Health Information and Quality Authority

An tÚdarás Um Fhaisnéis agus Cáilíocht Sláinte

A systematic review on the association between alcohol consumption and mental health outcomes

Publication date: 17 June 2026

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- **National Care Experience Programme** — Carrying out national service-user experience surveys across a range of health and social care services, with the Department of Health and the HSE.

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Acknowledgements

HIQA would like to thank all members of the Expert Advisory Group (EAG) listed below who provided their time, advice and information in support of this work.

The findings and conclusions of this report represent HIQA's assessment of the evidence and may not reflect the views of all members of the EAG. However, all perspectives were carefully considered in the preparation of this report.

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Organisations that assisted HIQA in providing information, in writing or through meetings, included:

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Conflicts of Interest

None reported.

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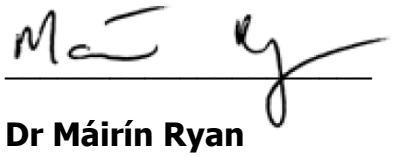
Foreword

Alcohol consumption is a leading risk factor for death and disability worldwide. In Ireland in 2024, 73% of people aged 15 years or older reported having drunk alcohol in the preceding 12 months. Although no level of alcohol consumption is considered completely safe per the World Health Organization (WHO), higher levels of alcohol consumption are associated with a greater burden of disease. Therefore, reducing overall alcohol consumption levels is an ongoing public health priority, globally.

Low-risk alcohol guidelines can provide guidance on alcohol consumption levels that are associated with lower levels of risk and when it is not safe to drink any alcohol. The current Irish low-risk alcohol guidelines were last assessed in 2015. Since then, new evidence has emerged internationally regarding the detrimental impact of alcohol on health, and international practice has advanced in terms of the methods used to inform low-risk alcohol guidelines. To ensure the Irish low-risk alcohol guidelines are supported by the best current evidence this report contains a systematic review on the association between alcohol consumption and mental health outcomes. This review was conducted at the request of the Department of Health. When considered alongside *Modelling the risk of alcohol-attributable mortality and hospital admission in Ireland*, this report will inform an update to the current Irish low-risk alcohol guidelines.

Work on this review was undertaken by an Evaluation Team from the HTA Directorate in HIQA. A multidisciplinary Expert Advisory Group was convened to advise the Evaluation Team over the course of the review. HIQA would like to thank the Evaluation Team, the members of the Expert Advisory Group and all who contributed to the preparation of this report.



Dr Máirín Ryan

Deputy Chief Executive & Director of Health Technology Assessment

Health Information and Quality Authority

Key Points

- The Department of Health requested HIQA to conduct evidence synthesis to support an update of Ireland's current low-risk alcohol guidelines. As a part of this, HIQA agreed to undertake a systematic review on the association between alcohol consumption and mental health outcomes.
- In 2018, Adelaide Health Technology Assessment published a systematic literature review on the association between alcohol consumption and mental health disorders. This was updated in 2022 by Cochrane Canada, with a specific focus on depression, anxiety and suicidal ideation. An update of this review was undertaken to build on this existing evidence base.
- The studies identified within the current update, along with the Cochrane Canada findings, were combined and narratively synthesised; with a total of 104 studies included.
- Across the studies included, alcohol consumption was reported in a number of ways including quantity, frequency, pattern (such as binge drinking) and age of initiation. The results of the studies were disaggregated by each mental health outcome (depression, anxiety and suicidal ideation). Results were also disaggregated into adults (18 years and older), older adults (65 years and older), and adolescents (under 18 years), where appropriate.
- Substantial methodological heterogeneity across the included studies limited comparability of findings, with wide variation in how alcohol exposure was measured (including different definitions of frequency, quantity, and binge drinking), and how mental health outcomes were assessed (including validated screening tools and clinical diagnoses). Variation in comparator groups, mainly the inclusion of former drinkers in non-drinker categories, may also have introduced bias and contributed to the mixed and inconsistent effects observed across studies.
- The included studies also had limitations including self-reporting of alcohol consumption, and a limited number of follow-ups (impacting drinking trajectory assessment). Study populations solely composed of clinical populations or those with an alcohol use disorder were not included in this review. There was also limited evidence from the Irish context.
- The certainty of evidence underpinning the association between each alcohol consumption type, and each mental health outcome, was assessed. All of the evidence was deemed to be of low or very low certainty, primarily due to high

or moderate risk of bias, inconsistency across study results, and or imprecision in study results.

- The results for depression, anxiety and suicidal ideation are presented below, but should be considered in the context of the heterogeneity observed across the studies, further study limitations, and the low or very low certainty of the evidence overall.

Depression:

- In adults:
  - across 17 longitudinal studies providing evidence of low certainty, there may be no significant association between the quantity of alcohol consumed and the future development of depression
  - across 26 longitudinal studies providing evidence of low or very low certainty, there are mixed results for the association between the frequency, the quantity and frequency (as a combined measure) of alcohol consumption, and binge drinking, and the future development of depression.
- In older adults, across 15 longitudinal studies providing evidence of very low certainty, there are mixed results for the association between the quantity of alcohol consumed and the future development of depression.
- In adolescents, across 21 longitudinal studies providing evidence of very low certainty, there may be no significant association or a small positive association between the quantity and or frequency of alcohol consumption (including binge drinking) and the future development of depression.

Anxiety:

- In adults, across four longitudinal studies providing evidence of low or very low certainty, there are mixed results for the association between the quantity and or frequency of alcohol consumption (including binge drinking) and the future development of anxiety.
- In adolescents, across eight longitudinal studies providing evidence of low certainty, there may be no significant association between the quantity and or frequency of alcohol consumption, or age of initiation of drinking, with the future development of anxiety.

Suicidal ideation:

- In adults, the evidence underpinning the suicidal ideation outcome was of very low certainty. When disaggregating by study type:

- across two longitudinal studies, there may be a small positive association between the quantity and or frequency of alcohol consumption (including binge drinking) and future suicidal ideation
- across 13 cross-sectional studies, there may be a small to large positive association between the quantity and or frequency of alcohol consumption (including binge drinking), and suicidal ideation (when measured for the same period).

- In adolescents, the evidence underpinning the suicidal ideation outcome was of very low certainty. When disaggregating by study type:
  - one longitudinal study reported no significant association between binge drinking and future suicidal ideation
  - across eight cross-sectional studies, there may be a small to large positive association between increased alcohol intake (including monthly binge drinking), and or age of initiation of drinking, and suicidal ideation (when measured for the same time period).

Overall:

- Methodological heterogeneity across the studies included limits the ability to draw definitive conclusions about the direction or strength of the associations between alcohol consumption and mental health outcomes. It is, therefore, important to consider the local Irish data in relation to the impact of alcohol consumption on mental health outcomes.
- Evidence from national surveys and registry data shows that Ireland has one of the highest rates of heavy episodic drinking in Europe. This is observed mainly among young adults. In Ireland harmful drinking patterns have been linked to increased depressive and anxiety symptoms. It has also been reported that alcohol is frequently involved in self-harm presentations to hospital emergency departments, and suicide deaths, highlighting its relevance as a public health concern in Ireland.
- This review contributes to the totality of heath evidence to support policy-makers and should be considered alongside the accompanying *Modelling the risk of alcohol-attributable mortality and hospital admission in Ireland* report and other relevant factors including the values, priorities and expectations of the target population, to inform decisions when updating the current Irish low-risk alcohol guidelines.

Plain language summary

The Department of Health asked the Health Information and Quality Authority (HIQA) to look at research to help update Ireland's low-risk alcohol guidelines. Low-risk alcohol guidelines give people information on how to lower their chances of getting hurt or sick from alcohol. This report looked at how drinking alcohol might impact someone's mental health later in their life. We looked at the different ways that people drink alcohol, including how much people drink, how often people drink, patterns of drinking (for example, binge drinking – when someone drinks a lot of alcohol in a short time), and at what age people start drinking. Australia and Canada have done similar reports on this topic before. We updated the work completed by Canada. We looked for studies that explored if drinking alcohol could lead to depression, anxiety or suicidal thoughts, later on in life. Because only a few studies looked at suicidal thoughts later on in life, we also included studies that measured drinking alcohol and having suicidal thoughts, at the same time.

We included 104 studies and found that the research linking the different ways that people drink alcohol, and their mental health, was not very clear. This is because studies measured how much alcohol people drink and mental health differently, which made the results hard to compare. The studies also had other issues that make it hard to draw conclusions. Many studies asked people to remember and report how much alcohol they drank in the past, which may not always be accurate or reliable. Some studies did not follow people for a long enough time to accurately check if there was an impact. Nearly all of the studies were done outside Ireland, making it hard to compare the results to Ireland.

We also had low or very low confidence in the results of the studies included because some of the studies had issues with how they were done, results didn't always agree across studies, and some findings weren't very precise. These issues make it difficult to clearly show how alcohol consumption patterns impact mental health. Keeping this in mind, the results for depression, anxiety and suicidal thoughts are presented below.

Depression:

- In 17 studies, which had results we have low confidence in, there was not a clear link between how much alcohol adults (18 years and older) drink and developing depression later in life. Another 26 studies, which provided results we have low or very low confidence in, found mixed results on whether how often people drink, and binge drinking, are linked with developing depression later in life.

- In older adults (65 years and older), 15 studies, which provided results we have very low confidence in, found mixed results on whether how much people drink is linked with developing depression later in life.
- In adolescents (under 18 years old), 21 studies, which provided results we have very low confidence in, did not show a clear link, or showed there may be a small connection between how much or how often people drink alcohol (including binge drinking), and developing depression later in life.

Anxiety:

- In adults, four studies, which provided results we have low or very low confidence in, found mixed results on whether how much people drink, and how often people drink (including binge drinking), are linked with developing anxiety later in life.
- In adolescents, eight studies which provided results we have low confidence in, did not show a clear link between how much people drink, how often people drink (including binge drinking), and what age people start drinking at, and developing anxiety later in life.

Suicidal thoughts:

- In adults and adolescents, the studies included provided results we have very low confidence in:
    - In adults, two studies that followed people over time, showed that people who drink alcohol may be a small bit more likely to have suicidal thoughts later in life. Thirteen studies showed that drinking more alcohol may mean a person is more likely to have suicidal thoughts, when measured at the same time.
    - In adolescents, one study that followed people over time, did not show a clear link between binge drinking and suicidal thoughts later in life. Eight studies showed that drinking more alcohol may mean a person is more likely to have suicidal thoughts, when measured at the same time.

Overall, the studies were done in many different ways, which makes it hard to compare them and know for sure how drinking alcohol affects mental health. In Ireland, binge drinking is very common, especially among young people. In Ireland alcohol is often linked with worse mental health and is often involved in self-harm and suicide. So, drinking alcohol and mental health are relevant public health concerns.

This review provides policy-makers with an overview of the international research on the relationship between drinking alcohol and the impact on mental health. This review together with other research and other evidence from the Irish setting will inform the update of Ireland's low-risk alcohol drinking guidelines.

List of abbreviations used in this report

AHTA	Adelaide Health Technology Assessment
AUDIT	Alcohol Use Disorder Identification Test
AUDIT-C	Alcohol Use Disorder Identification Test (shortened three-question version)
CES-D	Centre for Epidemiological Scale - Depression
GRADE	Grading of Recommendations Assessment, Development and Evaluation
HED	heavy episodic drinking
HIQA	Health Information and Quality Authority
HR	hazard ratio
HSE	Health Service Executive (Ireland)
HTA	Health Technology Assessment
OR	odds ratio
QUIPS	Quality in Prognosis Studies
RoB	Risk of Bias
RR	risk ratio
WHO	World Health Organization

1 Background

Alcohol consumption is a leading risk factor for death and disability worldwide.[1] In Ireland in 2024, 73% of people aged 15 years or older reported having drunk alcohol in the preceding 12 months.[2] Although no level of alcohol consumption is considered completely safe per the World Health Organization (WHO), higher levels of alcohol consumption are associated with a greater burden of disease.[1] Therefore, reducing overall alcohol consumption levels is an ongoing public health priority, globally. One of the objectives of WHO's *Global Alcohol Action Plan 2022–2030* is to raise awareness among decision-makers and the general public of the risks and harms associated with alcohol consumption.[3]

Low-risk alcohol guidelines can provide this information, in addition to providing guidance on levels of alcohol consumption that are associated with lower levels of risk and when it is not safe to drink any alcohol. Low-risk alcohol guidelines can be viewed as one tool in the portfolio of measures to reduce alcohol-related harm.[4] The current Irish low-risk alcohol guidelines were last assessed in 2015, following the completion of a review commissioned by the Health Service Executive (HSE).[5] Since then, new evidence has emerged internationally regarding the detrimental impact of alcohol on health,[6, 7] and international practice has advanced in terms of the methods used to inform low-risk alcohol guidelines.

Accordingly, a number of countries have updated their low-risk alcohol guidelines in recent years, including the UK in 2016,[8] France in 2017,[9] Australia in 2020[10] and Canada in 2023.[11, 12] To support these updates, in Australia in 2018, Adelaide Health Technology Assessment (AHTA) conducted a systematic review on the impact of the association between alcohol consumption and mental health disorders.[13] AHTA's review included mental health outcomes such as depression, anxiety, and alcohol-related psychosis, and summarised that while the evidence was too inconclusive to make definite statements, 'harmful' or 'hazardous' drinking of alcohol may negatively impact on mental health. In Canada in 2022, Cochrane Canada published a rapid update of the AHTA systematic review, focusing solely on the development and or exacerbation of depression, anxiety, and suicidal ideation.[14] The Canadian review outlined that the daily quantity of alcohol intake and or frequency of alcohol intake, in adults, is likely to have little to no influence on the odds of developing depression.[14] The evidence is less certain for the development of anxiety, but suggests that alcohol consumption has little to no influence, even when considering heavy episodic drinking (HED) or binge drinking more than once a month. Past HED or binge drinking may be associated with moderately greater odds of suicidal ideation. Cochrane Canada also stated that further longitudinal studies assessing the development of anxiety and suicidal ideation over time are needed to increase our understanding.[14]

Following a request from the Department of Health, HIQA agreed to conduct a systematic review on the association between alcohol consumption and mental health outcomes. This is to ensure the Irish low-risk alcohol guidelines are supported by the best current evidence. Given the evidence base available, this report will provide an update of the Cochrane Canada review published in 2022.[14]

2 Methods

A detailed summary of the methods used to conduct this review is provided in the *Protocol for a systematic review on the association between alcohol consumption and mental health outcomes* (linked here).

Briefly, this systematic review update addressed the following the research question:

- *What is the association between varying levels and or patterns of alcohol consumption and specific mental health outcomes in the general population and in specific subgroups of interest?*

While the methods used within this review update reflect those used by Cochrane Canada,[14] a broader range of databases and sources were used for identification of published literature. Only primary research studies published from December 2021 (the last date searched by the original review) up to August 2025 were included in this update. Additionally, in line with the Cochrane Canada rapid update, the mental health outcomes focused on this report were depression, anxiety and suicidal ideation.

All potentially eligible documents were exported to Covidence (www.covidence.org) for independent screening of titles, abstracts, and full texts by two reviewers for relevance based on the inclusion and exclusion criteria detailed in the protocol.[15] Primary research studies were included if they:

- focused on individuals from the general population
- examined quantities and or frequencies of alcohol consumption either in a single episode and or over time
- included the development and or exacerbation of depression, anxiety, and or suicidal ideation as an outcome.

Primary research studies were excluded if they:

- focused on a population consisting only of people who had a specific clinical health condition (for example, cancer) or had alcohol use disorder (AUD)
- focused on a specific type of alcoholic beverage
- assessed the influence of mental health on alcohol consumption (that is, the inverse of the relationship of interest in this review).

Additionally, while only longitudinal studies were included for the depression and anxiety outcomes, both cross-sectional and longitudinal studies were included for suicidal ideation. This was due to the limited number of longitudinal studies investigating suicidal ideation identified in both the AHTA systematic review[13] and the Cochrane Canada update.[14]

For each included study, data extraction was completed by a single reviewer and checked for accuracy and omissions by a second reviewer. To summarise and present the totality of evidence, the results of the Cochrane Canada update (including risk of bias results) were also extracted by one reviewer and checked for accuracy and omissions by a second reviewer. Risk of bias (RoB) assessment for all studies included in the current update was conducted using the Quality in Prognosis Studies (QUIPS) tool[16] (as used in the Cochrane Canada update[14]).

For screening, full-text review, extraction and RoB assessment, where discrepancies and consensus could not be reached, a third reviewer was engaged.

The certainty of evidence for each mental health outcome (depression, anxiety, and suicidal ideation) and each exposure type (for example quantity, frequency, HED or binge drinking, and age of initiation) was assessed using the GRADE (Grading of Recommendations Assessment, Development and Evaluation) framework for prognostic studies.[17] Due to the significant heterogeneity observed across the studies, and the number of exposure outcome combinations (such as quantity of alcohol consumed and the development of depression, frequency of alcohol consumption and the development of depression), a narrative approach was taken towards GRADE assessment.[18] Here, the evidence underpinning each exposure outcome combination (for which new evidence was added) was discussed by the review team, under the GRADE domains used to downgrade and upgrade the certainty of evidence. Following this discussion, an overall certainty of evidence was allocated to each exposure outcome combination. Of note, when using GRADE for prognostic studies, observational evidence starts at a high certainty level.

Relative effect measures (risk ratios (RRs), odds ratios (ORs) or hazard ratios (HRs)), absolute risk differences, beta coefficients, or correlation values from each study, were presented according to the amount or frequency of alcohol intake. For studies in which adjusted and unadjusted results were reported, adjusted results were presented. For studies in which multiple models were conducted, results from the final model were presented. The overall findings of the studies included within the current update, along with the Cochrane Canada findings, were combined and narratively synthesised.[14] A meta-analysis was not conducted due to the heterogeneity observed across the included studies. This was in line with the AHTA review[13] and Cochrane Canada rapid update,[14] with the AHTA review citing differences in the timing of baseline and follow-up questionnaires; methods of

classifying alcohol consumption and statistics used to analyse the data, as sources of heterogeneity.[19]

3 Findings

3.1 Primary studies identified

3.1.1 Search results

Overall search results are presented in Appendix A and the PRISMA flow diagram in Figure 3.1 below. The collective search, up until 19 August 2025, resulted in 3,802 potentially relevant records. Searching of electronic databases and registries resulted in 3,791 records. Following removal of duplicates, 3,728 records were screened for relevance, with 182 full texts assessed for eligibility and 21 studies subsequently included. Supplementary searches of 15 pre-agreed websites were then conducted, using combinations of key terms such as "alcohol consumption", "mental health", "depression", "anxiety" and "suicidal ideation". The first 10 pages of results for each website were screened. No relevant records were identified.

