Reducing alcohol-associated liver disease burden in the general population

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The prevalence of alcohol use disorder (AUD) and alcohol-associated liver disease (ALD) is rising. The National Institute on Alcohol Abuse and Alcoholism organised a multistakeholder workshop focused on reducing the burden of ALD. Decreasing ALD morbidity and mortality requires a multipronged approach, including increased population-based screening for AUD, early recognition of ALD, and multidisciplinary treatment. Recommended screening tools for alcohol use include the alcohol use disorders identification test for consumption (AUDIT-C). In patients with elevated AUDIT-C scores (AUDIT-C score of ≥3 points in women, ≥4 points in men), screening for fibrosis is recommended using non-invasive blood-based tests, such as the Fibrosis-4 index. Sequential testing using blood-based and imaging-based non-invasive liver disease assessment is preferred to blood-based tests alone to increase the positive predictive value of referral pathways. Screening, brief intervention, and referral to treatment are effective for reducing unhealthy alcohol use among adults who are not alcohol dependent. Integrated care models that incorporate mental health treatment into general medical settings are crucial for AUD and ALD. Emerging care models, such as multidisciplinary ALD clinics and substance use navigators, can improve patient engagement and outcomes. Markers of success include a reduction in per capita alcohol consumption, declines in morbidity and mortality related to AUD and ALD, and a decrease in health-care costs.

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Introduction

Alcohol-associated liver disease (ALD) is a leading alcohol-related chronic medical illness.[1,2] Additionally, there was an increase in prevalence of ALD over the course of the COVID-19 pandemic, due to higher amounts of alcohol consumption in the general population.[3]

Unhealthy alcohol use (including drinking above lower-risk limits) and ALD are often comorbid conditions. Treating unhealthy alcohol use and alcohol use disorder (AUD) reduces the incidence and progression of ALD.[4] Routine screening for unhealthy alcohol use and ALD should be integrated into primary care and other general medical settings, so that both can be identified early and patients can be offered brief interventions to address alcohol use and referred to specialists as indicated. Linkage to treatment is also crucial for patients with comorbid AUD and ALD, requiring partnerships between primary care, hepatologists, and addiction specialists. Although there has been an admirable increase in attention to increasing access to alcohol-use treatment among those with established ALD, the larger upstream problem of alcohol consumption within the broader population has gone largely unaddressed.

To this end, the National Institute on Alcohol Abuse and Alcoholism (NIAAA) convened a workshop that brought together global experts in different disciplines of liver disease management; clinical practice of addiction treatment; and experts in health-care delivery, implementation science, and outcome assessment to address the problem of reducing ALD prevalence in the general population.

Methods

The NIAAA workshop took place in a hybrid meeting from April 17–18, 2024, in Bethesda, MD, USA. Participants included NIAAA leadership, primary care physicians, psychologists, addiction physicians, health-care system leaders, health economists, hepatologists (general and transplant), and patients. Speakers were chosen by a multidisciplinary panel based on content expertise and are authors of this Health Policy. The format was a brief lecture followed by an open forum for discussion. Funding for travel was provided by the NIAAA but no other funding was provided for manuscript development. Recommendations were based on expert opinion after review of current literature, as well as the proceedings on the conference (table 1).

Results

Scope of the problem

In the USA, the prevalence of all categories of heavy drinking (eg, exceeding daily or weekly limits) is 15–35% in people assessed during health-care encounters and has increased over time, with resultant growth in the burden of AUD and ALD.[5,6] As of 2021, AUD affected 29·5 million Americans, or 10·6% of those aged 12 and older, with rising trends.[7] Furthermore, the health benefits of reducing alcohol consumption applies to a broader population than people who meet diagnostic criteria for AUD. More recently, the Surgeon General of the USA recommended attaching a cancer warning label to alcohol-containing products, similar to warning labels already attached to tobacco products, alerting consumers to the increased risk of some types of cancers with alcohol consumption.[8]

A third of all alcohol-related deaths are attributed to liver disease complications, and ALD is the leading cause of liver-related morbidity and mortality.[9–11] Consequently, ALD has become the leading indication for liver transplant in the USA.[12,13]

