18

Green indicates fewer drinks per week and per occasion than US-recommended guidelines; yellow indicates false negatives—cases in which reported drinking may or does exceed recommended levels but do *not* screen positive; and red indicates cases in reported drinking will screen positive.

direct biomarker phosphatidylethanol (21,22), such testing may be useful for selected cases but is not needed for universal alcohol screening. Similarly, a diagnosis of an alcohol use disorder, which has not typically been included in trials, is not required.

Because the US drinking guideline is the reference standard, a critical question is whether the USAUDIT-C recommended cutoffs in total scores satisfactorily distinguish patients who drink above recommended limits from those who do not. As described above, Delaney et al. (13) have shown significant inconsistencies between patient-reported consumption and AUDIT-C classification accuracy. The USAUDIT-C removes these inconsistencies. Tables 1 and 2 show the finite number of responses possible to the instrument, and they show the scoring results of each possible set of response alternatives. This is a logical, not an empirical demonstration. Validating the scoring cutoffs for the USAUDIT against more accurate and detailed measures of patient drinking, compared to the US drinking guidelines, could also be conducted in order to determine the marginal improvement in classification accuracy.

Tables 1 and 2 provide all the relevant information on how the scoring of the USAUDIT-C measures patients' reported drinking and how the cutoffs function. In each table the scoring points of each response alternative (in blue) appear in the heading and the left column along with the number of drinks for each column and row. Across the middle of the tables (at maximum number of drinks recommended per day for each group) is a shaded row containing the additional points attributable to responses to question 3. Each box of each table contains the number of reported standard

drinks consumed and the scoring points for each possible response combination. For example, a female patient who drinks 2–3 times a week and typically has 2 drinks on those days has 4–6 drinks per week, receiving 5 points on questions 1 and 2. If that patient selects “never” in question 3, the total points remains 5. But if she indicates she has 4 or more drinks monthly, 2 points are added to produce a total score of 7.

With recommended cutoffs of 7 for women and men over age 65 and 8 for younger men, the first three questions alone determine whether a patient screens positive. Thus, the most efficient screening system is to administer the USAUDIT-C first to all patients, calculate the total score, and administer the remaining 7 AUDIT questions only to those who score positive. A total of 18 points can be scored on questions 1–3, six more than on the WHO AUDIT due to the additional two response alternatives; thus, 46 points may be scored on the full the USAUDIT in contrast to the 40 points possible on the WHO AUDIT. Care must be taken with special cases, such as women who are pregnant (a score >0 is positive) and with patients whose medical condition or medications require abstinence from alcohol.

With the recommended cutoffs, all patients will be scored as positive if they exceed the recommended US guidelines. There will be no false positives, i.e., patients deemed to be at risk whose drinking is within recommended limits. All response alternatives that produce a positive score in the AUDIT-C that are inconsistent with patient reports of drinking within the US guidelines are corrected by the USAUDIT. However, in the case of women and older men there are four patterns that produce false negatives, patients whose reported

drinking exceeds, or may exceed, recommended guidelines but who are deemed negative (see yellow cells). With younger men, there are only three false negative response patterns.

Conclusions

Alcohol screening requires accurate measurement of alcohol consumption. Delivery of effective counseling does not require a diagnosis of an alcohol use disorder or any of the constituent dependence symptoms or consequences. The original validation studies of the AUDIT-C sought to use it to provide such diagnoses, but the results show their cutoffs produce a high rate of false positives resulting largely from not measuring alcohol consumption correctly.

The USAUDIT adapts the WHO AUDIT to 14 g standard drink and the US low-risk drinking guidelines. It provides greater accuracy in measuring alcohol consumption than the AUDIT-C. It identifies all reported drinking above recommended levels, with no false positives and only a few false negatives. Highest efficiency can be achieved by administering the USAUDIT-C universally, with the remaining seven AUDIT questions given only to those who screen positive for current alcohol consumption. Responses to these questions provide useful information to clinicians in discussing symptoms of dependence and harm with patients.

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Declaration of interest

John Higgins-Biddle has served as a consultant to the Centers for Disease Control and Prevention regarding the development of the USAUDIT and a planning and implementation guide for alcohol screening and brief intervention. Thomas Babor served as a Temporary Advisor to the World Health Organization on the development of the WHO AUDIT, and both authors developed a manual for the USAUDIT for the Substance Abuse and Mental Health Services Administration.