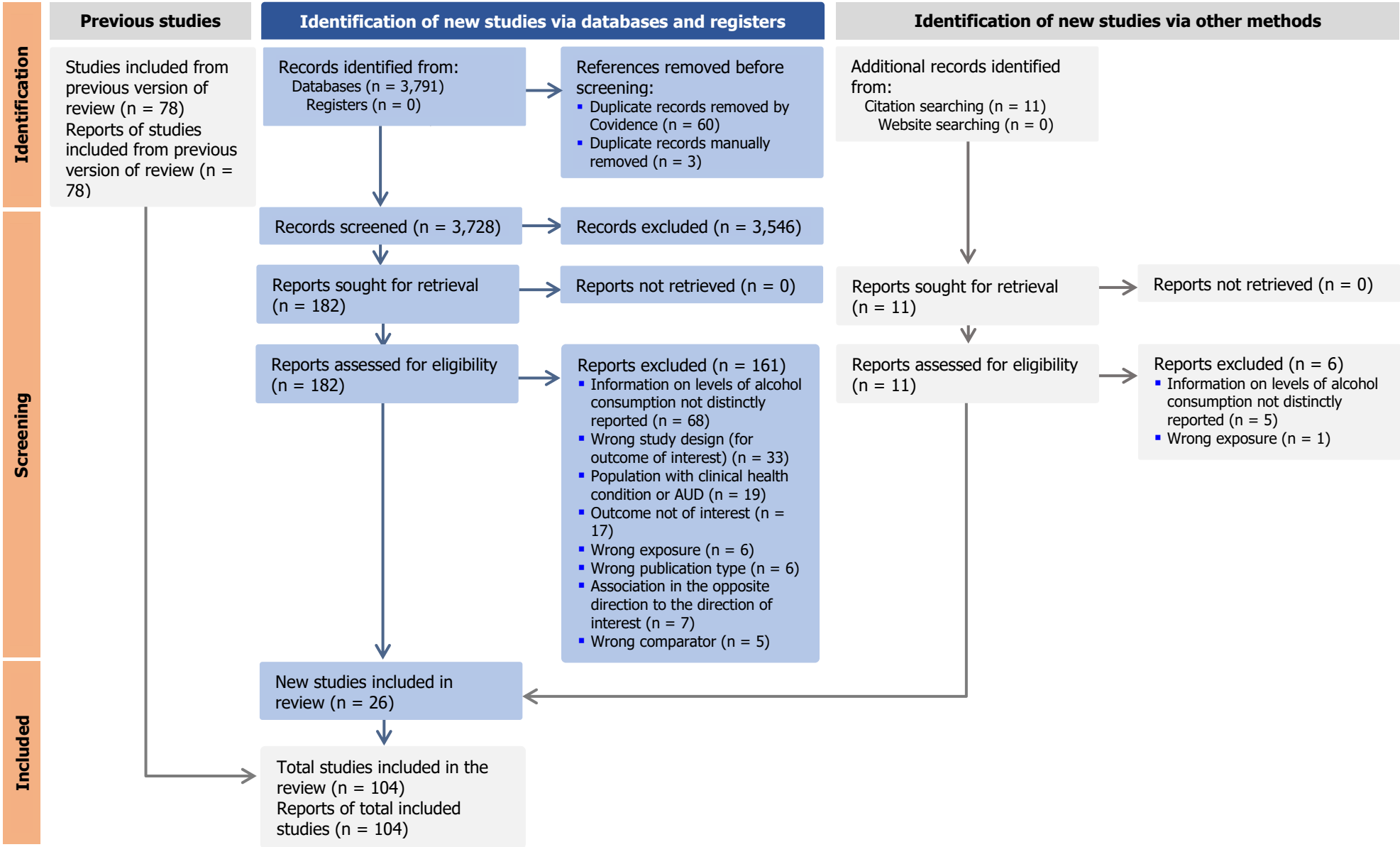
Backward and forward citation searching of all included articles was conducted via CitationChaser,[20] identifying 1,512 backward and 189 forward citation results.

Following removal of duplicates and citations published before 2021, and brief scanning of these citations for relevance, 11 additional records were identified and retrieved. Following eligibility assessment, five studies were subsequently included.

Reasons for exclusion of all records which underwent full-text review in this update were documented and summarised (see Appendix B).

All studies in the AHTA review[13] were then checked for inclusion in the Cochrane Canada rapid update,[14] with 63 studies identified. Two of these studies overlapped with the 23 studies identified in the Cochrane Canada update.[21, 22] One of the Cochrane Canada studies could not be found, and five studies were excluded as they did not meet our inclusion criteria.[23-27] This resulted in a total of 78 unique studies from the Cochrane Canada update (see Appendix C). These 78 studies, were then cross-checked against The Retraction Watch Database on 13 August 2025,[28] to ensure none of the studies had been retracted since publication. No retractions were identified, and these studies were subsequently included.

Figure 3.1 PRISMA flow diagram



3.1.2 Characteristics of included primary studies

The characteristics of the 26 studies identified in the current update are outlined in Appendix D. Briefly, outcome measures included were:

- depression in 13 longitudinal studies[29-41]
- anxiety in two longitudinal studies[32, 35]
- suicidal ideation in four longitudinal[31, 42-44] and 10 cross-sectional studies.[45-56]

The studies included in the current update focused on the following age groups[1]:

- adults (aged 18 years and older) in 21 studies.[29, 31, 33, 35-43, 45, 46, 50, 51, 53, 54] Sub-groups within the adults age range included:
  - younger adults (people aged 18 to 25 years) in four studies[29, 45, 47, 48]
  - older adults (aged 65 years or older) in one study.[37]
- children and adolescents (aged under 18 years) in five studies.[30, 32, 44, 52, 55]

As per the Cochrane Canada rapid update, due to the limited number of studies identified for younger and older adults, results for all adults over 18 will be grouped together for the majority of outcomes. When investigating the effect of the quantity of alcohol consumed and the development of depression, 16 studies were identified for older adults. Due to the number of studies this sub-group were disaggregated for this exposure outcome combination (see Section 3.2.2).

The studies were conducted in the following individual countries:

- the USA in seven studies[29, 38, 41, 42, 46, 49, 56]
- Canada in three studies[32, 35, 52, 53]
- China,[34, 55] Finland,[30, 44] and the UK,[43, 50] each in two studies
- Brazil,[40] Germany,[54] India,[45] Japan,[36] Latvia,[51] Norway,[47] South Korea,[31] and Sweden,[37] each in one study.

Two studies were also conducted across multiple countries.[33, 39]

The characteristics for the studies included in the AHTA systematic review[13, 19] and the Cochrane Canada rapid update,[14] can be found in their respective publications.

3.1.3 Risk of bias of included primary studies

Risk of bias assessment for the 26 studies identified in the current update are outlined in Appendix E. Overall, two studies (8%) were deemed to be of high

[1] As both 'younger adults' and 'older adults' are sub-groups of the 'adult' group they are counted within the adult group.

RoB,[35, 52] 17 studies (65%) were deemed to be of moderate RoB,[29, 31-34, 36, 37, 39-42, 44-46, 50, 51, 55] and seven studies (27%) were deemed to be of low RoB.[30, 38, 43, 47, 49, 54, 56] The most commonly reported domains at moderate or high risk of bias were Domain 1: Study Participation and Domain 2: Study Attrition. The Domain 1: Study Participation evaluates the extent to which the study sample represents the eligible population, including the sampling strategy, recruitment procedures, and inclusion and exclusion criteria. Nine of the 26 studies included in this update were judged to be of moderate or high RoB, primarily due to convenience sampling, limited representativeness, and unclear recruitment procedures. These limitations reduce confidence that the included samples adequately reflect the broader eligible population and may result in differences between participants and eligible nonparticipants, potentially influencing the observed associations.

Domain 2: Study Attrition assesses whether participants who provided follow-up data are representative of those who initially enrolled in the study and whether loss to follow-up may influence the observed association between exposure and outcomes. This domain considers overall withdrawal rates, reasons for attrition and whether individuals lost to follow-up differ systematically from those who remain in the study. In this update, 15 studies were judged to be of moderate RoB, and eight were judged to be of high RoB, mainly due to a low response rate and lack of information on participants' dropout, which may affect the overall reliability and generalisability of the findings.

Risk of bias outcomes for studies included in the AHTA systematic review[13, 19] and the Cochrane Canada rapid update,[14] can be found in their respective publications, and or are indicated in Section 3.2, where appropriate. Overall, in both reviews, the majority of studies were judged to be of moderate RoB, mainly due to lack of adjustment for confounders, unclear participant selection, issues in exposure or outcome measurement and missing data. In the Cochrane Canada rapid update the presence of mental-health outcomes at baseline was a key determinant of overall RoB.[14] Studies where mental health outcomes were present at baseline or where this was unclear were considered to have a higher RoB. Studies with lower RoB, mainly those that excluded participants with existing mental health conditions at baseline, or clearly demonstrated that mental health outcomes were not present at baseline, were given greater weight in the conclusions.

3.1.4 Certainty of the evidence

Following GRADE certainty of evidence assessment, one exposure outcome combination was deemed to have moderate evidence, five were deemed to have low certainty of evidence, and 11 were deemed to have very low certainty of evidence. Summary of findings tables for depression, anxiety and suicidal ideation can be found in Section 3.2.4, Section 3.3.3, and Section 3.4.3, respectively.

3.2 Alcohol consumption and the development of depression

When investigating depression both clinical diagnoses of depressive disorders[57, 58] and symptoms of depression identified using screening tools (scales, surveys and questionnaires),[59-61] were included. Results were not disaggregated based on outcome measurement type.

3.2.1 Adults

Quantity of alcohol consumed and development of depression

One longitudinal study reporting on the quantity of alcohol consumed and the development of depression in adults was identified in the current update.[36] When combined with the Cochrane Canada results, there was a total of 17 longitudinal studies.[36, 61-76]

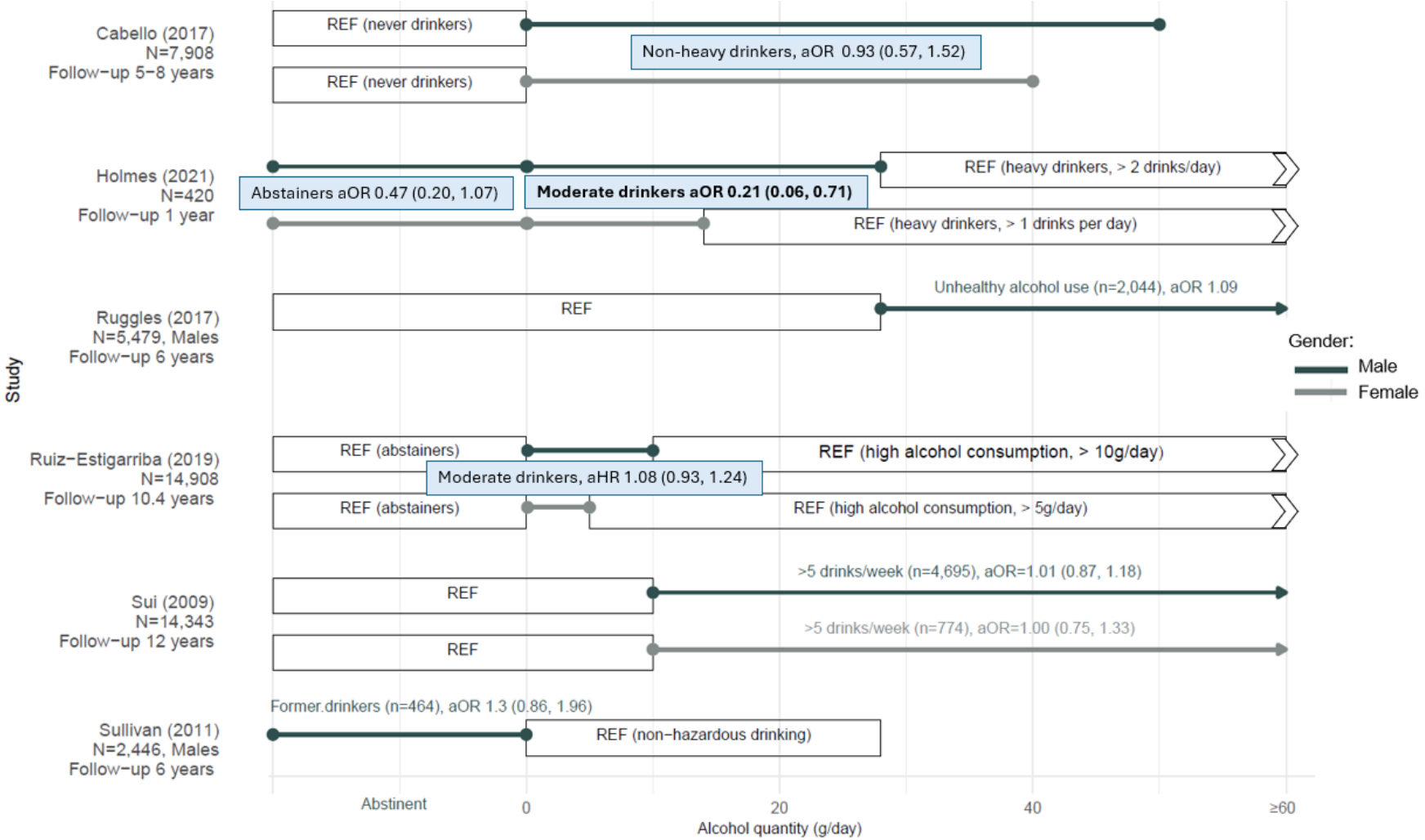
Fifteen studies reported the quantity of alcohol intake by different amounts of grams of alcohol consumed per day and the odds of depression and or depressive symptoms. These 15 studies are presented graphically, by their RoB (see Figure 3.2). Only studies deemed to be low RoB are presented,[62, 64-67, 75] with studies of moderate and high RoB presented in Appendix F. Two further studies reported the association of alcohol intake and depressive symptoms as beta coefficient values and reported no significant effect for quantity of alcohol consumed.[63, 74]

The 17 studies included adults, and younger adults (aged 18-25 years old), with follow-up from one[62] to 12 years.[72] The studies were conducted in a variety of countries including the USA,[72] the Netherlands,[69, 74] and Sweden.[63, 65, 67, 73] Seven studies were deemed to be of low RoB,[62-67, 75] seven of moderate RoB,[36, 61, 68-72] and three of high RoB.[73, 74, 76]

When considering the effects across all studies, the majority of studies (13/17) showed no significant association between the odds of developing depression and increasing amounts of alcohol intake per day.[36, 61, 63-67, 70, 71, 73-76] This is consistent with results reported in the Cochrane Canada rapid update.[14] This lack of association was true when including only studies deemed to be of low RoB, and also true in moderate or high RoB studies. Three studies provided disaggregated results for males and females;[67, 68, 71] with similar findings observed across both groups.

In adults, there may be no association between the quantity of alcohol consumed and the future development of depression. (Low certainty of evidence)

Figure 3.2 Quantity of alcohol consumed and development of depression in adults (studies of low risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; HR = hazard ratio; OR = odds ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively [with the associated reference groups also combined to form one reference group] while the bars represent grams of alcohol/day included in each drinking category. Ruiz-Estigarriba et al.[66] included both abstainers and high alcohol consumption within their reference group.

Frequency of alcohol consumption and development of depression

Two longitudinal studies reporting on the frequency of alcohol consumption and the development of depression in adults and older adults were identified in the current update.[33, 34] When combined with the Cochrane Canada results,[14] there was a total of nine longitudinal studies (see Table 3.1).

The nine studies were conducted across a number of different countries, and the follow-up periods ranged from two years to 28 years.[61] As per Cochrane Canada,[14] while frequency was measured differently across studies, results were disaggregated into the following frequencies: none; less than one time per month; 1-4 times per month; 2-3 times per week and four times or more per week.

When considering the effects across studies, mixed results were observed. Four of the nine studies showed no significant association between the frequency of alcohol consumption and future development of depression.[34, 58-60] Four studies reported significant reductions in the odds of developing depression with increasing frequency of alcohol consumption.[33, 57, 77, 78] While one study from Canada (n = 877) reported a moderate positive association between occasional drinking (less than one time per month) and major depressive disorder after four years (RR [95% CI] = 1.56 [1.40, 1.75]),[57] increasing consumption to greater than once per month displayed a reduction in odds (RR [95% CI] = 0.68 [0.61, 0.76]).