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	Statement
Scope of problem	
Problem 1	The prevalence of AUD and ALD is rising
Problem 2	ALD is frequently diagnosed at advanced stages compared with other causes of chronic liver disease, leading to poorer outcomes, including liver-related mortality
Problem 3	Early screening and interventions for both unhealthy alcohol use and ALD are associated with better outcomes
Problem 4	The use of non-stigmatising language is required for effective screening, accurate assessment, and treatment engagement for AUD and ALD
Early disease identification in general medical settings	
Recommendation 1	Screen all patients annually for unhealthy alcohol use using the three-item AUDIT-C
Recommendation 2	If AUDIT-C is 7–12, assess for the presence of DSM-5 AUD with an alcohol symptom checklist
Recommendation 3	In patients with elevated AUDIT-C (ie, ≥3 points for women or ≥4 for men), use the FIB-4 index (or alternative validated algorithm) to screen for hepatic fibrosis and evidence of ALD
Recommendation 4	Offer feedback and advice to stop or decrease drinking to those with unhealthy alcohol use and elevated FIB-4 (≥1·3); explain the effect of alcohol use on the liver and advise to stop drinking (optimal) or decrease to as low as possible, if stopping is not acceptable to the patient
Recommendation 5	Test those with unhealthy alcohol use and indeterminate FIB-4 (1·30–2·66) for hepatic fibrosis using an accurate non-invasive test, such as VCTE or a blood-based fibrosis test of comparable performance; alternatively, intensify management of unhealthy alcohol use and any metabolic risk factors (metabolic and alcohol-related liver disease, diabetes, hypertension, obesity, hypertriglyceridaemia, and low HDL cholesterol) and repeat FIB-4 tests in <1 year
Recommendation 6	Refer those with high FIB-4 (≥2·67), or indeterminate FIB-4 and another confirmatory fibrosis test, to specialty liver care; specialist care should evaluate the presence of advanced fibrosis or cirrhosis by elastography (VCTE, MR elastography, and point or 2-dimensional shear-wave elastography) or biopsy as applicable
Recommendation 7	Offer ongoing monitoring with repeated AUDIT-C and FIB-4 and feedback, as in Recommendation 4, for those with concern for advanced fibrosis indicating high risk for progression or decompensation of ALD, with frequency of testing based on severity of risk
Intervention and management	
Recommendation 8	Alcohol SBIRT as an intervention approach might be effective for reducing unhealthy alcohol use
Recommendation 9	Brief intervention is recommended as an initial intervention for unhealthy alcohol use or mild AUD, which involves providing advice and feedback on liver disease and other alcohol-related harms if patients screen positive on the AUDIT-C and FIB-4 is ≥1·3
Recommendation 10	Timely treatment consisting of medications and/or behavioural interventions for patients with AUD and ALD, especially moderate-to-severe AUD, is recommended
Care delivery and public health measures	
Recommendation 11	Integration of early multidisciplinary medical and psychosocial management (eg, collaboration amongst behavioural health, social work, hepatology, and addiction medicine and psychiatry providers) is vital to successful long-term recovery in AUD and ALD
Recommendation 12	Telemedicine, colocated models of care, expanded hub-and-spoke integrated care delivery models, and remote care should be explored to address care barriers, including in rural and underserved communities
Recommendation 13	Alternative payment structures that prioritise population health and improve parity for addiction treatment services, such as value-based payment, should be explored
Outcome assessments and goals	
Implementation	
Recommendation 14	Implementation of preventive risk scores (AUDIT-C and FIB-4) in general medicine settings with adequate reimbursement and resources
Recommendation 15	Improvement in implementation of SBIRT in primary care and other medical settings
Recommendation 16	Improvement in quality-of-life measures in patients with AUD and ALD
Short-term outcomes	
Recommendation 17	Decrease in return to harmful drinking and severity of ALD in screen-positive ALD patients at practice and health-care system levels
Recommendation 18	Improvement in cost-effectiveness and sustainability of the programmes that combine alcohol-use intervention and ALD screening at practice and health-care system levels
Long-term outcomes	
Recommendation 19	Reduction in ALD burden, including health-care costs, emergency room visits, hospitalisations, number of liver transplantations, and ALD-related mortality within health-care system, state, and national levels
Recommendation 20	Incorporation of quality-adjusted life-years, which combine both health-related quality of life and long-term mortality, into a single long-term outcome measure

ALD=alcohol-associated liver disease. AUD=alcohol use disorder. AUDIT-C=Alcohol Use Disorders Identification Test for Consumption. FIB-4=fibrosis-4. MR=magnetic resonance. SBIRT=screening, brief intervention, and referral to treatment. VCTE=vibration-controlled transient elastography.

Table 1: **Problems and recommendations relating to the prevalence, diagnosis, and treatment of AUD and ALD**

Effective treatments for AUD exist and can reduce liver-related morbidity and mortality, yet they are underused in patients with ALD.[14–16] Unlike patients with chronic liver disease due to other causes, patients with ALD often present at later stages, when the treatment window is limited or already closed.[17] Unfortunately, liver-directed therapies for ALD offer only modest short-term survival benefit.[18] Conversely, treatment of AUD, including with pharmacotherapy and behavioural interventions, is associated with lower risk of disease progression and liver-related mortality, especially when implemented early in the disease course to support sustained alcohol abstinence.[4,15,19,20]

The burden of ALD is high among men, especially those aged 50–70 years. However, demographic groups with increasing risk for worse ALD outcomes include females, young adults, racial and ethnic minorities, and rural populations. Females generally have smaller distribution volume and lower enzymatic activity that affects alcohol metabolism, with phenotypic gene expression and psychosociocultural barriers to treatment that affect susceptibility to disease.[21] Young adults have higher risk of harmful drinking in conjunction with an increased overlap of metabolic syndrome. This combination has led to increased hospitalisations for severe liver disease requiring evaluation for liver transplantation.[22,23] Genetic polymorphisms, along with social determinants of health, increase risk of disease in racial and ethnic minorities. This increased risk has been evidenced by a higher burden of ALD among Hispanic populations and substantially higher mortality from alcohol-associated hepatitis among Native Americans and Asians.[24,25] Finally, rural populations face difficulties in access to care and have higher rates of emergency department visits, with less linkage to addiction care after discharge.[26,27]

Stigma and alcohol-associated health disorders

There are at least three types of stigma in ALD: public stigma involves negative or discriminatory attitudes that others have about people with ALD; self stigma refers to the negative attitudes, including internalised shame, that people with ALD have about their own condition; and structural stigma involves policies of governments or private organisations that intentionally or unintentionally restrict opportunities for people with ALD.[28] The effects of stigma and discrimination on access to both AUD and liver-related care, as well as the success of integrated care for AUD and ALD, should be considered such that interventions that are developed, evaluated, and implemented are equitable in their dissemination and effect.[29–33] Addressing stigmatising language is especially critical in this context. Bielenberg and colleagues[34] conducted a systematic review of stigma interventions for providers treating patients with substance use disorders, showing that educational interventions and contact with individuals in recovery effectively reduce stigma. Similarly, Sukhera and colleagues[35] proposed an educational framework to dismantle structural stigma, emphasising the importance of recognising and addressing stigmatising language in clinical interactions.

Screening for unhealthy alcohol use and ALD

Global barriers

Barriers to screening for unhealthy alcohol use and liver disease can be categorised as clinician barriers, patient barriers, and health-system barriers (table 2).

Clinician barriers to ALD and AUD screening include low education and comfort with how to screen and what to do with the results, insufficient time given competing demands of concurrent medical issues, and culture.[36] Other barriers include variable understanding of AUD and unhealthy alcohol use across providers of different disciplines, time, and an absence of robust, standardised infrastructure to screen and diagnose early-stage disease, especially at the primary care level.[37]

Patient barriers to screening include stigma surrounding alcohol use and perceived loss of confidentiality leading to under-reporting, variable engagement in care, and health-care disparities that mediate access to primary care, specialty care, and addiction services.

Health-system barriers include insufficient workflows for effective ALD and AUD screening, an absence universal annual screening for alcohol consumption in most health-care settings, dearth of referral pathways and sufficiently trained workforce to address advanced liver disease and AUD, and the separation of AUD care from medical treatment.