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References

- Centers for Disease Control and Prevention. Fact-Sheet. 2016 [accessed 2017 Nov 10]. <https://www.cdc.gov/alcohol/fact-sheets/prevention.htm>.
- U.S. Preventive Services Task Force. 2013 [accessed 2017 Nov 10]. <https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/alcohol-misuse-screening-and-behavioral-counseling-interventions-in-primary-care>.
- Allen JP, Litten RZ, Fertig JB, Babor T. A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clin Exp Res.* 1997;21(4):613–19. doi:10.1111/j.1530-0277.1997.tb03811.x.
- Babor TF, Robaina K. The Alcohol Use Disorders Identification Test (AUDIT): a review of graded severity algorithms and national adaptations. *Int J Alcohol Drug Res.* 2016;5:17–24. doi:10.7895/ijadr.v5i2.222.
- Saunders JB, Aasland OG. WHO collaborative project on the identification and treatment of persons with harmful alcohol consumption: report on phase i, the development of a screening instrument. Geneva, Switzerland: World Health Organization; 1987.
- Babor TF, Higgins-Biddle JC, Saunders JB, Monteiro MG. AUDIT: the alcohol use disorders identification test: guidelines for use in primary care. 2nd ed. Geneva, Switzerland: World Health Organization; 2001.
- World Health Organization. Lexicon of alcohol and drug terms. Geneva, Switzerland: World Health Organization; 1994.
- Kalinowski A, Humphreys K. Governmental standard drink definitions and low-risk alcohol consumption guidelines in 37 countries. *Addiction.* 2016;111(7):1293–98. doi:10.1111/add.v111.7.
- Bush K, Kivlihan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT Alcohol Consumption Questions (AUDIT-C); An effective brief screening test for problem drinking. *Arch Intern Med.* 1998;158:1789–95. doi:10.1001/archinte.158.16.1789.
- Bradley KA, Bush KR, Epler AJ, Dobbie DJ, Davis TM, Sporleder JL, Maynard C, Burman ML, Kivlihan DR. Two brief alcohol-screening tests from the Alcohol Use Disorders Identification Test (AUDIT): a validation in a female veterans affairs patient population. *Arch Intern Med.* 2003;163:821–29. doi:10.1001/archinte.163.7.821.
- Grant BF, Harford TC, Dawson DA, Chou PS, Pickering RP. The Alcohol Use Disorder and Associated Disabilities Interview Schedule (AUDADIS): reliability of alcohol and drug modules in a general population sample. *Drug Alcohol Depend.* 1995;39(1):37–44. doi:10.1016/0376-8716(95)01134-K.
- Bradley KA, DeBenedetti AF, Volk RJ, Williams EC, Frank D, Kivlihan DR. AUDIT-C as a brief screen for alcohol misuse in primary care. *Alcohol Clin Exp Res.* 2007;31(7):1308–1217. doi:10.1111/j.1530-0277.2007.00403.x.
- Delaney KE, Lee AK, Lapham GT, Rubinsky AD, Chavez LJ, Bradley KA. Inconsistencies between alcohol screening results based on AUDIT-C scores and reported drinking on the AUDIT-C questions: prevalence in two US national samples. *Addict Sci Clin Pract.* 2014;9:2. doi:10.1186/1940-0640-9-2.

14. USDA Dietary Guidelines. 2015 [accessed 2017 Dec 10]. <https://health.gov/dietaryguidelines/2015/guidelines/appendix-9/>.
15. Centers for Disease Control and Prevention. Alcohol and Public Health/Frequently Asked Questions. 2018 [accessed 2017 Dec 10]. <https://www.cdc.gov/alcohol/faqs.htm#excessivealcohol>.
16. NIAAA Rethinking Drinking. 2016 [accessed 2017 Dec 10]. <https://www.rethinkingdrinking.niaaa.nih.gov/How-much-is-too-much/Is-your-drinking-pattern-risky/Whats-Low-Risk-Drinking.aspx>.
17. Centers for Disease Control and Prevention. Planning and implementing screening and brief intervention for risky alcohol use: a step-by-step guide for primary care practices. Atlanta, Georgia: Centers for Disease Control and Prevention, National Center on Birth Defects and Developmental Disabilities; 2014. <https://www.cdc.gov/ncbddd/fasd/documents/alcoholsbiimplementationguide.pdf>
18. Babor TF, Higgins-Biddle JC, Robaina K. USAUDIT: the alcohol use disorder identification test, adapted for use in the United States: a guide for primary care practitioners. 2016. [accessed 2017 Dec 10]. http://my.ireta.org/sites/ireta.org/files/USAUDIT-Guide_2016_final.pdf.
19. Smith PC, Schmidt SM, Allensworth-Davies D, Saitz R. Primary care validation of a single-question alcohol screening test. *J Gen Intern Med.* 2009;24(7):783–88. doi:10.1007/s11606-009-0928-6.
20. Miller PM, Thomas SE, Mallin R. Patient attitudes towards self-report and biomarker alcohol screening by primary care physicians. *Alcohol Alcoholism.* 2006;41:306–10. doi:10.1093/alcalc/agl022.
21. Piano MR, Tiwari S, Nevorol L, Phillips SA. Phosphatidylethanol levels are elevated and correlate strongly with AUDIT scores in young adult binge drinkers. *Alcohol Alcohol.* 2015;50:519–25. doi:10.1093/alcalc/agv049.
22. Walther L, De Bejczy A, Löf E, Hansson T, Andersson A, Guterstam J, Hammarberg A, Asanovska G, Franck J, Söderpalm B, et al. Phosphatidylethanol is superior to carbohydrate-deficient transferrin and gamma-glutamyl-transferaseγ-Glutamyltransferase as an alcohol marker and is a reliable estimate of alcohol consumption level. *Alcohol Clin Exp Res.* 2015;39(11):2200–08. doi:10.1111/acer.12883.