In adults, the evidence is very uncertain, with studies showing mixed results for the association between the frequency of alcohol consumption and the future development of depression. (Very low certainty of evidence)

Table 3.1 Frequency of alcohol consumption and development of depression in adults

Study Country, number of participants; follow-up	None	< 1 time per month	1–4 times per month	2–3 times per week	≥ 4 times per week	Association of alcohol consumption and development of depression
Tsai et al.[59] Taiwan, n = 2,629; 8 years	Ref		≥ 1 time/wk, < 2 drinks/time: aOR [95% CI] = 0.89 [0.63, 1.26] ≥ 1 time/wk, ≥ 2 drinks/time: aOR [95% CI] = 0.70 [0.30, 1.64]			Non significant
Augestad et al.[60]* Norway, n = 6,661; 3-12 years	Ref	*Defined as no recent drinking* *Males:* aHR [95% CI] = 0.75 [0.38, 1.49] *Females:* aHR [95% CI] = 1.17 [0.61, 2.24]	*Defined as 1-4 times in the past 14 days* *Males:* aHR [95% CI] = 0.62 [0.32, 1.21] *Females:* aHR [95% CI] = 1.18 [0.61, 2.27]	*Defined as 5-10 times in the past 14 days* *Males:* aHR [95% CI] = 0.59 [0.24, 1.45] *Females:* aHR [95% CI] = 1.02 [0.27, 3.88] *Defined as >10 times in the past 14 days* *Males:* aHR [95% CI] = 0.47 [0.16, 1.38] *Females:* aHR [95% CI] = 0.72 [0.15, 3.47]		Non significant
Bell et al.[61] UK, n =7,478; 28 years	Not in past year: aHR [95% CI] = 1.24 [0.99, 1.56]	Special occasions: aHR [95% CI] = 0.97 [0.83, 1.15]	Ref (weekly) Monthly: aHR [95% CI] = 1.07 [0.92, 1.25]	Daily: **aHR [95% CI] = 1.17 [1.05, 1.32]**		Non significant to a small significant increase
Deng et al.[33] Europe, n = 3,304; 5 years	Ref	*Males:* aOR [95% CI] = 0.99 [0.63, 1.55] *Females:* aOR [95% CI] = 0.74 [0.55, 1.01]	*1-2 times a month* *Males:* **aOR [95% CI] = 0.63 [0.41, 0.95]** *Females:* **aOR [95% CI] = 0.71 [0.54, 0.92]** *1-2 times a week:* *Males:* **aOR [95% CI] = 0.67 [0.48, 0.92]** *Females:* **aOR [95% CI] = 0.66 [0.51, 0.85]** *3-4 times a week:* *Males:* aOR [95% CI] = 0.73 [0.48, 1.10] *Females:* aOR [95% CI] = 0.71 [0.49, 1.03] *Almost every day:* *Males:* aOR [95% CI] = 0.83 [0.61, 1.13] *Females:* **aOR [95% CI] = 0.59 [0.43, 0.81]**			Non significant to small significant decreases

Study Country, number of participants; follow-up	None	< 1 time per month	1–4 times per month	2–3 times per week	≥ 4 times per week	Association of alcohol consumption and development of depression
Ju et al.[34] China, n = 8,234; 5 years	Ref	aOR [95% CI] = 1.02 [0.70, 1.48]	aOR [95% CI] = 1.25 [0.79, 1.96]	aOR [95% CI] = 1.34 [0.74, 2.41]	aOR [95% CI] = 0.91 [0.63, 1.33]	Non significant
Meng et al.[57] Canada, n = 877; 4 years	Ref	**aRR [95% CI] = 1.56 [1.40, 1.75]** *Males:* **aRR [95% CI] = 2.62 [1.93, 3.56]** *Females:* **aRR [95% CI] = 1.19 [1.05, 1.35]**	**aRR [95% CI] = 0.68 [0.61, 0.76]** *Males:* **aRR [95% CI] = 0.45 [0.33, 0.62]** *Females:* **aRR [95% CI] = 0.75 [0.66, 0.85]**			Moderate/small significant decreases to small/moderate significant increases
Meng[77] Canada, n = 12,227; 16 years	Ref (occasional/former/abstainer)		*Defined as a 'regular' drinker* **HR [95% CI] = 0.88 [0.78, 1.00]** *Males:* **HR [95% CI] = 0.79 [0.64, 0.98]** *Females:* HR [95% CI] = 0.92 [0.80, 1.05]			Small significant decreases to non significant
Cheng et al.[78] China, n = 15,628; 2 years	Ref	-	*Current drinker, defined as more than monthly* **aOR [95% CI] = 0.6 [0.5, 0.7]** *Males:* **aOR [95% CI] = 0.7 [0.5, 0.9]** *Females:* aOR [95% CI] = 0.8 [0.5, 1.3] More than daily drinking (compared to less than daily drinking): aOR [95% CI] = 1.2 [0.8, 1.7]			Small significant decreases to non significant
Mason et al.[58] USA, n = 429; 4 years	-	Beta coefficient values indicated no effect for quantity or frequency of consumption.				Non significant

Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; aRR = adjusted risk ratio; CI = confidence interval; HR = hazard ratio; OR = odds ratio; Ref = reference group; UK = United Kingdom; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk; red = high risk.
Cougle et al.[23] was included in the Cochrane Canada update, however, was not included in the current update as the alcohol consumption was outlined as the outcome and not the exposure.
Beta coefficient values were calculated using structural equational modelling analyses.
*Alcohol consumption frequency was recorded to reflect frequency in the past 14 days.

Quantity and frequency (combined measure) of alcohol consumption and the development of depression

Three longitudinal studies reporting on the association of a combined measure of alcohol quantity and frequency and the development of depression in adults were identified in the current update (see Table 3.2).[31, 38, 41] Two of the studies were deemed to be of moderate RoB,[31, 41] with the remaining study deemed to be of low RoB.[38] Overall, combined measures of alcohol quantity and frequency showed mixed results, with small significant decreases,[31] non-significant results[31, 38, 41] and small significant increases[41] all observed.

In adults, studies show mixed results for the association between the combined quantity and frequency of alcohol consumption and the future development of depression. (Low certainty of evidence)

Table 3.2 Quantity and frequency (combined measure) of alcohol consumption and the development of depression

Study Country, number of participants; follow-up	**No drinking**	**Occasional** (<1 day/week)	**Moderate** ≥1 day/week, ≤7 drinks/week (females), ≤14 drinks/week (males)	**Heavy** ≥1 day/week and/or ≥7 drinks (females), ≥14 drinks (males)	**Association of quantity and frequency (combined measure) of alcohol consumption and depression**
Visontay et al.[38] USA, n = 3,593; approximately 20 years	Ref	aOR [95% CI] = 0.83 [0.55, 1.25]	aOR [95% CI] = 0.77 [0.45, 1.29]	aOR [95% CI] = 1.17 [0.72, 1.96]	Non significant
Cho et al.[31] South Korea†, n = 129,446; 17 years	Ref	Initial non-drinkers who increased to light drinking (>0–≤1 glass per day and 1 day per week): **aHR [95% CI] = 0.91 [0.84, 0.98]** Those who increased to light-to-moderate drinking (>1–≤2 glasses and 2 days): aHR [95% CI] = 0.94 [0.80, 1.10] Those who increased to moderate-to-heavy drinking: >2–≤4 glasses and 3–4 days: aHR [95% CI] = 0.97 [0.81, 1.17] Those who increased to heavy drinking: >4 glasses and 5–7 days: aHR [95% CI] = 1.18 [0.96, 1.45]			Small significant decrease to non significant
Yu et al.[41] USA, n = 11,057; 16 years	Higher levels of drinking at baseline was related to increased depression scores between baseline and follow-up among male non-drinkers, and low/moderate drinkers **(beta coefficient [95% CI] = 0.16 [0.02, 0.31] and 0.16 [0.01, 0.30], respectively)** However, increased drinking between visits was also associated with decreases in depression scores, especially among male low/moderate drinkers **(beta coefficient [95% CI] = - 0.15 [-0.26, -0.04])**.				Non significant to small significant positive associations

Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; CI = confidence interval; HR = hazard ratio; OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk.
Beta coefficient values were calculated using fixed-effect logistic regressions.
*A standard drink in the USA contains 14 grams of pure alcohol.
†A standard drink in South Korea contains seven grams of pure alcohol.

Heavy episodic or binge drinking and development of depression

Four longitudinal studies reporting on heavy episodic drinking (HED) or binge drinking and the development of depression in adults were identified in the current update.[29, 35, 39, 40] When combined with the Cochrane Canada results,[14] there was a total of 16 longitudinal studies.[21, 29, 35, 39, 40, 58, 61, 64, 66, 68, 70, 75, 79-82]

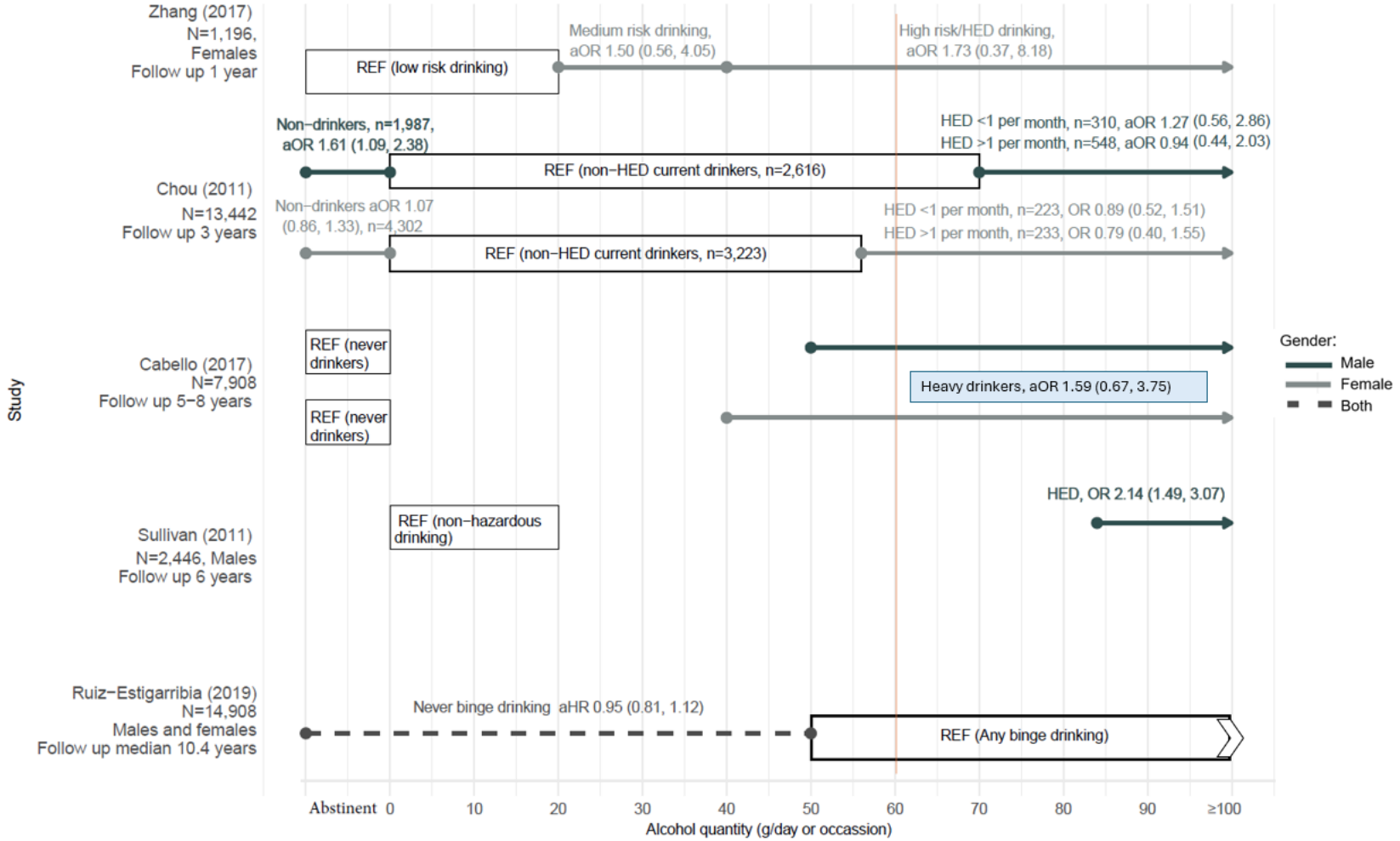
Seven of the 16 studies which reported odds or hazard ratios are graphically presented,[21, 64, 66, 75, 79] with five of these studies (which were deemed of low RoB) presented in Figure 3.3.[21, 64, 66, 75, 79] The two remaining studies deemed of moderate and high RoB are presented graphically in Appendix G.[61, 70] The remainder of the studies which could not be graphically presented are presented in table format, in Appendix G.

The studies were conducted across several countries, and the follow-up periods ranged from one year[21] to 28 years.[61] Different definitions and measurements for HED or binge drinking were used across the studies. Twelve studies defined the quantity of alcohol associated with HED or binge drinking,[21, 29, 35, 39, 58, 61, 64, 66, 70, 75, 79-81] with these definitions somewhat comparable to the Irish definition (six standard drinks on any one occasion, equalling 60 grams of pure alcohol).[5] Seven studies also investigated the frequency with which participants undertook HED or binge drinking.[35, 39, 58, 68, 80-82]

When considering the effects across the 16 studies, the majority of studies (9/16) reported no significant association between HED or binge drinking and the future development of depression.[21, 29, 35, 39, 64, 66, 68, 70, 81] Five studies reported small or moderate increased odds or associations between HED and depression.[40, 58, 61, 75, 82] Of these, one study, of low RoB, reported moderate increased odds in the development of depression in males who undertake HED or binge drinking.[75] Another study, of moderate RoB, reported moderate increased risks in developing depression, in those with consistent risky alcohol drinking (defined as those with a Alcohol Use Disorder Identification Test (AUDIT) score of five or more), and those who developed risky alcohol drinking over time, compared to non-risky drinkers.[40]

In adults, studies show mixed results for the association between heavy episodic or binge drinking with the future development of depression. (Low certainty of evidence)

Figure 3.3 Heavy episodic or binge drinking and development of depression in adults (studies of low risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; OR = odds ratio; Ref = reference group
Notes: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively [with the associated reference groups also combined to form one reference group] while the bars represent grams of alcohol/day included in each drinking category. Red line at 60g/day represents the definition of binge drinking in Ireland based on guidelines.

3.2.2 Older Adults

Quantity of alcohol consumed and development of depression

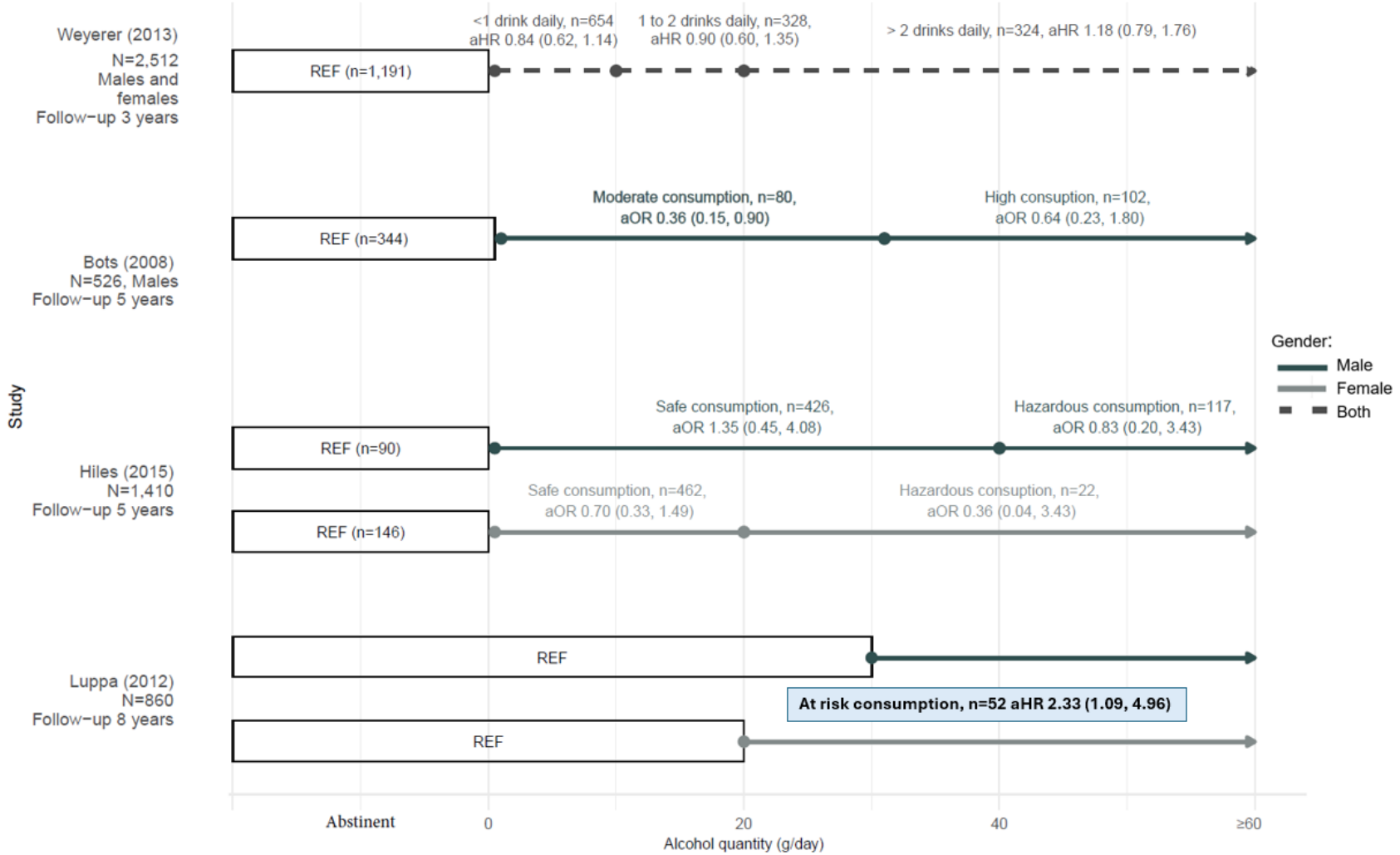
One longitudinal study reporting on the quantity of alcohol consumed and the development of depression in older adults was identified in the current update.[37] When combined with the Cochrane Canada results, there was a total of 15 longitudinal studies.[22, 37, 83-95] The studies were conducted in a variety of countries including the USA,[22, 88-90] Germany[83, 86] and Sweden,[37] and follow-up periods ranged from three years[83] to 20 years.[89]

All 15 studies reported the quantity of alcohol intake by different amounts of grams of alcohol consumed per day and the odds of depression and or depressive symptoms. The studies are presented graphically, by their RoB (see Figure 3.4 and Figure 3.5). Only studies deemed to be low RoB are presented in the main report, with studies of moderate and high RoB presented in Appendix H.