Screening for unhealthy alcohol use and AUD

In the USA, 84·5% of adults had a visit with a doctor or other health-care professional in 2023.[38] Alcohol screening is routinely implemented in many primary care practices consistent with recommendations.[39] Screening is most sensitive when collected based on self report and has high reliability in such settings.[7,40–43] Several widely used brief alcohol screening questionnaires are useful for identifying patients at increased risk of ALD, including the three-item Alcohol Use Disorder Identification Test for Consumption (AUDIT-C) questions and single-item alcohol screens that ask about heavy drinking—four or more drinks in a day for women, and five or more drinks for men (appendix p 2–3).[44–46]

See Online for appendix

The three-item AUDIT-C performs as well as the 10-item AUDIT, including for identifying AUD.[47,48] The AUDIT-C is a scaled marker of alcohol use (scores 0–12) strongly associated with level of daily alcohol consumption. It is often used as a binary screen, at the standard threshold for unhealthy alcohol use (≥3 points for women and ≥4 for men).[48] Screening all patients annually is preferable because AUDIT-C assesses the typical quantity and frequency of drinking, as well as episodic heavy drinking, in the previous 12 months.[49] AUDIT-C scores are strongly associated with health outcomes, including all-cause hospitalisations, hospitalisations for

	Proposed strategy to address barriers
Patient-level barriers	
Patient does not believe they have a problem or that they could benefit from treatment for their alcohol use	Education on the harms of alcohol consumption in context of ALD; clear advice that cessation of alcohol consumption is recommended; motivational interviewing to overcome ambivalence and promote motivation for treatment
Perceived stigma about unhealthy alcohol use and/or AUD	Embedded therapists and addiction specialists to facilitate engagement; patient-first and non-judgmental language; organisational level educational campaigns to address stigma; changing the word alcoholic to alcohol-associated in medical charts, scientific and public articles on ALD, and when communicating with patient and team
Preoccupied or overwhelmed with medical care for liver disease or competing care needs (liver disease *vs* addiction treatment)	Embedded therapists and addiction specialists working alongside liver specialists to provide counselling and same-day colocated care; care coordination to simplify treatment plan and implementation for patient and team
Feel too sick or experiencing hepatic encephalopathy	Educating therapists on aspects of liver disease and coordinating care of liver disease symptoms with liver specialists
Logistical issues (eg, transportation, caregiver time, and money)	Telemedicine appointments to improve attendance
Under-reporting alcohol use	Routine screening in primary care; monitoring with alcohol biomarkers (eg, phosphatidylethanol)
Poor social support for recovery (eg, drinking or unsupportive)	Actively drinking family support can be referred for their own treatment; family therapy, psychoeducation, or peer support groups (eg, Al-Anon) for non-drinking family supports having difficulty with patient's alcohol use
Clinician-level barriers	
Inadequate recognition or screening of unhealthy alcohol use or heavy drinking	Education and awareness about problematic alcohol use, AUD, and the use and interpretation of screening measures
Lack of basic medical knowledge of definitions regarding alcohol use and use disorder and expertise and familiarity with validated tools to assess and diagnose AUD among physicians	All levels of medical education address health risks, identification, and intervention for alcohol use and use disorders
Lack of hepatologists or gastroenterologists with interest and training in AUD treatment	Incorporation of education regarding AUD and addiction treatment into specialty training and certification; development of clinical tools to facilitate AUD and addiction treatment in hepatology care settings
Variability in attitudes towards AUD treatment	Active recruitment of specialists to this field; fostering collaboration and mentorship between addiction specialists, behavioural health clinicians, and hepatologists and gastroenterologists
System-level barriers	
Alcohol screening not integrated into routine care	Alcohol screening with the AUDIT-C or single item screens should be part of routine health care, integrated with vital signs or integrated mental health screening
Patients with screens indicating unhealthy alcohol use are not screened with non-invasive tests to allow early identification	Screening algorithms (non-invasive tests and assessment for fibrosis if unhealthy alcohol use) allow early identification of ALD and brief interventions or AUD treatment
Time-limited or session-limited care	Adequate time allowed for patient care, including screening and referral for treatment for AUD and addiction; team-based collaborative care to allow short-term follow-up and reassessment
Lack of addiction specialists and behavioural health professionals to treat addiction disorders	Efforts to enhance addiction treatment workforce, including expansion of training programmes and incorporation of treatment education into all levels of medical training
Standard treatment strategies and protocols might not be suited to patients with ALD	Flexible and individualised approaches to addiction treatment in ALD; low-barrier models of AUD and addiction treatment to improve engagement; adaptation of existing treatments and development of novel strategies to deliver AUD and addiction treatment for medically complex patients, including patients with ALD
Absence of available adequate or appropriate local care or resources	Implementation interventions and training programmes to increase local treatment resources; use of telemedicine and digital resources
Absence of insurance coverage for AUD treatment or insurance dictates level of care	Population health-based system-wide initiatives and alternative payment models to improve access to care; insurance and national policy level advocacy
Siloed practices of addiction specialists and liver specialists	Collaboration between addiction specialists and liver specialists within institutions and communities to improve cross-disciplinary education, programme building, innovation, and care coordination; investment in integrated and colocated clinical programmes to improve cohesion in patient care and foster collaboration

ALD=alcohol-associated liver disease. AUD=alcohol use disorder. AUDIT-C=Alcohol Use Disorders Identification Test for Consumption.

Table 2: **Potential barriers to the comanagement of ALD and either unhealthy alcohol use or AUD and proposed strategies to address these barriers**

gastrointestinal conditions, and surgical outcomes, including duration of postoperative hospital and intensive care unit stay.[50–53] Finally, AUDIT-C scores are associated with elevated aspartate aminotransferase and alanine aminotransferase (appendix p 6). The AUDIT-C score is a useful simple tool for this purpose, and should be used broadly, including in specialty hepatology clinics to identify those with ongoing alcohol use who should be counselled to stop.