When considering the effects across studies, seven of the 15 studies showed no significant association or odds of developing depression, with increasing amounts of alcohol intake per day.[37, 83, 85, 89-91, 94] Four studies reported a small significant reduction in the odds of developing depression in those who consume a given quantity of alcohol (which varied across studies), compared to those who do not consume alcohol.[84, 87, 88, 93] Three studies reported significant small to moderate increases in the odds of developing depression, when consuming greater than or equal to 20 grams[86, 95] or 40 grams of alcohol per day,[88, 95] compared to lesser amounts or no drinking. One study reported increased odds of developing depression when drinking at moderate consumption, compared to those who abstain.[84]

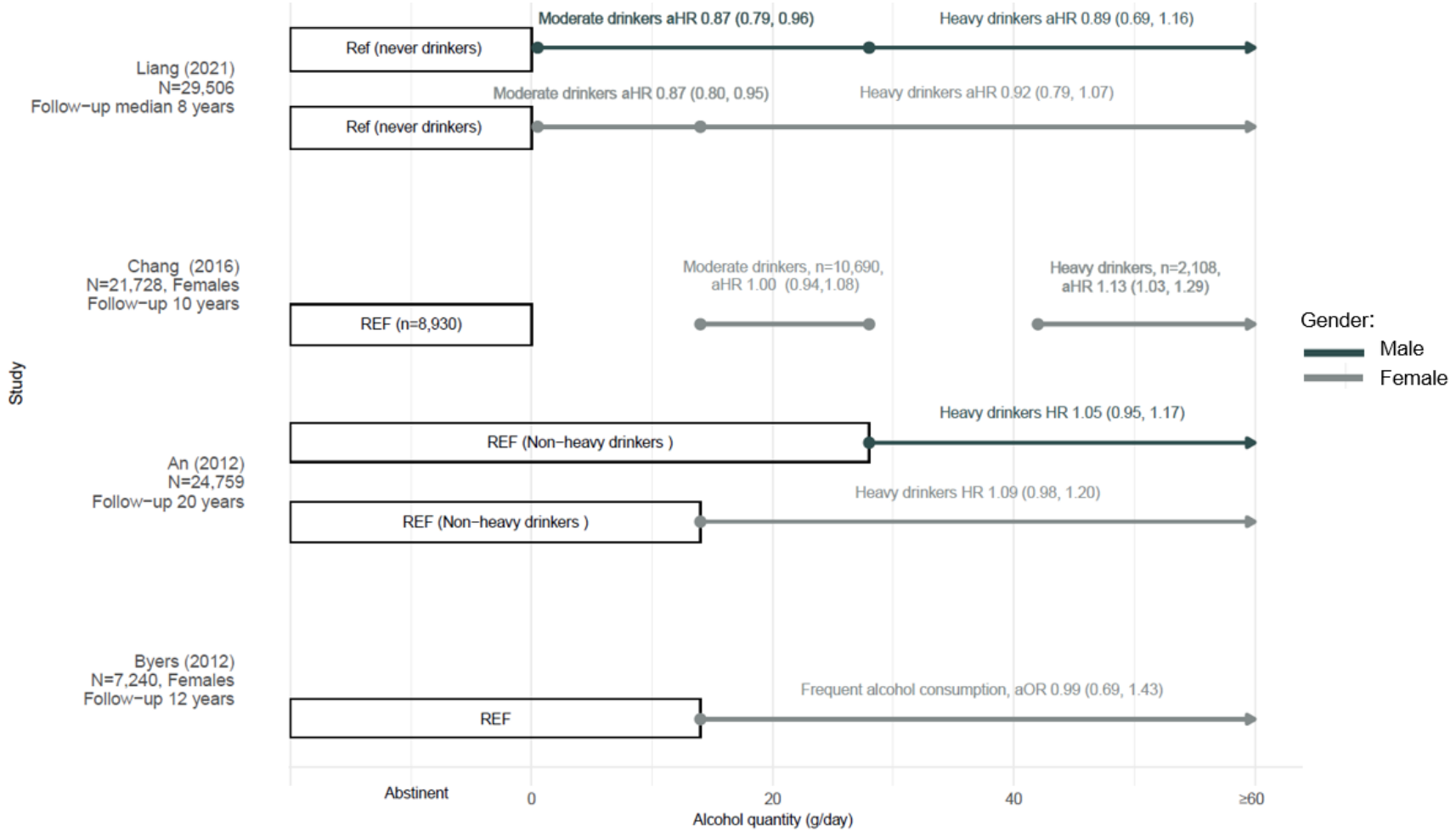
In older adults, the evidence is very uncertain, with studies showing mixed results for the association between the quantity of alcohol consumed and the future development of depression. (Very low certainty of evidence)

Figure 3.4 Quantity of alcohol consumed and development of depression in older adults (studies of low risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; HR = hazard ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively [with the associated reference groups also combined to form one reference group] while the bars represent grams of alcohol/day included in each drinking category.

Figure 3.5 Quantity of alcohol consumed and development of depression in older adults (studies of low risk of bias) (cont.)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; Ref = reference group; HR = hazard ratio.
Note: 95% CI presented in brackets. Statistically significant results are presented in bold. The bars represent grams of alcohol/day included in each drinking category.

3.2.3 Adolescents

Quantity and or frequency of alcohol consumption and development of depression

As per the Cochrane Canada update,[14] for adolescents (aged under 18 years), the results from studies reporting on the quantity of alcohol consumed, and or the frequency of alcohol consumption were combined for synthesis. One longitudinal study reporting on the quantity of alcohol consumption and the development of depression in adolescents was identified in the current update.[30] When combined with the Cochrane Canada results,[14] there was a total of 14 longitudinal studies (see Table 3.3).[30, 58, 96-107]

The majority of studies were conducted in the USA,[58, 96, 100-102, 104] with additional studies from countries including the UK,[58, 96, 100-102, 104] Finland,[99-102] and Canada.[97] Four studies were deemed to be of low RoB,[30, 96-98] with four studies of moderate RoB,[30] and six of high RoB.[58, 103-105] Follow-up periods ranged from one year[30] to 17 years.[30] The majority of studies measured depression using self-report instruments, and two studies from Finland utilised national healthcare registers and hospital discharge reports to identify depression.[30, 105] Two studies quantified the odds of developing depressive symptoms or depression,[30, 99] while the remaining studies presented correlation or beta coefficient values (see Table 3.3).

Most studies (13/14) reported non significant or small positive associations between the quantity or frequency of alcohol consumption, and the development of depression in adolescents. One study (of moderate RoB) with 7,100 participants,[99] reported moderately increased odds of depressive symptoms or episodes at a 2-4-year follow-up, in those who drink alcohol occasionally or weekly, compared to those who do not drink.

In adolescents, the evidence is very uncertain, however there may be no association or a small positive association between the quantity and or frequency of alcohol consumption and the future development of depression. (Very low certainty of evidence)

Table 3.3 Quantity and or frequency of alcohol consumption and development of depression in adolescents

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of alcohol intake with development of depression
Bolstad et al.[30] Finland, n= 7,660; up to 17 years	Quantity (grams per day)	[Change in OR reflects steps of one standard deviation] aOR [95% CI] = 1.06 [0.96, 1.17]	Non significant
Danzo et al.[96] USA, n = 593 families, up to 3 years	Frequency (number of alcoholic drinks in the past month was recorded each year 6th through 9th grades)	Correlation values between alcohol intake and depression in the following 1-3 year period (where available) ranged from 0.02 to **0.30**; values were lower in males	Non significant to small significant positive associations
Hooshmand et al.[97] Canada, n = 4,412; up to 3 years	Quantity (participants were asked on average how many drinks do you have with responses from <1 drink to over 10 drinks) Frequency (participants were asked how often do they have a drink, with responses from never to every day) Responses recorded 9th through 12th grades	Correlation values between alcohol quantity and depressive symptoms in the following 1-3 year period (where available) ranged from 0.04 to **0.16** Correlation values between frequency of alcohol consumption and depressive symptoms in the following 1-3 year period (where available) ranged from **0.09 to 0.17**	Non significant to small significant positive associations
Parrish et al.[98] Mexico, n = 620; 2 years	Frequency (participants reported how many times in the past 3 months they drank alcohol)	Beta coefficient value = 0.04	Non significant
Edwards et al.[99] UK, n = 7,100; approximately 2-4 years	Medium frequency (occasional compared to none) High frequency (weekly compared to none)	Medium frequency: *Males:* **aOR [95% CI] = 2.25 [1.09, 4.66]** *Females:* **aOR [95% CI] = 1.63 [1.04, 2.55]** High frequency: *Males:* **aOR [95% CI] = 2.54 [1.06, 6.10]** *Females:* **aOR [95% CI] = 1.93 [1.08, 3.44]**	Moderate significant increases

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of alcohol intake with development of depression
Fleming et al.[100] USA, n = 885; up to 3 years	Frequency (alcohol use measured each year, 8th through 11th grades)	Correlation values between alcohol use and depressive symptoms in the following 1-3 year period (where available) ranged from 0.02 to **0.23**	Non significant to small significant positive associations
McCarty et al.[101] USA, n = 512; 3 years	Any consumption in the past 6 months was measured each year, 6th through 9th grades	Correlation values between alcohol use and depressive symptoms in the following 1-3 year period (where available) from 0.02 to **0.17**	Non significant to small significant positive associations
Wymbs et al.[102] USA, n = 521; 4 years	Frequency (alcohol use over the past 6 months, responses scale ranging from (0) never used to (7) > 1 time per day) Responses recorded in the 8th and 9th grades	Correlation values between alcohol frequency and depressive symptoms in the following 1-4 year period (where available) ranged from 0.02 to **0.17**	Non significant to small significant positive associations
Mackie et al.[103] UK, n = 393; up to 18 months	Quantity (participants were asked how many alcoholic drinks they consumed on a typical day when they drank, with responses ranging from one to ≥10) Frequency (participants were asked how often they consumed alcoholic drinks, with responses ranging from never to almost daily) Responses were used to calculate a quantity-frequency index.	Correlation values between alcohol quantity-frequency index and depressive symptoms in the following up to 18 months period (where available) ranged from 0.08 to **0.18**	Non significant to small significant positive associations
Mason et al.[58] USA, n = 429; 2–6 years	Quantity (participants were asked the amount they usually drank each time they consumed alcohol) Frequency (participants were asked how many times they had consumed	Quantity: Correlation values between alcohol quantity and depressive symptoms in the following 2-6-year period (where available) ranged from 0.06 to **0.21**	Non significant to small significant positive associations

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of alcohol intake with development of depression
	alcoholic drinks within the past month)	Frequency: Correlation values between alcohol frequency and depressive symptoms in the following 2-6-year period (where available) ranged from 0.03 to 0.08	
Mason and Spoth[104] USA, n = 151; 2 years	Quantity (participants were asked "About how much (if at all) do you usually drink each time you drink?" Frequency (participants reported the number of times they had consumed beer, wine, wine coolers, or other liquor within the past month) Responses were used to calculate a quantity-frequency index.	Correlation between the quantity-frequency index at 16 years of age and age 18 depressed mood = **0.27**	Small significant positive association
Patwardhan et al.[105] Finland, n = 6,963; 12 years	Alcohol use - mean score of responses to 3 items: frequency (participants were asked how often they have had a drink in the past year); intensity (participants asked how many times they have been drunk in the past year); HED (alcohol heavy episodic drinking past 30 days)	Beta coefficient value [95% CI] = **0.10 [0.05, 0.15]**	Small significant positive association
Scholes-Balog et al.[106] Australia, n = 927; 3 years	Frequency (alcohol use measured in 6th, 9thand 11th grades)	Correlation values between alcohol use and depressive symptoms in the following 1-3-year period (where available) ranged from -0.04 to **0.24**	Non significant to small significant positive associations
Skogen et al.[107] Norway, n =1,095; 1–3 years	Alcohol trajectory ('Early Onset High' participants who started consuming alcohol early and at high levels of consumption over time, compared to 'Stable Low' low levels	Standard deviations of regression coefficients ranged from **0.33 to 0.46,** indicating the association between 'early onset high' alcohol consumption and depression symptoms across all time points from age 13-18 years.	Small significant positive associations

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of alcohol intake with development of depression
	of alcohol consumption throughout adolescence).		

Key: aOR = adjusted odds ratio; CI = confidence interval; UK = United Kingdom; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk; red = high risk.
Beta coefficient values were calculated using cross-lagged latent variable regression models (Parrish et al.[98]) and mediation analyses (Patwardhan et al.[105])
*Significance not indicated in the study.

Heavy episodic or binge drinking and development of depression in adolescents

Two longitudinal studies reporting on HED or binge drinking and the development of depression in adolescents were identified in the current update.[30, 32] When combined with the Cochrane Canada results,[14] there was a total of 11 longitudinal studies (see Table 3.4).[30] Follow-up of depressive symptoms ranged from one year[30, 32] to 17 years,[30, 32] and these were measured in approximately 64,000 adolescents.

Different definitions and measurements for HED or binge drinking were used across the studies. Of note, seven studies defined the quantity of alcohol associated with HED or binge drinking (five alcoholic drinks in a row, equalling 70 grams of pure alcohol),[30, 32, 80, 108-111] and this definition was somewhat comparable to the Irish definition (six standard drinks on any one occasion, equalling 60 grams of pure alcohol).[5] Three studies were less comparable to the Irish definition, as their definition for HED and or binge drinking was below 60 grams of pure alcohol.[58, 104, 112] One further study measured HED by frequency of alcohol intoxication.[107]

Considering the effects across the studies, all 11 studies reported non significant and or small positive significant associations between HED or binge drinking and the development of depression in adolescents.

In adolescents, the evidence is very uncertain, however there may be no association or a small positive association between heavy episodic or binge drinking and the future development of depression. (Very low certainty of evidence)

Table 3.4 Heavy or episodic binge drinking and development of depression in adolescents

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	None	Results	Association of HED or binge drinking and development of depression
Bolstad et al.[30] Finland, n= 7,660; up to 17 years	Participants were asked how many times during the past 30 days they had ≥6 drinks* (boys) or ≥4 drinks* (girls).	Ref	*1-2 times per month:* aOR [95% CI] = 0.89 [0.73, 1.10] *≥ 3 times per month:* aOR [95% CI] = 1.09 [0.81, 1.48]	Non significant
Gustafson[80] USA, n = 3,194; up to 12 years	Participants were asked 'In the past 12 months, how many days did you have ≥5 drinks† in a row?'	Ref	Correlation values between binge drinking measured at adolescence and depressive symptoms measured at young adulthood and adulthood ranged from 0.03 to **0.07**	Non significant to small significant positive associations
Wilkinson et al.[108] USA, n = 12,017; 13 years	Participants were asked 'In the past 12 months, how many days did you have ≥5 drinks† in a row?'	Ref	Beta coefficient value [standard error]: *Male* = -0.01 [0.01] *Female* = 0.01 [0.01]	Non significant
Cisler et al.[109] USA, n = 2,511; 1 year	Participants were asked how many days in the past 12 months did they have ≥5 drinks† on an occasion, at three time points; Wave 1 (baseline), Wave 2 (mean of 15.29 months after Wave 1) and Wave 3 (14.44 months after Wave 2).	Ref	Beta coefficient value for binge drinking (Wave 1) to predict depression (Wave 2): 0.01 Beta coefficient value for binge drinking (Wave 1) to predict depression (Wave 3): **-0.06**	Small significant negative association to non significant
Dabravolskaj et al.[32] Canada, n=24,274; 1 year	Having ≥5 drinks# of alcohol on one occasion [Reference group]	Beta coefficient value = 0.06 [-0.12, 0.23]	-	Non significant
Needham[110] USA, n = 10,828; 6 years	Participants were asked 'In the past 12 months, how many days did you have ≥5 drinks† in a row?"	Ref	Beta coefficient [standard error] values: *Male:* **-0.06 [0.03]** *Female:* **-0.11 [0.01]**	Small significant negative associations
Pesola et al.[111] UK, n = 1,883; 2 years	Harmful drinking behaviours - the Alcohol Use Disorder Identification Test	Ref	Direct effect [95% CI]: *Males:* -0.03 [-0.1, 0.05] *Females*: -0.03 [-0.9, 0.03]	Non significant
Chan et al.[112] Australia, n = 969; 3 years	Participants were asked how many times they have had ≥5 alcoholic drinks‡ one after the other, at three	Ref	Wave 1 heavy drinking correlation value with Wave 2 depression: **0.15**	Small significant positive associations

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	None	Results	Association of HED or binge drinking and development of depression
	time points, each one year apart (Wave 1 (baseline), Wave 2 and Wave 3).		Wave 1 heavy drinking correlation value with Wave 3 depression: **0.09** Wave 2 heavy drinking correlation value with Wave 3 depression: **0.08**	
Mason et al.[58] USA, n = 429; 2-6 years	Participants were asked 'During the past month, how many times have you had ≥3 drinks[†] (beer, wine, or other liquor) in a row?'	Ref	Correlation value = 0.10	Non significant
Mason and Spoth[104] USA, n = 151; 2 years	Participants were asked 'During the past month, how many times have you had ≥3 drinks[†] (beer, wine, or other liquor) in a row?'	Ref	Correlation value = **0.27**	Small significant positive association
Skogen et al.[107] Norway, n = 1,095; 1-3 years	Participants were asked how often they had been drunk in the last six months (Early onset)	Ref	Standard deviation of regression coefficients ranged from 0.16 to **0.34**	Non significant to small significant positive associations

Key: aOR = adjusted odds ratio; CI = confidence interval; HED = heavy episodic drinking; Ref = reference group; UK = United Kingdom; USA = United States of America.

Note: Data which are statistically significant are presented in bold. Risk of bias assessment: green = low risk; yellow = moderate risk; red = high risk. Beta coefficient values were calculated using linear mixed effects models (Wilkinson et al.[108]), multiple regression analyses (Cisler et al.[109]), multivariable mixed-effects models Dabravolskaj et al.[32]) and latent growth curve analysis (Needham et al.[110]).

[*]A standard drink in Finland contains 12 grams of pure alcohol, with four drinks equalling 48 grams of pure alcohol and six drinks equalling 72 grams of pure alcohol.

[†]A standard drink in the USA contains 14 grams of pure alcohol, with three drinks equalling 42 grams of pure alcohol and five drinks equalling 70 grams of pure alcohol.

[‡]A standard drink in Australia contains 10 grams of pure alcohol, with five drinks equalling 50 grams of pure alcohol.

[#]A standard drink in Canada contains 13.45 grams of pure alcohol, with five drinks equalling 67.25 grams of pure alcohol.

3.2.4 Summary of findings for the depression outcome

Following GRADE certainty of evidence assessment for the depression outcome, three exposure outcome combinations were deemed to have low certainty of evidence, and four exposure outcome combinations were deemed to have very low certainty of evidence (see Table 3.5). All of the exposure outcome combinations were downgraded due to risk of bias, five were downgraded due to inconsistency related to heterogeneity of the study results, and six were downgraded due to imprecision related to the width of the confidence intervals of study results.

Table 3.5 Summary of findings for the depression outcome

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
Adults, general population	**Quantity of alcohol consumed**		
	n = 171,841 (18 longitudinal studies)	18 longitudinal studies were included; 7 of low RoB, 8 of moderate RoB, and 3 of high RoB. 16 studies reported the quantity of alcohol consumption measured in grams per day. 14 of the 18 studies found no significant association or odds of depressive symptoms with increasing amounts of alcohol consumption per day. This lack of significant association remained consistent even when considering only the studies assessed as having a low RoB, as well as those classified as moderate or high RoB.	⊕⊕◯◯ LOW[a,d]
	Frequency of alcohol consumption		
	n = 57,467 (9 longitudinal studies)	9 longitudinal studies were included; 1 of low RoB, 6 of moderate RoB, and 2 of high RoB. Across all studies, the frequency was measured differently, including on a weekly or a monthly basis. Mixed results were reported; 4 studies showed no significant association between the frequency of alcohol consumption and the future development of depression. 4 studies reported a decrease in the odds of developing depression with increasing frequency of alcohol consumption. In contrast, 1 longitudinal study with 877 adults found that occasional drinking (less than 1 drink per month) was positively associated with future depressive symptoms after 4 years.	⊕◯◯◯ VERY LOW[a,b,d]
	Quantity and frequency (combined measure)		
	n = 133,248 (3 longitudinal studies)	3 longitudinal studies were included; 1 of low RoB and 2 of moderate RoB. Overall, combined measures of alcohol quantity and frequency showed mixed results, with small significant decreases, non significant results and small significant increases all observed.	⊕⊕◯◯ LOW[a,b]
	HED or binge drinking		
	n = 128,480 (16 longitudinal studies)	16 longitudinal studies were included. Different definitions and measurements for HED or binge drinking were used across the studies. In 12 studies, the definitions used were somewhat comparable to the Irish guideline of 60 grams of pure alcohol per occasion. 6 studies also investigated the frequency with which participants undertook HED or binge	⊕⊕◯◯ LOW[a,d]

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
		drinking. 9 of the 16 studies reported no significant association between HED or binge drinking and future depression. 5 studies reported small or moderate increased odds or associations between HED and depression. 1 study (of low RoB) found a moderate increase in odds of depression in males engaging in HED or binge drinking. 1 study (of moderate RoB) noted increased risks in those with consistent risky drinking and those who developed risky drinking over time, compared to non-risky drinkers.	
Older adults (aged 65 years and older), general population	**Quantity of alcohol consumed**		
	n = 178,421 (15 longitudinal studies)	15 longitudinal studies were included; 8 of low RoB, 4 of moderate RoB and 3 of high RoB. All 15 studies reported alcohol intake in grams per day and its relation to depression or depressive symptoms. 7 out of the 15 studies showed no significant association or odds of developing depression with increasing amounts of alcohol intake per day. 4 studies reported a small significant reduction in odds of developing depression in those who consume a given quantity of alcohol, compared to those who do not consume alcohol. 3 studies also reported significant small to moderate increases in the odds of developing depression, when consuming greater than or equal to 20 grams or 40 grams of alcohol per day, compared to lesser amounts or no drinking.	⨁◯◯◯ VERY LOW[a,b,d]
Adolescents (aged under 18 years), general population	**Quantity and or frequency of alcohol consumption**		
	n = 30,922 (14 longitudinal studies)	14 longitudinal studies were included; 4 of low RoB, 4 of moderate RoB and 6 of high RoB. Alcohol consumption was reported in various ways, including as the amount of alcohol in grams per day (a continuous variable), the number of drinks (a categorical variable), and the frequency of alcohol consumption on a weekly or monthly basis. The measurement of depression also varied across the studies; the majority measured depression using different self-reported instruments, and 2 studies used diagnoses from health reports and registers. 13 of 14 studies reported non significant or small positive associations between alcohol consumption and depression. Only 1 study with over 7,000 participants (of moderate RoB) found a moderate increase in depression.	⨁◯◯◯ VERY LOW[a,b,d]
	HED or binge drinking		

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
	n = 65,101 (11 longitudinal studies)	11 longitudinal studies were included; 3 of low RoB, 4 of moderate RoB and 4 high RoB. Different definitions and measurements for HED or binge drinking were used across the studies. The definitions used in 6 studies were somewhat comparable to the Irish guideline of 60 grams of pure alcohol per occasion. 3 studies reported a threshold below 60 grams of alcohol, while 2 studies measured the frequency of alcohol intoxication or harmful drinking behaviours. All 11 studies reported non significant or small positive significant associations between HED or binge drinking and the development of depression in adolescents.	⨁◯◯◯ VERY LOW[a,b,d]

Key: HED = heavy episodic drinking; RoB = risk of bias.
Note: Downgraded due to: a. Risk of bias; b. Inconsistency of results; c. Indirectness of evidence; d. Imprecision.

3.3 Alcohol consumption and the development of anxiety

When investigating anxiety both clinical diagnoses of anxiety disorders[113, 114] and symptoms of anxiety identified using screening tools (scales, surveys and questionnaires),[35, 115] were included. Results were not disaggregated based on outcome measurement type.

3.3.1 Adults

Level of alcohol intake and development of anxiety in adults

No studies reporting on the level of alcohol intake and the development of anxiety in adults were identified in the current update. Therefore, the results from the Cochrane Canada rapid update remain unchanged.[14]

Briefly, two longitudinal studies reporting on the level of alcohol intake and development of anxiety in adults were included (see Table 3.6).[114, 115] One study (of low RoB) reported similar odds of anxiety development with higher levels of alcohol intake compared to low levels.[115] The second study (of moderate RoB) reported significantly increased moderate odds of developing anxiety in those who drink at very high-risk levels.[114]

In adults, the evidence is very uncertain about the influence of different levels of alcohol consumption on the odds of developing anxiety in future; it may be similar whether drinking at moderate to high risk levels, but greater when drinking at very high-risk levels. (Very low certainty evidence.) **[Statement unchanged from Cochrane Canada update].**

Table 3.6 Levels of alcohol consumption and development of anxiety in adults

Study Country, number of participants; follow-up	Non-drinker	Low-risk drinker	Moderate-risk drinker	High-risk drinker	Very high-risk	Association of level of alcohol consumption and development of anxiety
Carvalho et al.[115] Ireland, n = 6,095; 2 years	Ref	*Defined as <4 drinks[†] per day* aOR [95% CI] = 0.82 [0.54, 1.24] *Males:* aOR [95% CI] = 0.61 [0.28, 1.37] *Females:* aOR [95% CI] = 0.90 [0.55, 1.47]		*Defined as ≥4 drinks[†] per day* aOR [95% CI] = 0.95 [0.54, 1.66] *Males:* aOR [95% CI] = 0.71 [0.30, 1.68] *Females:* aOR [95% CI] = 1.18 [0.59, 2.34]		Non significant
Knox et al.[114]* USA, n = 22,005; 3 years	-	*Defined as 1–40 g/day [males], 1–20 g/day females]* Ref	*Defined as 0–60 g/day [males], 20–40 g/day [females]* OR [95% CI] = 0.94 [0.65, 1.35]	*Defined as* 60–100 g/day*[males]*, 40–60 g/day*[females]* OR [95% CI] = 1.13 [0.63, 2.05]	*Defined as 100 g/day [males], >60 g/day [females]* **OR [95% CI] = 2.5 [1.73, 3.62]**	Non significant to a moderate significant increase

Key: aOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk.
[†]A standard drink in Ireland is 10 grams of pure alcohol, with four drinks equal to 40 grams of pure alcohol.
[*]The Knox et al.[114] data outlined is for people who did not change their intake between baseline and follow-up assessments.

Heavy episodic or binge drinking and development of anxiety in adults

One longitudinal study reporting on HED or binge drinking and the development of anxiety in adults was identified in the current update.[35] When combined with the Cochrane Canada results,[14] there was a total of three longitudinal studies.[35, 79, 115]

Two longitudinal studies examined the risk of developing anxiety among heavy versus non-heavy drinkers (see Table 3.7).[79, 115] Both studies were conducted among adults aged 50 years and or older; one in the USA with a 3-year follow-up,[79] and the other in Ireland with a 2-year follow-up.[115] The study conducted in Ireland, reported that a positive screen for problem drinking was associated with a greater likelihood of developing anxiety symptoms in females.[115] One further longitudinal study in 102 adults reported no significant association between HED and the development of anxiety symptoms, over a six-month period.[35] Overall, associations between HED and the development of anxiety, were mixed across the included studies.

In adults, studies show mixed results for the association between heavy episodic or binge drinking and the future development of anxiety. (Low certainty of evidence)

Table 3.7 Heavy episodic or binge drinking and development of anxiety in adults

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	Ref	Results	Association of HED or binge drinking and development of anxiety
Chou et al.[79] USA, males n = 5,461; females n = 7,981; 3 years	Binge drinking was defined as having ≥5 drinks* [males] or ≥4 drinks* [females] on 1 occasion.	Non-HED drinker	*Less than monthly:* *Males:* OR [95% CI] = 2.25 [0.87, 5.80] *Females:* OR [95% CI] = 1.28 [0.58, 2.82] *Monthly or more:* *Males:* OR [95% CI] = 0.88 [0.32, 2.42] *Females:* OR [95% CI] = 0.50 [0.18, 1.39]	Non significant
Carvalho et al.[115] Ireland, n = 6,095; 2 years	The CAGE screening test†, used to identify alcohol use disorders was used. A 'problem drinker' was identified as those with a CAGE score ≥ 2.	Non-drinker	aOR [95% CI] = 1.71 [0.90, 3.27] *Males:* aOR [95% CI] = 1.23 [0.45, 3.35] *Females:* **aOR [95% CI] = 2.22 [1.01, 4.86]**	Non significant to a moderate significant increase
Kim et al.[35] Canada, n = 102; 6 months	A composite score for HED was used. This score was comprised of standardised total scores for questions based on drinking frequency (1 item), severity (1 item) and perception (3 items).	Correlation value = 0.05		Non significant

Key: aOR = adjusted odds ratio; CI = confidence interval; HED = heavy episodic drinking; OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; red = high risk.
*A standard drink in the USA contains 14 grams of pure alcohol, with four drinks equal to 56 grams of pure alcohol, and five drinks equal to 70 grams of pure alcohol.
†The CAGE screening test assesses four aspects of drinking with the following questions: (a) Have you ever felt you should cut down on your drinking?; (b) Have people annoyed you by criticizing your drinking?; (c) Have you ever felt bad or guilty about your drinking?; and (d) Have you ever had a drink first thing in the morning to steady your nerves or to get rid of a hangover? These questions are scored 'yes' = 1 or 'no' = 0. The summed scores then create a scale ranging from 0–4.[115]

3.3.2 Adolescents

Quantity and or frequency of alcohol consumption and development of anxiety in adolescents

No longitudinal studies reporting on alcohol quantity and or frequency and the development of anxiety in adolescents were found in the current update. However, one longitudinal study reporting on binge drinking and the development of anxiety in adolescents was identified.[32] When combined with the Cochrane Canada results for the quantity and or frequency of alcohol consumption,[14] there was a total of six longitudinal studies (see Table 3.8).[32, 98, 99, 103, 113, 116]

Two studies were conducted in the USA,[98, 113] and two in the UK,[99, 103] while one study each was conducted in Finland[116] and Canada.[32] The follow-up periods ranged from one year[32] to 13 years,[113] and the studies included over 35,000 adolescents in total. Two studies were deemed to be of low RoB;[98, 113] however, the sample sizes were small, with less than 650 participants in each. The largest study, with over 24,000 participants, was of moderate RoB and measured the frequency of binge drinking and the development of anxiety.[32] The overall findings were similar across the studies, with the majority of studies (5/6) reporting a non significant association between quantity or frequency of alcohol consumption and the development of anxiety in adolescents.[32, 98, 99, 103, 116]

In adolescents, there may be no association between the quantity and or frequency of alcohol consumption and the future development of anxiety. (Low certainty of evidence)

Table 3.8 Quantity and or frequency of alcohol consumption and development of anxiety in adolescents

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of alcohol intake with development of anxiety
Cerdá et al.[113] USA, n = 503 boys; 13 years	Frequency (number of occasions of drinking in past year) Quantity (average number of drinks per occasion in past year)	Frequency: Did not statistically significantly increase anxiety. Quantity: Beta coefficient [95% CI] value = **0.12 [0.05, 0.19]**	Non significant to a small significant positive association
Parrish et al.[98] USA, n = 620; 2 years	Frequency (participants reported how many times in the past 3 months they drank alcohol)	Beta coefficient value = 0.02	Non significant
Dabravolskaj et al.[32] Canada, n = 24,274; 1 year	Having ≥5 drinks* of alcohol on one occasion (binge drinking) [Reference group] No binge drinking [Comparator]	Beta coefficient value [95% CI] value = 0.11 [-0.05, 0.26]	Non significant
Edwards et al.[99] UK, n = 7,100, approximately 2–4 years	Medium frequency (occasional), compared to none High frequency (weekly), compared to none	Medium Frequency: *Males:* OR [95% CI] = 1.13 [0.65, 1.95] *Females:* aOR [95% CI] = 1.19 [0.80, 1.76] High frequency: *Males:* OR [95% CI] = 1.20 [0.55, 2.62] *Females:* aOR [95% CI] = 1.41 [0.84, 2.36]	Non significant
Fröjd et al.[116] Finland, n = 2,070; 2 years	Drinking ≥ once/week, compared to less Drunk at least once a week, compared to less	Drinking ≥ once/week: aOR [95% CI] = 1.3 [0.6, 2.8] Drunk at least once a week: aOR [95% CI] = 0.8 [0.2, 3.6]	Non significant
Mackie et al.[103] UK, n = 393; up to 18 months	Quantity: Participants were asked how many alcoholic drinks they would consume on a typical day they drink. Frequency: Participants were asked how often they have an alcoholic drink. A composite score for alcohol use was derived as quantity x frequency.	Correlation values between alcohol quantity-frequency index and anxiety symptoms in the following up to 18 months period (where available) from 0.02 to 0.26	Non significant

Key: aOR = adjusted odds ratio; CI = confidence interval; OR = odds ratio; Ref = reference group; UK = United Kingdom; USA = United States of America.
Note: Risk of bias assessment: green = low risk; yellow = moderate risk; red = high risk.
Beta coefficient values were calculated using cross-lagged latent variable regression models (Parrish et al.[98]) and multivariable mixed-effects models Dabravolskaj et al.[32])
*A standard drink in Canada contains 13.45 grams of pure alcohol, with five drinks equalling 67.25 grams of pure alcohol.

Age of initiation

No longitudinal studies reporting on the development of anxiety by age of initiation of alcohol consumption in adolescents were identified in the current update. Therefore the results from the Cochrane Canada rapid update remain unchanged.[14] Briefly, two longitudinal studies assessed age at first alcohol intoxication;[117] with one of these studies also assessing age at first drink (see Table 3.9).[117] Both studies were deemed to be of moderate RoB. As per Cochrane Canada, the results indicated there was no increased odds in developing anxiety, based on age of initiation of drinking.

In adolescents, drinking initiated before 13 years of age may not be associated with the onset of anxiety. (Low certainty of evidence) **[Statement unchanged from Cochrane Canada update].**

Table 3.9 Association between age of initiation of drinking and the development of anxiety

Study Country, number of participants; follow-up	Never (≥ 18 years)		Never (≥ 16 years)	Pre-adult (16-17 years)	Late teen (15–16 years)	Middle teen (13–14 years)	Pre-teen (≤ 12 years)	Association between age of initiation and development of anxiety
Age at first intoxication†								
Mustonen et al.[118] Finland, n = 1,472; up to 17 years	-		Ref	-	aHR [95% CI] = 0.90 [0.61, 1.31]	aHR [95% CI] = 1.08 [0.81, 1.45]	aHR [95% CI] = 1.39 [0.84, 2.30]	Non significant
Newton-Howes et al.[117] New Zealand, n ranged from 1,025 (age 18) to 962 (age 35); up to 24 years	Ref	-	aOR [95% CI] = 1.01 [0.91, 1.13]					Non significant
Age at first drink								
Newton-Howes et al.[117] New Zealand, n ranged from 1,025 (age 18) to 962 (age 35); up to 24 years	Ref	-	aOR [95% CI] = 1.16 [0.86, 1.57]					Non significant

Key: aHR = adjusted hazard ratio; aOR = odds ratio; CI = confidence interval; Ref = reference group.
Note: Risk of bias assessment: yellow = moderate risk.
†Mustonen et al.[118] asked participants 'At what age did you get drunk for the first time?', and Newton-Howes et al.[117] asked participants whether they had ever consumed enough alcohol to become 'dizzy or tipsy'.

3.3.3 Summary of findings for the anxiety outcome

Following GRADE certainty of evidence assessment for the anxiety outcome, three exposure outcome combinations were deemed to have low certainty of evidence, and one exposure outcome combination was deemed to have very low certainty of evidence (see Table 3.10). Three of the exposure outcome combinations were downgraded due to risk of bias, one of the exposure outcome combinations was downgraded due inconsistency related to heterogeneity of the study results, and all of the exposure outcome combinations were downgraded due to imprecision related the width of the confidence intervals around the study results.

Table 3.10 Summary of findings for the anxiety outcome

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
Adults, general population	**Level of alcohol intake**		
	n = 28,100 (2 longitudinal studies)	2 longitudinal studies were included. Cut-offs for how participants were classified as low, moderate, high and or very high-risk drinkers differed across the studies. 1 study (of low RoB) reported similar odds of anxiety development with higher levels of alcohol intake compared to low levels. The remaining study (of moderate RoB) reported significantly increased moderate odds of developing anxiety in those who drink at very high-risk levels compared to low-risk drinkers.	⨁◯◯◯* VERY LOW[a,d]
	HED or binge drinking		
	n = 19,639 (3 longitudinal studies)	3 longitudinal studies were included; 2 of low RoB and 1 of high RoB. 1 longitudinal study measured HED using the Alcohol Use Disorder Identification Test (3-question version), while another used frequency of binge drinking per occasion. Only 1 longitudinal study (of low RoB) with 6,096 adults reported non significant to moderate associations between HED and the development of anxiety symptoms, over a 2-year period. Overall, associations between HED or binge drinking and the future development of anxiety were mixed across the included studies.	⨁⨁◯◯[b,d] LOW
Adolescents (aged under 18 years), general population	**Quantity and or frequency of alcohol consumption**		
	n = 34,960 (6 longitudinal studies)	6 longitudinal studies were included; 2 of low RoB, 3 of moderate RoB and 1 of high RoB. Alcohol consumption was reported in various ways across the studies, including as the average number of drinks per occasion, weekly frequency, or the number of occasions of drinking in the past year. The results were similar across the studies, with 5/6 studies reporting a non significant association between the quantity or frequency of alcohol consumption and the future development of anxiety in adolescents.	⨁⨁◯◯[a,d] LOW
	Age of initiation		
	n = approximately 2,497 (2 longitudinal studies)	2 longitudinal studies of moderate RoB were included. 1 study assessed age at first alcohol intoxication, while the remaining study also assessed age at first drink. The results indicated there were no significant increased odds of developing anxiety, based on the age of initiation of drinking.	⨁⨁◯◯* LOW[a,d]

Key: HED = heavy episodic drinking; RoB = risk of bias.
Note: Downgraded due to: a. Risk of bias; b. Inconsistency of results; c. Indirectness of evidence; d. Imprecision.
*No new evidence was added in this update and therefore the GRADE statement remained unchanged from the Cochrane Canada update

3.4 Alcohol consumption and suicidal ideation

When investigating suicidal ideation as an outcome a number of related outcome measures were included, such as suicidal ideation,[119] suicidal thoughts,[47] suicide attempts,[43] suicide risk,[120] suicidality,[121] suicidal behaviours,[51] and self-harm (which incorporates non-suicidal self-injury and suicidal attempts).[44] Results were not disaggregated based on outcome measurement type. Two studies with suicide mortality as the outcome were included for information purposes only,[31, 49] and did not influence statements on suicidal ideation. Information on these two studies can be found in Appendix I.