Although an AUD diagnosis requires an interview, for those who have elevated AUDIT-C scores, consideration should be given to administering a DSM-5 Alcohol Symptom Checklist to identify patients likely to have moderate or severe AUD. AUDIT-C screening and use of

the DSM-5 checklist for patients with AUDIT-C score of 7–12 was associated with increased AUD diagnosis and AUD treatment initiation.[54,55]

Amount of alcohol consumption

There is variation in the definition of amounts of alcohol consumption, measures of alcohol consumption, and patterns. Diagnostic criteria for metabolic dysfunction-associated steatotic liver disease (MASLD), metabolic dysfunction and alcohol-related liver disease, and ALD rely on grams per day of absolute alcohol; however, there is not a standard validated approach to measuring alcohol consumption in clinical settings. Visual representation as to what constitutes a standard-sized drink for beer, wine, or liquor are often included in validated alcohol self-report tools, such as AUDIT-C and Timeline Followback. For example, standard-sized US drinks per day have been estimated for each AUDIT-C score based on the US National Epidemiologic Study of Alcohol and Related Conditions. AUDIT-C scores (0–12 points) reflect drinking from 0 to 18 drinks a day. Based on grams of absolute alcohol in each standard-sized US drink (14 grams), the grams per day of absolute alcohol for each score can be estimated.

Limitations in screening hard to reach populations

In the USA, there is a critical need to increase screening for high-risk alcohol use and AUD among broader populations who do not routinely use traditional health-care settings. Priority should be given to the development of screening programmes in non-traditional settings, such as community centres, schools, or supermarkets, as well as partnering with community leaders to deliver culturally and linguistically tailored services. Expanding screening through electronic and mobile health platforms can also reach online support groups and social media channels to engage with individuals at risk. Early experiences in implementing community-based outreach on liver disease prevention and lifestyle modifications for MASLD have shown signs of success.[56–58] However, effective implementation of community-based alcohol screening will require further attention to ensure appropriate linkage to care. Initiatives to develop screening programmes with additional resources, such as pathway navigators or community health workers, will provide valuable support and facilitate access to follow-up testing and treatment. In Europe, multiple screening programmes have also been developed for liver disease in the general population—including ALD. Multiple algorithms using non-invasive laboratory biomarkers often followed by more accurate but costly laboratory tests or liver stiffness scans, such as vibration controlled transient elastography, have been tested in research and demonstration projects in an effort to identify cost-effective screening programmes that minimise false-positive and false-negative screens.[58–62]

Role of biomarkers for alcohol consumption

Patient under-reporting of alcohol use and actual alcohol use is common and, in some studies, can be as high as 50%.[63–67] Confirmation of alcohol use is important, and alcohol biomarkers can be helpful. There are several direct alcohol biomarkers that can be used to identify alcohol use. Direct biomarkers, which measure direct metabolites of alcohol in either urine or blood, are preferred due to greater specificity and positive predictive value. Among the most common and useful are urinary ethyl glucuronide and blood-based phosphatidylethanol (PEth). PEth is a phospholipid moiety that forms on red blood cells in the presence of alcohol. The 16:0, 18:1 and 16:0, 18:2 isomers are the most widely tested and validated in the liver disease population. PEth has been favoured more recently as it has become more widely available. PEth allows identification of alcohol use approximately 24 weeks before the date of the test and has some evidence supporting correlation between PEth level and amount of use (abstinent use *vs* moderate use *vs* heavy use). Limitations of incorporating biomarkers in screening include cost, feasibility, and availability.

Screening for ALD

Missed opportunities to intervene to change drinking behaviour mean that patients with ALD are more likely to present with decompensated cirrhosis than with other liver disease causes.[17] As such, screening for alcohol use and ALD is crucial. In patients with elevated AUDIT-C (≥3 points women; ≥4 men), screening for fibrosis is recommended annually using non-invasive tests, such as the blood-based Fibrosis-4 index (FIB-4), for as long as unhealthy alcohol use is present. Alternatively, based on availability, there are other validated tests that also rely on routine blood tests (figure 1). Knowledge of the risk of hepatic fibrosis using non-invasive testing might lead to higher motivation to reduce drinking among patients, increase the window of opportunity for AUD treatment in compensated disease, and locate patients who are eligible for new, antifibrotic treatments.[15,68–71] AUDIT-C should be reassessed regularly over time, depending on the patients' risk of fibrosis progression. Feedback of fibrosis screening and liver health results to patients with unhealthy alcohol use can result in lower amounts of alcohol use over time and can increase abstinence.[68,72]

FIB-4 is the widely recommended non-invasive test for first-line fibrosis screening in the population.[73] Unfortunately, FIB-4 at the 1·30 cut-off has poor discrimination for detection of elevated liver stiffness, a surrogate for advanced fibrosis. FIB-4 might therefore eventually be replaced by more modern, multivariable algorithms.[73–75] Furthermore, patients with alcohol-associated steatohepatitis and increased aspartate aminotransferase to alanine aminotransferase ratio probably have elevated FIB-4 due to hepatic inflammation rather than fibrosis. However, FIB-4