3.4.1 Adults

Quantity and or frequency of alcohol consumption and suicidal ideation in adults

One longitudinal[43] and five cross-sectional studies[45-47, 50, 54] reporting on alcohol quantity and or frequency (or a combined measure of quantity and frequency) and suicidal ideation in adults were found in the current update. When combined with the Cochrane Canada results,[14] there was a total of 10 studies.[43, 45-47, 50, 54, 119, 120, 122, 123]

Four studies measured frequency of alcohol consumption (see Table 3.11),[43, 45, 47, 119] and six studies measured alcohol via AUDIT, or the shortened three-question version test (AUDIT-C) (see Table 3.12).[35, 46, 47, 50, 54, 120] One further study of moderate RoB did not report ORs and noted that alcohol dependence and abuse was significantly associated with suicidal ideation (beta coefficient values of 0.30 in males, and 0.47 in females).[123] Overall, three of the 10 studies were conducted in the USA,[46, 119, 120] and the majority of the studies (6/10) were deemed to be of moderate RoB.[45, 46, 50, 119, 120, 123]

Four studies reported on the frequency of alcohol consumption and suicidal ideation in adults (see Table 3.11).[43, 45, 47, 119] Mixed results were observed across the studies. Two studies reported similar odds of suicidal ideation in those who consume alcohol across a wide range of frequencies (including the number of days per year, and monthly or less), compared to non-drinkers.[45, 119] The two remaining studies reported mixed results, with decreased odds of suicidal ideation observed in those who drink three times or less a week,[47] and increased odds observed in those who drink four times or more a week (compared to non-drinkers or those who drink three times or less a week).[43, 47]

Table 3.11 Frequency of alcohol consumption and suicidal ideation in adults

Study Country, number of participants; follow-up	Never	Monthly or less	2-4 times a month	2-3 times a week	4 or more times a week	Association of frequency of alcohol consumption and suicidal ideation
Hammond et al.[47] Norway, n = 49,825; NA	Ref	**aOR [95% CI] = 0.87 [0.75, 1.00]**	**aOR [95% CI] = 0.79 [0.69, 0.91]**	**aOR [95% CI] = 0.83 [0.71, 0.98]**	**aOR [95% CI] = 1.61 [1.22, 2.13]**	Small significant decreases to a moderate significant increase
Hu et al.[43]* UK, n = 435,154; mean of 13.6 years	Ref				**aHR [95% CI] = 1.14 [1.01, 1.30]**	Small significant increase
Armstrong et al.[45] India, n = 8,317; NA	Ref	aOR [95% CI] = 0.95 [0.70, 1.30]	aOR [95% CI] = 1.26 [0.82, 1.93]	aOR [95% CI] = 1.58 [0.89, 2.80]		Non significant
Kittel et al.[119] USA, n = 269,078; NA	Ref	1-11 days (a year) *Males:* OR [95% CI] = 1.01 [0.94, 1.30] *Females:* OR [95% CI] = 1.07 [0.95, 1.21]	12-49 days (a year) *Males:* OR [95% CI] = 1.02 [0.86, 1.21] *Females:* OR [95% CI] = 1.08 [0.94, 1.23] 50-99 days (a year) *Males:* OR [95% CI] = 0.83 [0.70, 0.97] *Females:* OR [95% CI] = 1.07 [0.91, 1.25] 100-299 days (a year) *Males:* OR [95% CI] = 0.87 [0.71, 1.08] *Females:* OR [95% CI] = 1.00 [0.84, 1.18] 300-365 days (a year) *Males:* OR [95% CI] = 0.97 [0.75, 1.24] *Females:* OR [95% CI] = 1.17 [0.82, 1.59]			Non significant

Key: aOR = adjusted odds ratio; aHR = adjusted hazard ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); OR = odds ratio; Ref = reference group; UK = United Kingdom; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk.
*Hu et al.[33] reported suicide attempts as the outcome.

Six cross-sectional studies measured alcohol consumption via the AUDIT or AUDIT-C.[46, 47, 50, 54, 120, 122] All of the studies reported significant small, moderate and or large increases in the odds of suicidal ideation in those who undertook moderate or high risk consumption (or moderate to high risk consumption[47]), compared to those who undertook low risk consumption (see Table 3.12). One study which reported disaggregated results for males and females, indicated higher odds of suicidal ideation in females (aOR [95% CI] = 5.62 [2.72, 11.60]) compared to males (aOR [95% CI] = 1.64 [1.03, 2.62]).[54]

Table 3.12 AUDIT or AUDIT-C measured alcohol consumption and suicidal ideation in adults

Study Country, number of participants; follow up	Low risk consumption (AUDIT ≤ 7 points)	Moderate risk consumption (AUDIT 8-15 points)	High risk consumption (AUDIT ≥16 points; or AUDIT C ≥3 points [females], ≥ 5 points [males])	Association of AUDIT measured alcohol consumption and suicidal ideation
Hammond et al.[47] Norway, n = 49,825; NA	Ref	**aOR [95% CI] = 1.09 [1.01, 1.18]**		Small significant increase
Schmeckenbecher et al.[54]* Germany, n = 2,437; NA	Ref		AUDIT-C cutoffs: ≥4 points (females), ≥ 5 (males) **aOR [95% CI] = 2.42 [1.69, 3.47]** *Females:* **aOR [95% CI] = 5.62 [2.72, 11.60**] *Males:* **aOR [95% CI] = 1.64 [1.03, 2.62]**	Moderate to large significant increases
Grove et al.[46]* USA, n = 1,153; NA	Ref		Past Year Suicidal Ideation: **aOR [95% CI] = 1.72 [1.07, 2.78]** Elevated Risk for Suicidal Behaviour: aOR [95% CI] = 1.05 [0.61, 1.80]	Non significant to a moderate significant increase
Ledden et al.[50] England, n = 14,949; NA	Ref	aOR [95% CI] = 1.25 [0.96, 1.63]	**aOR [95% CI] = 3.96 [2.65, 5.91]**	Non significant to a large significant increase
Parker et al.[120] USA, n = 3,239; NA	Ref		**aOR [95% CI] = 2.02 [1.13, 3.64]**	Moderate significant increase
Kim et al.[122] South Korea, n = 5,982; NA	Ref	**aOR [95% CI] = 1.24 [1.04, 1.48]**	**aOR [95% CI] = 1.77 [1.43, 2.17]**	Small to moderate significant increases

Key: aOR = adjusted odds ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk, yellow = moderate risk, red = high risk.
Richards et al.[26] was included in the Cochrane Canada review. However, it was excluded in the current update due to errors in reporting, and a population composed solely of those with clinical conditions.

Kim and Lee[25] was included in the Cochrane Canada review. However, it was excluded in the current update as the population was composed solely of those with a clinical condition.
*AUDIT-C used to measure alcohol consumption.

Overall, across the 10 studies which reported on the association between quantity and or frequency of alcohol consumption and suicidal ideation in adults, five cross-sectional studies of low or moderate RoB reported small, moderate or large associations between higher levels of alcohol consumption and suicidal ideation or similar.[46, 47, 50, 54, 120] However, only one longitudinal study of low RoB was included,[43] with a small significant increase in the odds of suicide attempts in those who have four or more drinks a week, compared to those who drink less.

In adults, the evidence is very uncertain overall. There may be a small positive association between increased intake of alcohol and future suicidal ideation. There may be a small to large positive association between increased intake of alcohol and suicidal ideation when measured for the same time period (cross-sectional data). (Very low certainty of evidence)

Heavy episodic or binge drinking and suicidal ideation in adults

One longitudinal[42] and two cross-sectional[51, 56] studies reporting on the association between the frequency of HED or binge drinking, and suicidal ideation in adults, were identified in the current update. When combined with the Cochrane Canada results,[14] there was a total of five studies (see Table 3.13).[42, 51, 56, 121, 124]

Four studies were conducted in the USA,[42, 56, 121, 124] and one in Latvia.[51] One study was deemed to be of low RoB,[56] three of moderate RoB,[42, 51, 121] and one of high RoB.[124] All five studies quantified the amount of alcohol consumption required to meet their definition of HED or binge drinking. The definitions used in four studies were somewhat comparable to the Irish definition (six standard drinks on any one occasion, equalling 60 grams of pure alcohol[5]), with the amounts of pure alcohol equalling between 56 to 75 grams.[42, 51, 56, 124]

Four studies (three cross-sectional[51, 56, 124] and one longitudinal[42]) reported small to moderate increases in the odds of suicidal ideation with HED at least monthly, compared to never or less than monthly.[124] One study reported disaggregated odds of suicidal ideation in both males and females.[124] While both males and females who binge drink at least monthly displayed increased odds of suicidal ideation (compared to those who do not binge drink monthly), the difference between males and females was small (males, OR [95% CI] = 1.63 [1.43, 1.85], females, OR [95% CI] = 1.94 [1.74, 2.16]).[124]

In adults, the evidence is very uncertain overall. There may be a small positive association between heavy episodic or binge drinking and future suicidal ideation. There also may be a small to moderate positive association between monthly heavy episodic or binge drinking and suicidal ideation when measured for the same time period (cross-sectional data). (Very low certainty of evidence)

Table 3.13 Heavy episodic or binge drinking and suicidal ideation in adults

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	Never	Less than monthly	At least monthly	Weekly	Every or almost every day	Association of HED or binge drinking and suicidal ideation
Xu et al.[56]‡ USA, n = 231,264; NA	Heavy drinking was defined as ≥5 days of binge drinking (≥5 alcoholic drinks* on a single occasion [males], ≥4 alcoholic drinks* on a single occasion [females]) in the past month.	Ref	-	Binge drinking: *Urban*#*:* **aOR [95% CI] = 1.14 [1.02,1.27]** *Rural*#*:* aOR [95% CI] = 1.03 [0.85, 1.24] Heavy drinking: *Urban*#*:* **aOR [95% CI] = 1.28 [1.13, 1.46]** *Rural*#*:* aOR [95% CI] = 1.45 [1.00, 2.10]	-	-	Non significant to small significant increases
Campbell-Sills et al.[42] USA, n = 6,811; mean of 17.4 months	Binge drinking: ≥5 (males) or ≥4 (females) alcoholic drinks* within a 24-hour period, at least once in the last 30 days.	Ref	-	**aOR [95% CI] = 1.42 [1.19, 1.70]**	-	-	Small significant increase
Herberman Mash et al.[121] USA, n = 3,813; NA	Heavy alcohol use (daily) was defined as ≥49 grams [males] and ≥ 24 grams [females]. [Reference group was those who drank less than this daily]	-	-	-	-	aOR [95% CI] = 1.05 [0.67, 1.65]	Non significant
Mieze et al.[51] Latvia, n = 16,084; NA	Alcohol consumption was assessed based on episodes of	Ref	**aOR [95% CI] = 1.45 [1.09, 1.93]**	**aOR [95% CI] = 1.93 [1.35, 2.74]**	**aOR [95% CI] = 2.87 [1.96, 4.22]**	aOR [95% CI] = 1.15 [0.52, 2.57]	Non significant to small/moderate

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	Never	Less than monthly	At least monthly	Weekly	Every or almost every day	Association of HED or binge drinking and suicidal ideation
	heavy drinking in the past 12 months (intake of ≥6 doses of alcohol[†] at once).						significant increases
Glasheen et al.[(124)] USA, n = 136,500; NA	Binge drinking was defined as consuming ≥5 drinks[*] on the same occasion on at least 1 day in the past 30 days.	Ref		*Males:* **OR [95% CI] = 1.63 [1.43, 1.85]** *Females:* **OR [95% CI] = 1.94 [1.74, 2.16]**	-	-	Moderate significant increases

Key: aOR = adjusted odds ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk, yellow = moderate risk and red = high risk.
While Richards et al.[(26)] was included in the Cochrane Canada review it was excluded in the current update due to errors in reporting, and a population composed solely of those with clinical conditions.
[‡]Nonveteran results only are presented.
[*]A standard drink in the USA contains 14 grams of pure alcohol, with four drinks equal to 56 grams of pure alcohol, and five drinks equal to 70 grams of pure alcohol.
[†]A standard drink in Latvia contains 12 grams of pure alcohol, with six drinks equal to 75 grams of pure alcohol.
[#]Urban areas were defined as having populations over 1 million people, suburban areas were defined as having populations between 250,000 and 1 million, and rural areas were defined as having populations less than 250,000 people. Suburban areas were included in urban areas.

3.4.2 Adolescents

Quantity of alcohol consumed and suicidal ideation in adolescents

No studies reporting on the quantity of alcohol consumed and suicidal ideation in adolescents were identified in the current update. Therefore, the results from the Cochrane Canada rapid update remain unchanged.[14] Briefly, one cross-sectional study of 14-15 year olds, outlined that a range of alcohol consumed in the past month (the equivalent of two to eight bottles of beer), compared to less than the equivalent of one bottle of beer, were not associated with suicidal ideation (aORs ranging from 0.93 to 1.0).[125] Of note, this study of moderate RoB was conducted in South Korea, with one standard drink defined as containing seven grams of pure alcohol,[126] and equal to one small bottle of beer.[127]

In adolescents, the consumption of any alcohol in the past month may have little to no influence on the development of suicidal ideation, but the evidence is very uncertain. (Very low certainty of evidence) **[Statement unchanged from the Cochrane Canada update]**

Frequency of alcohol consumption in last month

One cross-sectional study reporting on the association between the frequency of alcohol consumption and suicidal ideation in adolescents was identified in the current update.[52] When combined with the Cochrane Canada results,[14] there was a total of three cross-sectional studies (see Table 3.14).[52, 125, 128]

Frequency of alcohol consumption was measured over the last month, or monthly use over the last year, and all of the studies used no alcohol consumption in the past month, or per month, as the reference group. The studies were conducted in South Korea,[125] Brazil[128] and Canada,[52] and two of the three were deemed to be of moderate RoB,[125, 128] with the remaining study deemed to be of high RoB.[52]

Across the studies, significant moderate to large increases in the odds of suicidal ideation were outlined when adolescents reported consuming alcohol at least once in the past month and or monthly, compared to no consumption. One study reported that the odds of suicidal ideation only increased slightly when comparing alcohol consumption 1-2 times in the past month (aOR = 3.91), to 20-29 times in the past month (aOR = 4.45).[125]

In adolescents, the evidence is very uncertain. There may be a moderate to large positive association between consuming alcohol at least once in the past month and or monthly, and suicidal ideation when measured for the same time period (cross-sectional data). (Very low certainty of evidence)

Table 3.14 Frequency of alcohol consumption in the last month and suicidal ideation in adolescents

Study Country, number of participants; follow-up	No alcohol consumption in the past month and or monthly	Alcohol in the past month and or monthly	Daily (1 or more glass)	Association of frequency of alcohol consumption and suicidal ideation
Lee et al.[125] South Korea, n = 57,303*; NA	Ref	**aOR = 3.91 (1–2 in past month) to 4.45 (20–29 in past month)**	**aOR = 4.52**	Large significant increases
Souza et al.[128] Brazil, n = 1,039; NA	Ref	**aOR [95% CI] = 1.64 [1.04, 2.58]** (at least once in the past month)	-	Moderate significant increase
Rakoff et al.[52] Canada, n = 5,912; NA	Ref	**aOR [95% CI] = 2.04 [1.26, 3.30]** (monthly or less) aOR [95% CI] = 1.67 [0.97, 2.87] (at least twice a month)	-	Non significant to moderate significant increase

Key: aOR: adjusted odds ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); OR = odds ratio; Ref = reference group.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: yellow = moderate risk; red = high risk.
Cheng[24] was included in the Cochrane Canada update but the reference group did not meet our PICO and therefore was excluded.
*In Lee et al.[125] 2018 and 2019 data is presented. 2019 data is presented here.

Heavy episodic or binge drinking and suicidal ideation in adolescents

One longitudinal study reporting on the association between the frequency of HED or binge drinking and suicidal ideation in adolescents was identified in the current update.[44] When combined with the Cochrane Canada results,[14] there was a total of four studies (see Table 3.15).[44, 125, 128, 129] Each of the studies were conducted in a different country; South Korea,[125] Finland,[44] the USA[129] and Brazil,[128] and all of the studies were deemed to be of moderate RoB.

Different definitions and measurements for HED or binge drinking, were used across all four studies. Of note, only one study defined the quantity of alcohol associated with HED (five alcoholic drinks in a row, equalling 70 grams of pure alcohol),[129] and this definition was comparable to the Irish definition (six standard drinks on any one occasion, equalling 60 grams of pure alcohol).[5]

Mixed results were observed across the four studies. Two studies indicated non significant associations,[44, 128] one study indicated a moderate increase in the odds of having suicidal ideation with at least one episode of HED in the past year,[129] and one study, reported a higher frequency of HED in the past month (five times or greater) resulted in a large increase in the odds of developing suicidal ideation.[125]

In adolescents, the evidence is very uncertain. There may be no association between heavy episodic or binge drinking and future suicidal ideation. However, there may be a small to large positive association between heavy episodic or binge drinking and suicidal ideation when measured for the same time period (cross-sectional data). (Very low certainty of evidence)

Table 3.15 Heavy episodic or binge drinking and suicidal ideation in adolescents

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	None	In the past year (at least once)	1–2 times in the past month	3–4 times in the past month	≥ 5 times in the past month	Association between HED or binge drinking and suicidal ideation
Lee et al.[125] South Korea, n = 57,303*; NA	Frequency of drunkenness was assessed through a question regarding the number of times in the last 30 days when respondents drank so much, they lost their consciousness or memory.	Ref	-	**aOR = 1.23**	aOR = 2.13	**aOR = 3.23**	Non significant to large significant increases
Levola et al.[44] Finland, n = 7,735; 17-18 years	Participants were asked how many times in the previous 30 days they had been intoxicated (not defined).	Ref	-	aHR [95% CI] = 1.45 [0.77, 2.71]†	aHR [95% CI] = 2.10 [0.97, 4.55]†		Non significant
Schilling et al.[129] USA, n = 31,953 (suicidal attempts only); NA	HED was assessed with the following question: "In the past year, has there been a time when you had 5 or more alcoholic drinks‡ in a row? (by "drinks" we mean any kind of beer, wine, or liquor? (yes or no)),”	Ref	**aOR [95% CI] = 1.75 [1.16, 2.64]**	-	-	-	Moderate significant increase
Souza et al.[128] Brazil, n = 1,039; NA	Participants were asked 'In the last month, did you get drunk?'	Ref	-	aOR [95% CI] = 1.94 [0.86, 4.36] (at least once)	-	-	Non significant

Key: CI = confidence interval; HED = heavy episodic drinking; NA = not available (follow-up for cross-sectional studies); OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold. Risk of bias assessment: yellow = moderate risk.
Cheng[24] was included in the Cochrane Canada update but the reference group did not meet our PICO and therefore was excluded.
*In Lee et al.[125] 2018 and 2019 data is presented. 2019 data is presented here.
†Self-harm is the outcome reported and the definition of self-harm in Levola et al.[44] may encompass non-suicidal self-injury and suicidal attempts.
‡A standard drink in the USA contains 14 grams of pure alcohol, with five drinks equalling 70 grams of pure alcohol.

Age of initiation

One longitudinal and one cross-sectional study reporting on the association between age of initiation of drinking alcohol and suicidal ideation, were identified in the current update.[44, 55] When combined with the Cochrane Canada results, there was a total of six studies (see Table 3.16).[44, 55, 130-132] Of note, these studies included participants which reported age of initiation of drinking alcohol during adolescence, and suicidal ideation either at a later period in adolescence, or in adulthood.

Two studies were conducted in South Korea,[123, 130] and one study each was conducted in the USA,[130] Finland,[44] the Pacific countries,[132] and China (using data from the USA),[55] respectively. All studies were deemed to be of moderate RoB.

All of the included studies displayed significantly increased odds of suicidal ideation in those who initiated drinking alcohol at a young age, compared to those who did not initiate drinking. However, the magnitude of these odds ranged from small (aOR [95% CI] = 1.11 [1.01, 1.22] in male, late teens compared to non-initiators)[131] to large (OR [95% CI] = 3.64 [2.51, 5.28] in those aged 12 years or under, compared to non-initiators)[130] across studies. In the two studies which provided aORs disaggregated by sex,[131, 132] similar odds were observed for males and females regardless of age of initiation in one study,[131] while males under 12 years of age displayed greater odds of developing suicidal ideation (aOR [95% CI] = 3.37 [2.16, 5.27) than their female counterparts (aOR [95% CI] = 1.90 [1.09, 3.70]),[132] compared to non-initiators.

In adolescents, the evidence is very uncertain. There may be a small to large positive association between the age of initiation of drinking alcohol and suicidal ideation in adolescents (cross-sectional and longitudinal data). (Very low certainty of evidence)

Table 3.16 Association between age of initiation of drinking and suicidal ideation

Study Country, number of participants; follow-up	Non-initiator and or never drinker	Late teen (≥15 years)	Middle teen (13–14 years)	Pre-teen (≤ 12 years)	Association between age of initiation and suicidal ideation
Ahuja et al.[130] USA, n = 13,867; NA	Ref	**OR [95% CI] = 2.11 [1.46, 3.04]**	**OR [95% CI] = 3.64 [2.51, 5.28]**		Moderate to large significant increases
Kim and Kim[131] South Korea, n = 63,884; NA	Ref	*Males:* **aOR [95% CI] = 1.11 [1.01, 1.22]** *Females:* **aOR [95% CI] = 1.21 [1.12, 1.30]**		*Males:* **aOR [95% CI] = 1.28 [1.16, 1.41]** *Females:* **aOR [95% CI] = 1.45 [1.33, 1.59]**	Small significant increases
Lee et al.[125] South Korea, n = 57,303*; NA	-	Ref	**aOR = 1.14**	**aOR = 1.39**	Small significant increases
Levola et al.[44] Finland, n = 7,735; 17-18 years	Ref (non-initiator and or initiator over 14 years)	**aHR [95% CI] = 1.46 [0.67, 3.20]**†			Small significant increase
Peltzer and Pengid[132] Pacific countries, n = 6,540; NA	Ref	[Threshold is ≥ 12 years] **aOR [95% CI] = 1.95 [1.32, 2.89]** *Males:* **aOR [95% CI] = 1.88 [1.14, 3.10]** *Females:* **aOR [95% CI] = 2.12 [1.34, 3.34]**		[Threshold is <12 years] **aOR [95% CI] = 3.39 [2.44, 4.71]** *Males:* **aOR [95% CI] = 3.37 [2.16, 5.27]** *Females:* **aOR [95% CI] = 1.90 [1.09, 3.70]**	Moderate to large significant increases
Wang et al.[55] China, n = 17,209; NA	Ref	**aOR [95% CI] = 1.30 [1.16, 1.47]**		**aOR [95% CI] = 1.88 [1.64, 2.16]**	Small to moderate significant increases

Key: aOR = adjusted odds ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); OR = odds ratio; Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: yellow = moderate risk.
Cheng[24] was included in the Cochrane Canada update but the reference group did not meet our PICO and therefore was excluded.
†Self-harm is the outcome reported and the definition of self-harm in Levola et al.[44] may encompass non-suicidal self-injury and suicidal attempts.
*In Lee et al.[125] 2018 and 2019 data is presented. 2019 data is presented here.

3.4.3 Summary of findings for the suicidal ideation outcome

Following GRADE certainty of evidence assessment for the suicidal ideation outcome, all of the exposure outcome combinations were deemed to have very low certainty of evidence (see Table 3.17). All of the exposure outcome combinations were downgraded due to risk of bias, five of the six exposure outcome combinations were downgraded due to inconsistency related to heterogeneity of the study results, and four of the exposure outcome combinations were downgraded due to imprecision related the width of the confidence intervals of the study's results.

Table 3.17 Summary of findings for the suicidal ideation outcome

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
Adults, general population	**Quantity and or frequency of alcohol consumption**		
	n = 803,203 (10 studies; 9 cross-sectional and 1 longitudinal)	9 cross-sectional and 1 longitudinal study were included; 4 of low RoB, 7 of moderate RoB, and 1 of high RoB. Alcohol consumption was reported in various ways across the studies; 4 studies measured frequency of alcohol consumption, and 6 studies measured alcohol via the Alcohol Use Disorder Identification Test (AUDIT) or AUDIT-C. Overall, across the 10 studies, 5 cross-sectional studies of low or moderate RoB reported small, moderate or large positive associations between suicidal ideation and higher levels of alcohol consumption. One longitudinal study of low RoB was included, with a small significant increase in the odds of suicide attempts in those who have four or more drinks a week, compared to those who drink less.	⊕◯◯◯ VERY LOW[a,b,d]
	HED or binge drinking		
	n = 394,472 (5 studies; 4 cross-sectional and 1 longitudinal)	4 cross-sectional and 1 longitudinal study were included; 1 of low RoB, 2 of moderate RoB, and 1 of high RoB. Different definitions and measurements for HED or binge drinking were used across the studies. The definitions used in 4 studies were somewhat comparable to the Irish guidelines of 60 grams of pure alcohol per occasion. 3 cross-sectional studies and 1 longitudinal study reported a small to moderate increase in suicidal ideation with heavy episodic drinking at least monthly, compared to never or less than monthly.	⊕◯◯◯ VERY LOW[a,b]
Adolescents (aged under 18 years), general population	**Quantity of alcohol consumed**		
	n = 57,303 (1 cross-sectional study)	1 cross-sectional study of moderate RoB outlined that a range of alcohol consumed in the past month (the equivalent of 2 to 8 bottles of beer), compared to the equivalent of less than 1 bottle of beer, was not associated with suicidal ideation.	⊕◯◯◯* VERY LOW[a,d]
	Frequency of alcohol consumption in the last month		
	n = 64,254 (3 cross-sectional studies)	3 cross-sectional studies were included; 2 of moderate RoB and 1 of high RoB. Across the studies, alcohol consumption frequency was measured over the past month or year, with no alcohol use in the last month as the reference group. All 3 studies reported a significant moderate to large increase in the odds of suicidal	⊕◯◯◯ VERY LOW[a,b,d]

Sub-group, population	Number of participants (studies)	Impact	Certainty of the evidence (GRADE)
		ideation when adolescents reported consuming alcohol at least once in the past month and or monthly, compared to no consumption.	
	HED or binge drinking		
	n = 98,030 (4 studies; 3 cross-sectional and 1 longitudinal)	3 cross-sectional and 1 longitudinal study were included; all of moderate RoB. Different definitions and measurements for heavy episodic and or binge drinking were used across all 4 studies. 2 cross-sectional studies indicated significant small to large increases in the odds of having suicidal ideation with at least 1 HED in the past month. In 1 cross-sectional study, a higher frequency of HED in the past month resulted in increased odds of developing suicidal ideation. The only longitudinal study included reported no significant association between frequency of intoxication and anxiety in adolescents.	⊕◯◯◯ VERY LOW[a,b,d]
	Age of initiation		
	n = 166,538 (6 studies; 5 cross-sectional and 1 longitudinal)	5 cross-sectional and 1 longitudinal study were included; all of moderate RoB. All studies reported significantly increased odds of suicide ideation in those who initiated drinking alcohol at a young age (12 years of age or younger), compared to those who did not initiate drinking. The magnitude of associations ranged from small to large.	⊕◯◯◯ VERY LOW[a,d]

Key: RoB = risk of bias
Note: Downgraded due to: a. Risk of bias; b. Inconsistency of results; c. Indirectness of evidence; d. Imprecision.
*No new evidence was added in this update and therefore the GRADE statement remained unchanged from the Cochrane Canada update

4 Discussion

This report aimed to investigate the association between varying levels and or patterns of alcohol consumption and specific mental health outcomes in the general population and specific subgroups of interest. During scoping for this review, a systematic review published by AHTA in 2018,[13] and a rapid update of this review published by Cochrane Canada in 2022,[14] were identified. To build on this existing evidence base, an update of the Cochrane Canada review was undertaken, and 26 relevant primary studies were identified. When combined with the previous evidence, the totality of evidence included 104 primary studies.

4.1 Depression

In regard to depression 13 longitudinal studies were identified in the current update. When combined with the Cochrane Canada results, a total of 63 longitudinal studies focused on depression across adults, older adults and adolescents were included. The evidence indicates mixed results between the quantity or frequency of alcohol consumption, HED, or binge drinking, and the future development of depression in adults and older adults. The current findings in relation to HED are similar to those in a 2020 systematic review, which included 42 cohort studies and outlined that heavy drinking (in all age groups) does not significantly predict the occurrence of depressive symptoms, after accounting for confounding factors.[133]

For adolescents, in the current update, results showed no association or a small association between quantity or frequency of alcohol consumption, HED, or binge drinking, and the future development of depression. This is similar to findings within the literature. A 2011 systematic review, which included 54 cohort studies and over 70,000 participants, reported no consistent link between adolescent alcohol use and later depression, after accounting for methodological differences.[134] The authors noted that variations in alcohol consumption measures reported, which included frequencies, quantities, and binge drinking patterns, limited comparability between studies.

Results found in the current update indicate that relationship between alcohol use and depression onset is not currently deemed as causal, aligning with the *Global status report on alcohol and health and treatment of substance use disorders* published by WHO in 2024,[135] and *Alcohol consumption, alcohol-related harm and alcohol policy in Ireland* published by the Health Research Board in Ireland, in 2021.[136] It should be noted that the causal pathway between alcohol use and a negative mental health outcome such as depression, is extremely complex. There are three potential pathways which may occur in relation to alcohol use and any mental health outcome: (1) alcohol use causes a negative mental health outcome to occur, (2) a negative mental health outcome increases alcohol use, and or (3) there

is a reciprocal causal relationship between alcohol use and a negative mental health outcome, or causation by another mechanism (such as a confounding factor or genetic vulnerability).[137] These potential pathways make it difficult to conduct, and synthesise research evidence investigating the association between alcohol consumption and mental health outcomes.

4.2 Anxiety

In regard to anxiety, the evidence is somewhat limited, as only two longitudinal studies were identified in the current update, with a further 10 studies from the 2022 Cochrane Canada rapid update. Overall, the findings indicate mixed results in terms of the association between the quantity or frequency of alcohol consumption, HED or binge drinking and the development of anxiety in adults. In adolescents, results in the current update indicate there may be no association between the quantity or frequency of alcohol consumption, or age of initiation and the development of anxiety. The overall findings are broadly consistent with a 2024 systematic review which reported that, in adults, while heavy or problematic alcohol consumption was occasionally associated with higher levels of anxiety;[138] these associations were small, inconsistent, and often weakened after adjustment for confounding variables. Additionally, the systematic review authors only included eight studies, and noted that there was a paucity of research in this area.[138] Similar to what was noted for the depression outcome, it was stated the inconsistency in findings in this area may be explained by the heterogeneity in exposure definitions and anxiety measurement tools, differences in study designs, and differences in population characteristics. The authors also concluded that more research is needed, particularly on how different levels of alcohol consumption influence future anxiety outcomes.[138] However, as previously noted, the causal pathway between alcohol use and a negative mental health outcome, is extremely complex, thus making it difficult to conduct, and synthesise research evidence investigating the association between alcohol consumption and mental health outcomes.

4.3 Suicidal ideation

For suicidal ideation, it is important to note upfront that the majority of evidence included for this outcome was from cross-sectional studies. When considering the limited longitudinal data included, the evidence appears to indicate that in adults and adolescents, there may be a small association between the quantity and or frequency of alcohol consumption (including HED or binge drinking) and future suicidal ideation. Previously, a 2025 systematic review and meta-analysis which included 47 studies from 12 countries examined substance misuse and suicide mortality, and outlined that alcohol misuse is one of the most significant modifiable risk factors for suicide, with this risk factor remaining high even after controlling for psychiatric comorbidities.[139] A 2025 systematic review and meta-analysis that

included 13 studies also noted that at a population level, every 1 litre increase in alcohol consumption per capita was associated with a 3.59% increase in the suicide mortality rate.[140] Furthermore, a 2022 meta-analysis of 33 longitudinal studies also found that alcohol use was associated with a 94% higher risk of death by suicide compared to non-drinkers, with a stronger effect observed in younger people and females.[141]While both the Athey et al.[139] review and the Issacs et al.[141] review focused on suicide mortality and not suicidal ideation (as in the current update), suicidal ideation has been identified as the third most important predictor of suicide (after mental health hospitalisations and prior suicide attempts).[142]

When focusing specifically on suicidal ideation, a 2021 systematic review and meta-analysis investigating substance use disorders (SUDs) and suicidality, outlined that SUDS, such as that for alcohol or drugs, and suicidality (ideation and attempts), likely influence each other with bidirectional effects.[143] This review included prospective and longitudinal studies and was focused on young adults (aged 25 years or younger), with this age group falling across both the adults and adolescents sub-groups outlined within the current update. The WHO have also noted that while the relationship between substance use and suicidal behaviour is complex, there is sufficient evidence of increased risk of suicides in the presence of SUDs.[135]

Any difference in findings observed between the longitudinal studies included in the current update, and those in previously published systematic reviews may in part be due to the types of alcohol consumption investigated. Alcohol misuse and substance use disorder, typically reflects more severe or dependent patterns of drinking, when compared to general alcohol consumption, as was synthesised in the current update. It was noted by the HRB in 2021 that as with other mental health outcomes, heavy alcohol use and suicide share common risk factors (such as adverse childhood experiences) which may account for some of the increased risk of suicidality in heavy drinkers.[136] The WHO has also outlined that reducing harmful use of alcohol is key when trying to prevent suicide, and is a universal strategy which can reach an entire population.[144]

When considering the evidence from cross-sectional studies included within the current update, significant positive associations between quantity or frequency of alcohol consumption, HED, or binge drinking and suicidal ideation in adult and adolescent groups were reported. However, due to the nature of cross-sectional data the cause and effect relationship between alcohol consumption and suicidal ideation cannot be determined. Therefore, caution should be undertaken when interpreting this evidence.[129]

Within the current update it was noted that adults with hazardous or high-risk drinking (measured via AUDIT or AUDIT-C), and adults and adolescents reporting monthly or more frequent HED or binge drinking, displayed small to large increases

in the odds of suicidal ideation, compared with lower-risk drinkers. This was consistent with what was noted in the Cochrane Canada rapid update, and what has been noted previously in the literature.[136, 145] Previous literature highlights that acute alcohol consumption may decrease inhibition and increase impulsivity and exacerbate feelings of hopelessness and despair.[136] This may indicate a potential causal pathway to suicidal behaviour. In those with AUDs, it has been noted that acts of suicide may occur during major depressive episodes (some of which may be alcohol induced) or outside periods of acute alcohol consumption. Therefore, treatment of both the AUD and suicide-specific interventions are required for this population.[145]

4.4 Heterogeneity of the included studies

While the application of the inclusion and exclusion criteria sought to reduce heterogeneity in the included studies, extensive variation across studies was still observed. While efforts were made to group similar studies, and or outline where differences occurred across studies, this heterogeneity impacted the overall results for each exposure outcome combination.

Firstly, a number of exposure levels for alcohol consumption were reported, including quantities and frequencies. While results were disaggregated by these exposure levels, within these levels, authors reported results across a number of different categories (such as weekly, 2-3 times a week, monthly and so on), increasing the complexity of analysis. Furthermore, when looking specifically at HED or binge drinking, multiple definitions for HED were observed across studies, and standard drink quantities also varied across studies (largely dependent on the country in which the study was conducted). This variation in the quantity and or frequency of alcohol consumption observed across studies, may have contributed to the mixed effects observed.