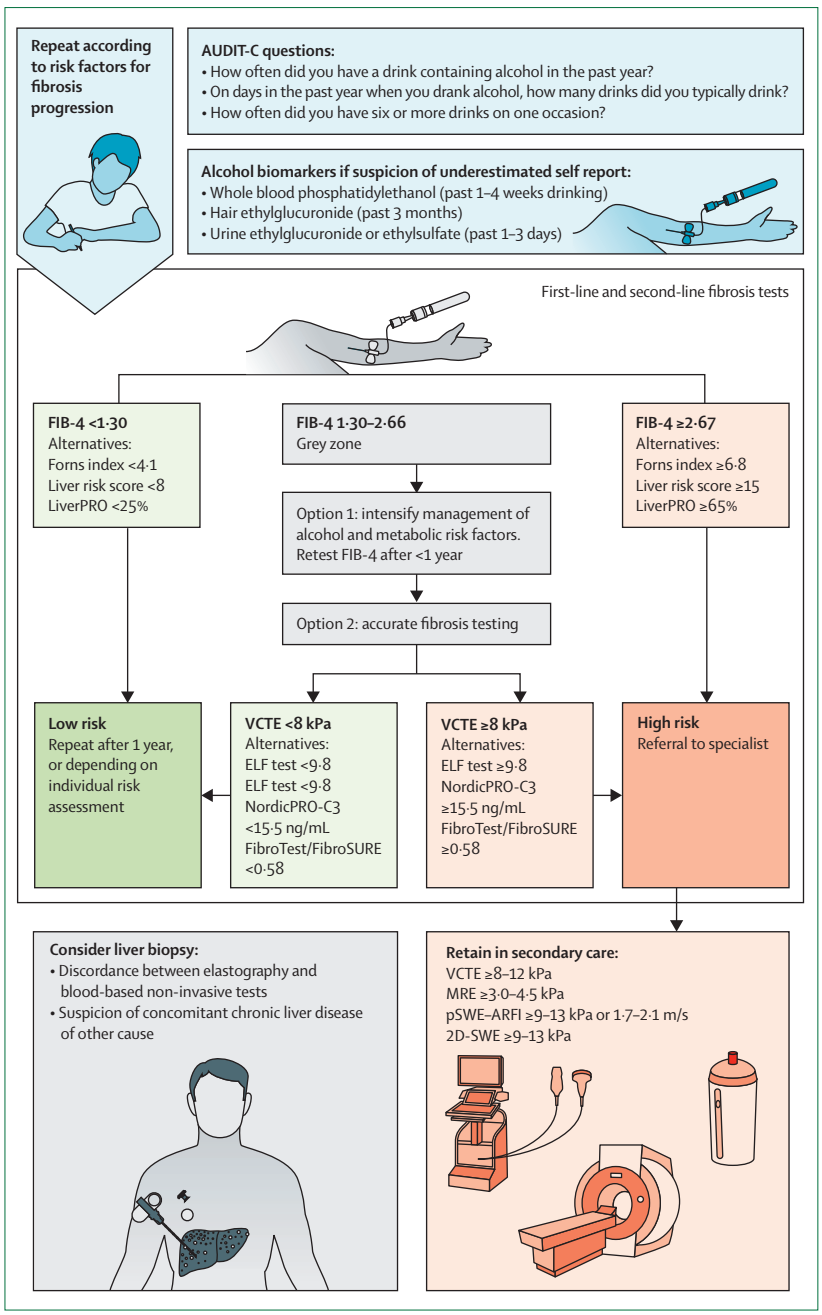

Figure 1: **Use of screening testing for unhealthy alcohol use and integration of screening for fibrosis and alcohol-associated liver disease**

AUDIT-C=Alcohol Use Disorders Identification Test for Consumption. ELF test=enhanced liver fibrosis test. FIB-4=Fibrosis-4. MRE=magnetic resonance elastography. pSWE–ARFI=point shear wave elastography-acoustic radiation force imaging. VCTE=vibration-controlled transient elastography.

showed prognostic value in an ALD study, showing a 6% risk of liver-related events over 4 years for individuals with FIB-4 less than 1·30, compared with 10% for those with values between 1·30 and 2·66, and 54% for those with FIB-4 of 2·67 or higher.[76] This finding suggests that an elevated FIB-4 might predict poor prognosis, regardless of whether the elevation is driven by fibrosis or inflammation. As the FIB-4 equation contains age, it loses sensitivity for patients younger than 35 years, and specificity for patients older than 65 years. As a consequence, physicians might consider alternative direct markers of fibrosis for younger patients, and might consider a higher FIB-4 threshold of 2·00 for older patients.[77,78]

Due to the low specificity of FIB-4, sequential testing is preferred to increase the positive predictive value of referral pathways, and to minimise over-referrals (figure 1). This testing includes use of imaging-based non-invasive liver disease assessment, such as vibration-controlled transient elastography, shear wave elastography, and magnetic resonance elastography (MRE). Although MRE is not validated in patients with ALD, results from MASLD diagnostic studies can probably be applied to an ALD population.[79,80] Liver stiffness measured by all techniques increases with inflammation, as do blood-based biomarkers. Consequently, non-invasive testing should be done in a stable outpatient setting, and preferably when aspartate aminotransferase is less than 75·00 IU/L and bilirubin less than 16·00 µmol/L (<0·94 mg/dL),[81] and should not be done in patients with alcohol-associated hepatitis.

Target settings for ALD screening

Identification of individuals with asymptomatic ALD requires a strategy to distinguish and engage with populations for screening. In addition to routine screening in general medicine clinics, screening can be implemented considering the frequency of health-care use and health-care setting (figure 2). Based on current understanding, we recommend prioritising ALD screening of individuals with high use of health care for alcohol-related reasons within care settings, such as in emergency departments and hospitals, for effective identification and opportunities for appropriate linkage to care.[82–84] Identification of non-liver related complications of alcohol, such as alcohol-related pancreatitis, is another opportunity for engagement.[85]

Intervention and management

Alcohol screening, brief intervention, and referral to treatment

Alcohol screening, brief intervention, and referral to treatment (SBIRT) might be effective for reducing unhealthy alcohol use among adults who are not alcohol dependent (appendix p 7).[86–94] Numerous effective treatments exist for AUD but the large majority of people with AUD do not receive care.[95] Major barriers to care include stigma, limited accessibility of AUD treatment, and the underlying symptoms of AUD causing ambivalence to engaging with treatment.[96] SBIRT for adults in the USA is covered by health insurers as preventive care benefits via the 2010 Affordable Care Act, as a result of Level B recommendation from USPSTF,[89] and so should be used more.

Brief interventions

Brief interventions are a client-centred counselling approach to unhealthy alcohol use, often implemented in medical or community settings. This method often includes motivational interviewing, personalised feedback, and counselling for individuals consuming alcohol at unhealthy levels. Brief interventions that included brief advice might be more effective than those that focused solely on motivational counselling.[97] The primary goals of brief interventions are to reduce alcohol-related harm and promote overall health, which might involve encouraging abstinence, reducing alcohol consumption, or preventing alcohol-related consequences. A brief intervention can range from 5 min to an hour and might occur in a single session or over several visits. Alcohol-focused brief interventions, delivered by clinicians, are effective in reducing self-reported alchohol use and heavy drinking over time.[86,92,98]

Brief interventions are suitable for individuals with or without liver disease. However, those with ALD face increased risks of liver-related morbidity and mortality, necessitating specific adaptations to the intervention approach. For individuals with ALD, even minimal alcohol consumption poses serious risks, so brief interventions should be offered regardless of the amount of alcohol consumed in all the clinical settings.

Enhancing traditional brief interventions with personalised liver health feedback, such as liver laboratory test results, alcohol biomarkers, non-invasive testing, and other relevant biomarkers, can improve outcomes. Brief interventions using feedback on hepatic biomarkers, such as FIB-4 and liver enzyme levels, decreases alcohol use, risk of hospitalisation, and mortality.[4,99] Decreases in alcohol use slow the progression to cirrhosis in patients with steatosis, and abstinence can decrease progression of cirrhosis.[100,101] Online brief interventions and promising digital health interventions have been noted to enhance alcohol treatment engagement.[86,92,98,102] A stepped-care approach has recently been encouraging, combining motivational interviewing followed by addiction medicine referral, if needed.[103]

For patients who do not respond to brief interventions or who show signs of AUD, repeated brief intervention with feedback on hepatic biomarkers and AUD medications for patients with AUD can be offered, as well as referral to a higher level of care.[4,104–108] Primary care or hepatology teams should consider integrating multidisciplinary providers, such as specialised staff for alcohol support, to offer more intensive alcohol interventions, directly provide AUD treatment, facilitate smooth transitions to specialised care, and ensure thorough follow-up for care coordination. These steps are crucial to ensuring successful transitions to higher levels of care for this population at high risk.

Addiction resources and AUD treatment infrastructure

Among the resources that will be needed to deliver integrated care for AUD and ALD, some of the most essential include a more robust addiction treatment workforce, greater access to addiction treatment services, and initiatives that support implementation efforts and research to address these needs.[109] In a study by Im and colleagues,[16] only a third of hepatologists and gastroenterologists in the USA reported having an integrated addiction provider embedded within their clinic, yet only 60% ever referred patients with AUD to behavioural therapy and 71% had never prescribed medications for AUD. In addition, among primary care providers, variability exists in rates of prescribing medications for AUD and overall attitudes toward AUD treatment.[110,111] Efforts are needed to increase the number of clinicians who are willing and able to deliver integrated screening, assessment, and treatment of AUD and ALD at all levels of training and in both primary care and subspecialty treatment settings.[109,112,113] Given the importance of timely linkage to AUD treatment among patients with ALD, resources to strengthen and streamline addiction treatment to improve access and minimise wait times are also needed.[14,114–116] Initiatives to design and evaluate interventions to expand the AUD treatment infrastructure should be informed by implementation research methods, an important step towards filling the treatment gap for AUD and ALD.[54,117]

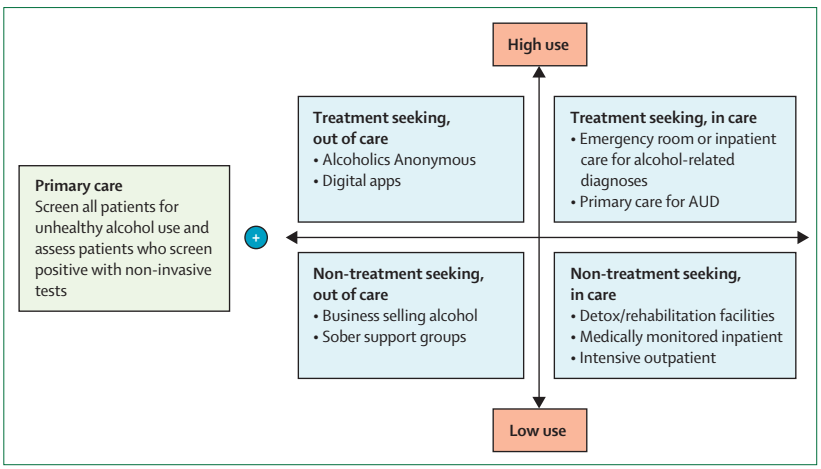

Figure 2: **Special populations that might warrant screening for ALD**
ALD=alcohol-associated liver disease. AUD=alcohol use disorder.

Public policy

Several public health and policy strategies have been shown to reduce alcohol consumption on a population level (table 3). These initiatives, which include restrictions on the availability of alcohol, regulations on marketing, and use of taxation, have also been shown to be cost effective.[118] Limiting the days, times, and locations in which alcohol is available, and enforcement of minimum drinking ages, can reduce unhealthy alcohol consumption.[119] Alcohol taxes have also been used to modify population level alcohol consumption; however, because tax levels have not adjusted to inflation, alcohol

National policy	Pricing strategies	Modifying alcohol availability	Modifying alcohol promotion
Written policy	Excise tax	Set minimum age restrictions	Legally binding regulation on advertising
National support monitoring	Minimum unit pricing	Alcohol sale regulation, with sales only between set hours	Warning labels about the effect of alcohol on health
Increase work force	Minimum pricing	Alcohol sale regulation based on limited premises of sale	Increased awareness campaigns

ALD=alcohol-associated liver disease. AUD=alcohol use disorder.

Table 3: **Framework of national policy that might help to reduce AUD and ALD in the general population**

prices have remained relatively low compared with other products.[120] Minimum pricing policies that limit how low alcohol prices can be are a well described strategy to curb alcohol consumption for even the least expensive alcohol-containing beverages, and are associated with reductions in alcohol-related morbidity and mortality.[121] One US-based modelling study indicated that even a slight increase in the price of the least expensive alcohol in one state would potentially safe hundreds of lives each year.[121]

Professional societies and public health agencies have begun to highlight the role of policy-level interventions to reduce unhealthy alcohol use and ALD. The 2022 European Association for the Study of the Liver–*Lancet* Liver Commission on liver disease suggested that a coordinated and multilevel strategy that breaks the traditional siloes between primary care, specialty care, public health, and policy makers can lead to improvements in ALD recognition and mortality.[122] In the USA, the Centers for Disease Control and Prevention CDC and the Office of the Surgeon General have highlighted the importance of these public health and policy-level approaches to decreasing alcohol consumption.[123,124] However, concerted efforts to implement these strategies systematically have been poor. Future steps will require mobilisation and engagement of stakeholders across governing bodies, community organisations, academia, and other sectors, both locally and nationally.[125]

Care delivery and implementation

Integration of AUD care into ALD treatment

According to the 2015–19 National Survey on Drug Use and Health, most individuals with AUD in the past year used health care (81%) and received screening for alcohol use (70%).[126] However, only 12% discussed alcohol use based on screening, and 5% were referred to addiction treatment. Even after accounting for some individuals receiving addiction treatment without referrals, only 6% received any addiction treatment. Rates of AUD treatment initiation among patients with ALD are similarly poor.[15,127] To achieve maximal early detection of ALD in the general population, ALD recognition and care integration needs to occur broadly across the spectrum of health-care delivery.

Gastroenterology and hepatology clinics are the primary entry point for patients with recognised alcohol-related cirrhosis, presenting an important opportunity to address harmful drinking. Education for front-line gastroenterologists and hepatologists on motivational interviewing and addressing stigma as a barrier to care can empower clinicians to better address the complexities of AUD in these patients.[16]

Multidisciplinary clinics and integrated, interprofessional care

Mirroring models that integrate mental health treatment into general medical settings such as primary care, integrated care for AUD and ALD can take a multitude of forms and occurs on a spectrum ranging from informal associations to colocated simultaneous care.[128] The historic silos that often separate addiction treatment from other forms of medical care, as well as the general fragmentation of care delivery across health-care systems, will require that unmet needs in terms of resources, partnerships, financial models, and public health be addressed.[124] Successful integration of care for AUD and ALD requires multidisciplinary and interprofessional collaboration.[129–131] Although the needs of each patient vary depending on the severity and acuity of AUD and ALD, as well as comorbidities, preferences, availability, and recommended level of care, models that involve primary care clinicians, hepatologists, addiction specialists, psychiatrists, behavioural health clinicians, and others have been described.[129–137]

For example, Mellinger and colleagues[129] showed the feasibility and benefits of a multidisciplinary ALD clinic that included a hepatologist, psychiatrist, psychologist, nurse, and social worker. This model improved patient outcomes, including reduced hospitalisations and better liver function, highlighting the value of collaborative care in managing ALD and AUD simultaneously.[129] These clinics also have the potential to become important loci to provide education in the management of ALD and AUD to a broad range of health-care providers, thereby increasing their influence and addressing serious shortages of trained providers.

Substance use navigators, often peers from the community, represent an innovative strategy to enhance patient engagement. By providing non-judgmental support and translating medical recommendations into accessible language, these navigators bridge the gap between providers and patients. Additionally, case conferences for multidisciplinary discussion facilitate tailored treatment plans for complex cases, further strengthening integrated care models.[138]

Models of care delivery

SBIRT implementation

SBIRT can be implemented as part of routine care using electronic medical record prompts to trigger the AUDIT-C questionnaire. Primary care teams can benefit from having team members (eg, social workers and/or registered nurses) who are available to work

with patients requiring more time than primary care providers have available for more intensive brief interventions.[139]

Kaiser Permanente Northern California (KPNC), an integrated health-care delivery system, successfully implemented systematic SBIRT in adult primary care in 2014. In the intervening decade, KPNC has conducted over 20 million screenings and has delivered over 1 million brief interventions to patients endorsing unhealthy alcohol use, and evaluations have found significant reductions in alcohol consumption, as well as improvements in health outcomes.[140,141] KPNC's strategy for this highly successful, large-scale SBIRT implementation involved using evidence-based implementation and sustainment strategies (appendix pp 8–9).[142]

Telehealth

Telehealth and other virtually delivered AUD treatment approaches are generally as effective as in-person care, and decrease access barriers for patients with other stigmatised conditions, including other mental health disorders.[143] The COVID-19 pandemic rapidly brought policy and reimbursement changes that dramatically reduced barriers to telehealth for substance use disorder care.[144] Key changes included reimbursement for telehealth-delivered medication and psychotherapy visits to the general population, not just those in rural areas. Overall, telehealth visits, compared with in-person care for AUD, are associated with attending more psychotherapy visits and greater number of medication treatment days.[145] In addition, patients with AUD often perceive advantages to telehealth, including potentially reduced stigma (eg, from receiving care at home) and increased convenience, although some also report potential feelings of decreased rapport with a clinician, indicating that offering both telehealth and in-person options might be important.[146] However, not all patients benefit from telehealth. Attention to the so-called digital divide is key and warrants further research, as it might further exacerbate health inequalities for older adults, minority populations, and patients with limited English proficiency.[147,148]

In the hepatology setting, telehepatology is effective in the treatment of chronic liver disease,[148–150] and the experiences of patients with metabolic and alcohol-associated steatotic liver disease have been positive.[150] However, the expansion of telehepatology has the potential to exacerbate existing health inequities, as those of Hispanic ethnicity have reported lower satisfaction with their treatment.[150] In a multicentre study of patients with cirrhosis within the Veteran Affairs health-care systems in Northern California, there was less satisfaction with telehepatology for patients that were older age, had lower quality of life, and/or with AUD.[151] These studies underscore the importance of finding ways to make telehealth more accessible and satisfactory for patient groups at high risk to potentially reduce burden in liver disease management services.

Recent studies are examining new treatment models, for example, focusing on engaging non-treatment seeking patients in a patient-first approach, working with individuals to identify their treatment goals, which might include improvement in functioning rather than cessation of drinking.[152] Similarly, new telehealth models integrating multidisciplinary care teams to deliver addiction treatment for patients with ALD and AUD might be promising.[102,153,154] Future studies should explore the use of digital medicine apps to enhance patients' ability to adhere to medical management of AUD and ALD.[155]

Hub and spoke

The hub-and-spoke model is an attractive solution for providing access, given the imbalance between primary care physicians (many) and subspecialist (few) workforces. One well established, localised hub-and-spoke model is Project Extension for Community Healthcare Outcomes (ECHO). Launched in 2003 to disseminate the knowledge of hepatitis C treatment to participating clinicians, Project ECHO has since expanded to include diverse health conditions (eg, rheumatology, dermatology, oncology, mental health, and palliative care). A key feature of Project ECHO is its focus on tele-education and telementorship; the hub does not provide direct clinical care.[156] The obstacles to more widespread use include extra time commitment, absence of financial incentives on the part of providers and health systems, inconvenient scheduling, and an absent provider–patient connection for patients.[154,156] An expanded hub-and-spoke model in which primary care physicians identify selected patients for formal telemedicine visits or e-consults from the subspecialist hub has the potential to reduce ALD and AUD burden.

Outcome assessment in detection, screening, and implementation

Practice, health-care, and national-level outcomes

Markers of success in decreasing ALD encompass global, national, centre, and individual perspectives. Key markers of success nationally include declines in morbidity and mortality related to AUD and ALD, a decrease in health-care costs (including hospital admissions and emergency room visits), a decrease in underage alcohol use and deaths, reduction in per capita consumption of alcohol and annual sales of alcoholic beverages, implementation of preventive risk scores (AUDIT-C) and FIB-4 in primary care offices, and emphasising early access to addiction and mental health resources. For collaborations between hepatologists and addiction specialists, success could be measured by a decrease in harmful drinking in people with ALD after initiation of ALD or AUD treatment and, in the case of liver transplantation, prevention of patient or graft loss.

Global outcomes

With the steady increase in AUD and the associated detrimental health-related consequences, a national plan

to reduce harmful alcohol use is imperative and timely. In 1996, WHO established the Global Alcohol Database which focused on the development of global health policies to decrease alcohol misuse. The current WHO goal is a 20% global reduction in harmful use of alcohol use by the year 2030. Countries with a higher number of public health policies not only have a decrease in the prevalence of AUD, but also a decrease in ALD-related mortality.[157] A study of 169 countries revealed that countries that had the highest alcohol preparedness index had substantial reductions in alcohol-related mortality, AUD, cardiovascular complications, and hepatocellular carcinoma.[158]

Quality of life

Promotion of better quality of life is also a key part of treatment for both ALD and AUD.[159] A one to two level reduction in an individual's WHO alcohol risk level is associated with improved health outcomes and quality of life.[160] In addition, NIAAA's new research definition of recovery now emphasises "remission from AUD and cessation from heavy drinking…(and) improvements in physical and mental health, quality of life, and other dimensions of well-being".[161]

Cost-effectiveness

Reliable long-term cost measures to assess ALD are needed and should focus on additional health-care costs incurred or saved as a result of early detection and treatment of AUD or ALD. Measures of short-term outcomes used in cost-effectiveness analysis should be derived from current core outcome sets to the greatest extent possible and should be aggregated within predefined health states to support decision analytical models of long-term outcomes.[162,163] Long-term outcome measures should include quality-adjusted life-years, which combine both health-related quality of life and long-term mortality into a single measure.

Conclusion and unmet needs

Identifying patients when they are asymptomatic, raising awareness of alcohol use as a public health

Panel: **Unmet needs and future plans to reduce the negative effect of alcohol on health**

Patients and care partners

- Increasing use of algorithms for routine FIB-4 in primary care patients, with unhealthy alcohol use identified by alcohol screening.
- Development of new telehealth models integrating multidisciplinary care teams to deliver treatment to ameliorate unhealthy drinking in patients with alcohol-associated liver disease (ALD). A particular goal would be to provide better access to such care to vulnerable and underserved populations.
- Development of remote wearable and biosensor data that provides environmental exposures, and multimodal data integration with omics data to better predict alcohol use disorder (AUD) and ALD progression.

Clinicians and providers

- Improving education on addiction management across the spectrum of medical training.
- Increasing the professional education of providers at all levels of clinical practice with regard to alcohol-associated disorders.
- Building support for research into efficacy of brief interventions on drinking behaviour by people with ALD (as opposed to only focusing on patients with a diagnosis of AUD) and the effect on progression of fibrotic liver injury of consumption of alcohol below the lowest entry threshold for defining metabolic dysfunction and alcohol-related liver disease (ie, social drinking not meeting criteria for AUD).

Health system

- Investment in the AUD treatment workforce from multiple angles, ranging from primary care to hepatology subspeciality to behavioural health clinicians, and within multiple care settings across the spectrum of prevention, including acute care, outpatient care, and community-based initiatives.
- Increased access to and assessment of the cost-effectiveness of addiction and mental health resources by patients with AUD and ALD.
- Innovate partnerships across disciplines and sectors to configure financial models that align with the goals of integrated care delivery for patients with liver disease who drink in an unhealthy way.
- Create pathways to protocolise recognition of risky drinking (eg, screening, brief intervention, and referral to treatment). A fully functional model would encompass all locations and all providers.
- Adoption of machine learning of electronic health records through artificial intelligence to identify people displaying at-risk drinking.
- Removal of health-system barriers to the treatment of AUD by primary care providers and specialists.

Public or national level policies

- Advocating, through public discourse, for safe limits regarding alcohol consumption, such as via the Dietary Guidelines for Americans.[165]
- Implementation of multiple established public health policies on global or national levels to decrease the harmful use of alcohol and its detrimental effects.
- Examination of and addressing barriers in vulnerable populations within models of integrated care.
- Use of pragmatic trials and effectiveness–implementation study designs to facilitate the dissemination and integration of brief interventions into broader health-care systems more efficiently.

issue, promoting effective treatment strategies, creating culturally sensitive rehabilitation programmes, and integrating medical and psychosocial care are all important initiatives for the prevention and treatment of AUD and ALD.[128,164]

We outline the unmet needs in four domains (panel). More studies are needed to understand the impact of ALD screening, including evaluations of enhanced interventions incorporating education and feedback on liver health and alcohol use. Individuals with advanced ALD often face complex psychosocial challenges related to social determinants of health, other substance use, and co-occurring mental health disorders. Future research should incorporate these factors in the design and testing of interventions. Additionally, the use of pragmatic trials and effectiveness–implementation study designs could facilitate the dissemination and integration of brief interventions into broader health-care systems more efficiently.

Advances in biomedical and health-care technology need to be leveraged to reduce the burden of AUD and ALD. Broader trends include decentralisation of care and multimodal data integration to create more accurate predictions of patient risk and outcome. Remote wearable and biosensor technology is improving to allow real-time assessment of alcohol consumption and liver health. Exposure and omics data are also within reach of more patients and could be developed to improve the prediction of AUD and ALD outcomes.

Unless a strong national intervention is implemented, the annual age-standardised mortality due to ALD is projected to increase by 75% by 2040, with 35% of deaths affecting people younger than 55 years.[10] Interventions aimed at early screening, recognition, and tailored treatment of ALD and AUD are key to preventing this increase and have a proven benefit.[4,132] Improving the health of patients with ALD and AUD will best be accomplished by integrating care of the physical, mental, and social aspects to reduce excessive drinking.

Contributors

All authors contributed equally to the methods, writing of the original draft and review and editing, and data interpretation.

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