Furthermore, mental health outcomes were assessed using a wide range of validated scales (for example, the Centre for Epidemiological Scale - Depression (CES-D), the Patient Health Questionnaire-9, Hospital Anxiety and Depression Scale), clinical diagnostic criteria, and or single-item assessments of symptoms. Within the current update we did not disaggregate results further dependent on the mental health outcome measurement method. This likely contributed to any inconsistency observed in effect estimates across studies, in line with findings reported in the Cochrane Canada rapid update.[14] This is supported by Graham et al.[146] who noted that in the general population, the relationship between alcohol consumption and depression varies significantly depending on measurement methods, both in terms of the measurement of alcohol used and the measurement of depression. Graham et al.[146] noted that, differences are observed in the strength of relationships between alcohol consumption and depression when taking into account those who are

clinically diagnosed with depression (for example, ICD-10 coding), and those who screen positively for depression symptoms on a relevant validated scale (for example, the Centre for Epidemiological Scale - Depression). Both these types of measurements were included within the current update, and may contribute to the heterogeneity observed within and across studies.[146]

Lastly, the reference or comparator group used by the primary studies included in the current update varied across studies, and included lifetime abstainers,[49] non-drinkers or those who have not consumed alcohol for certain periods of time (for example, the last month[125]), and those who consume a certain amount of alcohol, or at a certain frequency (for example, less than daily[121]). This variation of reference groups within exposure outcome combinations contributed to the varied effects observed across studies. Additionally, within the studies included, many of the comparator groups deemed as "non-drinkers" may have contained both long term and or lifetime abstainers of alcohol, and also former drinkers, many of whom may have given up alcohol due to health reasons.[147] These are identified as two distinct group of abstainers, and it is noted that those with previous heavy drinking have risks similar to those who are current heavy drinkers, and therefore should be excluded from comparator groups in alcohol consumption research.[147] The inclusion of former drinkers in the comparator group may result in overestimation of the protective effect of alcohol consumption.[148]

4.5 Limitations

While this update contributes to the comprehensive evidence base in this area, there are notable limitations. These limitations can be categorised as limitations of the systematic review update process, and limitations of the included studies.

4.5.1 Limitations of the systematic review update process

Firstly, as this review was an update of the Cochrane Canada rapid update,[14] the methodology was aligned. This included the PECOS (population, exposure, comparator, outcome and study design) and therefore limited the studies included within the current update. Limitations of these studies are outlined in Section 4.5.2. Additionally, while a rigorous framework to appraise RoB was applied, it is important to acknowledge that some subjectivity remains within this process. To mitigate this, independent assessments were undertaken by multiple reviewers, and a subset of studies were cross-checked with the Cochrane Canada rapid update to ensure RoB assessment consistency. When performing RoB assessment for the studies included within the current update, any conflicts were discussed among team members and resolved through consensus, thereby enhancing the consistency and credibility of the final judgments.

4.5.2 Limitations of the included studies

A number of limitations were noted for the included studies. Firstly, the updated search did not include the full spectrum of mental health outcomes and was limited to depression, anxiety, and suicidal ideation. Previously, in the AHTA review, alcohol-related psychosis was also outlined as an outcome of interest; however, no studies were identified which reported on the risk of psychosis due to alcohol consumption.[13] This outcome was therefore not investigated in the Cochrane Canada update, or the current update.

Additionally, while people with clinical health conditions may exhibit increased prevalence of anxiety, depression, and other personality disorders, as compared to the general population,[149-151] the inclusion criteria focused on the general population and excluded studies limited to populations solely composed of those with clinical conditions. This included the exclusion of populations solely composed of those with mental health conditions and those with AUDs. A 2022 systematic review and meta-analysis outlined that people with common mental health disorders (such as major depressive disorder) are twice as likely to report an alcohol use disorder, than those without a common health disorder.[152] Additionally, a 2020 systematic review and meta-analysis of 42 studies identified that AUDs were significantly associated with an increased risk of subsequent depressive symptoms, albeit heavy drinking was not.[133] The authors indicated that there are additional characteristics associated with AUD, such as tolerance, withdrawal and lack of control, that are not necessarily associated with alcohol intake. These contribute to differences between those who abuse alcohol and those who consume alcohol.

Additionally, although systematic reviews of prognostic factor studies are essential for summarising evidence and guiding clinical and public health decision-making, they are frequently limited by methodological and reporting challenges. Observational prognostic studies are often assessed as moderate or high RoB due to substantial heterogeneity in study design, variability in exposure and outcome measurements, limited or inconsistent adjustment for confounding factors, and small study effects.[153] These limitations are well documented in prognostic methodology literature and have direct implications for the GRADE certainty of evidence.[154] For example, in the current update, a high proportion of the studies were deemed of moderate or high RoB. When combined with inconsistency in terms of the study results, and or imprecision of study results due to the width of the confidence intervals, all of the evidence underpinning the exposure outcome combinations outlined was deemed to be of low or very low certainty. While recommendations based on this evidence were not developed within the current update, it is noted within the GRADE framework that weak and or conditional recommendations developed based on low or very low certainty evidence should take into consideration shared decision-making, and the values, priorities and expectations of the target population.[154] In addition, the broader social and emotional impacts on

family members and friends of those who drink, were beyond the scope of this review.

Additionally, it should be noted that exposure to alcohol in terms of consumption of, or patterns of drinking, was predominantly measured through self-report. Self-report may be susceptible to social desirability bias, with respondents likely to share lower levels of consumption to appear more socially acceptable.[155] This may lead to underreporting, and indicate more people are consuming alcohol at lower amounts. If mental health outcomes are measured accurately, while alcohol consumption is underreported, this could result in lower amounts of alcohol consumption being associated with mental health outcomes. This bias can occur even in anonymous surveys (which are assumed to provide more honest responses than in-person interviews).[156] This limitation is consistent with observations noted by Cochrane Canada[14] and AHTA.[13]

It should also be noted that life-course drinking patterns and trajectories vary overtime. For example, a 2022 study of Irish older adults, reported a decline in average weekly consumption and heavy episodic drinking over time and with increasing age for both men and women.[157] This, however, was observed in combination with an increase in the frequency of consumption. While longitudinal studies with repeated measures aim to evaluate trajectories of alcohol consumption overtime, studies with limited numbers of follow-up assessments, as observed in many of the studies in the current update, may not fully capture these trajectories.

Lastly, while increasing levels of alcohol consumption are a concern worldwide, and the totality of evidence included 104 relevant primary studies set internationally, only one of these studies was conducted in Ireland.[115] While efforts were made to report the included studies in relation to the current Irish low-risk drinking guidelines, it is important to note that drinking culture, consumption partners, preferences and social norms around alcohol use may vary between countries. These differences may limit the generalisability of international data to the Irish context. Consequently, the limited national evidence base means that findings should be interpreted with caution.

4.6 Alcohol consumption and mental health from an Irish perspective

Given the heterogeneity and limitations present in the included studies, and the limited Irish evidence included, a summary of the impact of alcohol consumption on mental health in Ireland is presented.

Within the Irish context, it is important to recognise the social and cultural environment in which alcohol consumption occurs. Ireland continues to report one of the highest rates of heavy episodic drinking in Europe, particularly among adults

aged 18 to 34 years, where patterns of consumption are often oriented towards binge drinking rather than moderate drinking.[158, 159] Alcohol remains deeply embedded in social and community life, shaping norms that can normalise heavy drinking and delay recognition of the physical, mental, and social harms it causes both to individuals and to those around them. These broader aspects are important when interpreting the overall public health implications of alcohol use.

Within the current update, one study of low RoB, by Carvalho et al.[115] was conducted in Ireland. The study identified that in females without depression at baseline, a positive screen for problem drinking at baseline doubled the odds of developing depressive symptoms or anxiety symptoms, at two-year follow-up. Additionally, for females who screened positive for depressive symptoms at baseline, problem drinking predicted the persistence of depressive symptoms at follow-up.[115] Male non-drinkers and problem drinkers displayed similar odds of developing depression and or anxiety symptoms at follow-up.[115]

The 2021 HRB Overview Series 11, reported results from the My World Survey 2 which was published in 2019.[136] This survey included approximately 19,000 young adults (aged 18–25 years) and adolescents (aged 12–19 years) and investigated mental health and well-being in Ireland. Results indicated that broadly, across both adolescents and young adults, those with increased alcohol misuse, such as problem or hazardous drinkers, or those with alcohol dependence were most likely to fall into moderate, severe or very severe categories for depression. Similar results were observed for anxiety.[136]

Additionally, in Ireland, in 2020, alcohol was reported as being involved in approximately one-third of all self-harm presentations to hospital emergency departments, with higher involvement among males.[158] Furthermore, toxicological analysis from the National Self-Harm and Suicide Registry has shown that alcohol was present in 44% of suicide deaths examined, indicating that harmful patterns of alcohol use may play a role in acute psychological distress and impulsive behaviours at the point of crisis.[160] While these data do not demonstrate causality, they underscore the relevance of alcohol as a public health factor in self-harm and suicide in Ireland and provide contextual grounding for the associations identified in the current update.

4.7 Qualitative evidence

While this systematic review focused on longitudinal and cross-sectional studies to investigate the impact of alcohol consumption on mental health outcomes, a number of limitations were identified. Below outlines qualitative evidence in terms of the lived experience of those consuming alcohol, and how this has impacted their mental health.

A number of qualitative studies have investigated populations' perceptions of their drinking habits, with many acknowledging the impact of drinking alcohol on mental health. A 2013 study by Wilson et al.[161] conducted interviews and focus groups with older adults in the UK, around their alcohol consumption, health and identities in later life. Interviewees outlined a cycle of mental health and alcohol problems that kept them drinking alcohol. In some, it was acknowledged that alcohol consumption worsened mental health conditions in the direct aftermath. Others also noted that if they were to go without alcohol now, it would allow for the return of negative mental health symptoms, which drinking had temporarily masked.[161] Similarly, a 2025 study by Munroe et al.[162] interviewed those drinking above recommended alcohol guidelines in the US during the COVID pandemic, and reported that a number of participants had decreased their alcohol consumption, as they had noted it had worsened mental health conditions (such as depression and anxiety).[162]

In 2021, Alcohol Change UK commissioned a qualitative study in which 11 people with experience of self-harm and alcohol use were interviewed.[163] Participants outlined that drinking alcohol and self-harm were connected in multiple complex ways; in that sometimes drinking alcohol exacerbated self-harm by lowering inhibitions, sometimes it represented a type of harm in itself, and for some, drinking alcohol was a way of avoiding self-harm.[163] A 2022 PhD thesis by Scott et al.[164] included interviews with 15 Irish adults who self-identified as having a problem with alcohol use. Following thematic analysis, a sub-theme on the adverse effect of alcohol use on mental health and emotional wellbeing was identified. A number of participants spoke about their problem alcohol use exacerbating any present negative mental health symptoms, while several participants noted hitting 'rock bottom' in terms of their mental health or wellbeing due to their problem alcohol use.[164] Participants also reported drinking alcohol to cope with their mental health issues, or to improve their mental health by for example, relieving feelings of loneliness, isolation, regret and shame.[164]

These types of qualitative studies provide rich information around the lived experiences of those consuming alcohol, and how this impacts their mental health. Future research should synthesis qualitative research in this field, ensuring that lived experiences are captured thoroughly.

4.8 Implications for the update to the Irish low-risk alcohol guidelines

In the current update mixed results or limited associations were identified between levels of alcohol consumption and the development of depression, anxiety and suicidal ideation. Extensive heterogeneity was observed in the evidence underpinning the systematic review, limiting the ability to draw definitive conclusions about the direction or strength of the associations between alcohol consumption and

mental health outcomes. This is in line with that reported in the AHTA review, and the Cochrane Canada rapid update.[13, 14] It should be noted that due to the limitations associated with the review, experts assembled to update the low-risk alcohol guidelines in Canada agreed that further work was required for mental health outcomes to be considered when making alcohol guideline recommendations.[11] Experts in Canada agreed that the alcohol consumption and mental health review would not inform their final discussions on formulation and presentation of their updated guidelines.[11]

However, as outlined previously, this work is part of a larger body of ongoing work supporting an update to the current Irish low-risk alcohol guidelines. This work should therefore be considered alongside the ongoing modelling study which is estimating the risk of alcohol-attributable mortality and hospital admission in Ireland.[165] When considered alongside this, the current report contributes to the totality of evidence, which will support policy-makers in making informed decisions regarding the alcohol guideline update.

5 Conclusion

This report provides an update of the Cochrane Canada review on the effect of alcohol consumption on the development of depression, anxiety and suicidal ideation.[14] Twenty-six primary research studies were identified and included within this update. When combined with the results of the Cochrane Canada update, a total of 104 primary studies were included.

Overall, it was be noted that the evidence underpinning each exposure outcome combination was deemed to be of low or very low certainty. Additionally, significant heterogeneity was observed across the included studies, particularly in relation to alcohol consumption and mental health outcome measurement methods. Along with further limitations of the included studies, including the majority being of moderate or high risk of bias (RoB), this increased the difficulty of synthesising study information, and contributed to the variations observed across the studies.

Taking this into consideration, in adults and older adults, the results indicate there may be mixed results between alcohol consumption and future development of depression. In adolescents, the results indicate there may be no significant association or a small positive association between alcohol consumption and the future development of depression. Similar results were observed for the anxiety outcome in adults and adolescents, with limited evidence underpinning this outcome. In regard to suicidal ideation, the longitudinal studies in adults and adolescents indicate no significant association, or a small positive association between alcohol consumption and future suicidal ideation, cross-sectional studies reported small to large associations between alcohol consumption and suicidal ideation measured for

the same time. However, causality and directionality cannot be established due to the cross-sectional nature of the data.

Given the outlined heterogeneity observed across the included studies, and further limitations to the included studies and systematic review update process, the evidence presented in the current update should be interpreted with caution. However, this report contributes to the totality of evidence to support policy-makers and should be considered alongside the modelling report and other relevant factors including the values, priorities and expectations of the target population, to inform decisions when updating the current Irish low-risk alcohol guidelines.

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Appendix A – Search strategy results

Databases	Number of results	Date searched
Medline and Embase via Ovid	2992	23 June 2025
CINAHL and PsycINFO via Ebsco	2472	25 June 2025
The Cochrane Library	236	25 June 2025
Total	5207	
Total after duplicates removed by Covidence	**3731**	

Database name	Medline and Embase via Ovid multidatabase search
Date search was run	23 June 2025

Database(s): **Embase** 1974 to 23 June 2025**, Ovid MEDLINE(R) ALL** 1946 to 23 June 2025

#	Searches	Results
1	(anxious or anxiety or depress* or suicid* or psychol* or psychopath* or psychiat*).ti.	1,176,105
2	((alcohol* adj2 (use* or drink* or consume or consumption or intake)) or (drink* or beer or wine or spirits)).ab.	671,710
3	1 and 2	21,990
4	(anxious or anxiety or depress* or suicid*).ab.	1,891,790
5	alcohol*.ti.	392,633
6	(drink* or substance use*).ti. and alcohol.hw,kf.	46,806
7	5 or 6	421,369
8	4 and 7	26,528

9	3 or 8	41,705
10	(associat* or correlat* or odds or risk or risks or regression or more likely or less likely).tw.	24,117,586
11	9 and 10	31,035
12	limit 11 to yr="2022 -Current"	7,011
13	conference abstract/ or conference*.pt. or case report/ or review.pt. or editorial.pt. or letter.pt.	19,725,193
14	12 not 13	5,832
15	(serum or mice or mouse or rodent* or MRI or gene or genes or genetic or receptor* or antigen*).mp.	21,005,763
16	14 not 15	5,034
17	remove duplicates from 16	2,992

Database name	The Cochrane Library
Date search was run	25 June 2025

ID	ID Search	Hits
#1	(anxious OR anxiety OR depress* OR suicid*):ti (Word variations have been searched)	59,648
#2	(alcohol* NEAR/3 (use* or drink* or consume or consumption or intake)):ab AND (drink* or beer or wine or spirits):ab (Word variations have been searched)	7,816
#3	#1 AND #2	262
#4	((anxious or anxiety or depress* or suicid*)):ab (Word variations have been searched)	140,667
#5	(alcohol):ti (Word variations have been searched)	16,622

#6	((drink* or substance use*)):ti AND (alcohol):ti,ab,kw (Word variations have been searched)	3,649
#7	#5 OR #6	18,833
#8	#4 AND #7	1,859
#9	#3 OR #8	1,895
#10	(associat* or correlat* or odds or risk or risks or regression or more likely or less likely) (Word variations have been searched)	762,875
#11	#9 AND #10 with Cochrane Library publication date from Dec 2021 to present	236

Database name	CINAHL and APA PsycINFO via Ebsco
Date search was run	25 June 2025

#	Query	Limiters/Expanders	Last Run Via	Results
S13	S11 NOT S12	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	2,472
S12	serum or mice or mouse or rodent* or MRI or gene or genes or genetic or receptor* or antigen*	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	1,240,560
S11	S9 AND S10	Limiters - Publication Date: 20211201- Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	2,797
S10	TX ((associat* or correlat* or odds or risk or risks or regression or more likely or less likely)	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	6,320,434
S9	S3 OR S8	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	18,762

S8	S4 AND S7	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	13,256
S7	S5 OR S6	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	127,039
S6	TI ((drink* or substance use*)) AND XB alcohol	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	34,258
S5	TI alcohol	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	104,976
S4	AB (anxious or anxiety or depress* or suicid*)	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	812,057
S3	S1 AND S2	Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	9,370
S2	(AB (alcohol* N3 (use* or drink* or consume or consumption or intake)))	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	219,566

	OR (AB drink* or beer or wine or spirits))			
S1	TI (anxious OR anxiety OR depress* OR suicid*)	Expanders - Apply equivalent subjects Search modes - Proximity	Interface - EBSCOhost Research Databases Search Screen - Advanced Search Database - APA PsycInfo;CINAHL Complete	382,24

Appendix B – Articles excluded following full-text review (presented alphabetically by author surname)

No.	Article	Reason for exclusion
1	Actrn. Evaluation of an internet-based treatment for comorbidity of alcohol disorders and depressive mood. http://www.who.int/trialsearch/Trial2.aspx?TrialID=ACTRN12610000061033	Wrong study design (for outcome of interest)
2	Agyapong, B.; Shalaby, R.; Eboreime, E.; Wei, Y.; Agyapong, V. I. O. Self-Reported Alcohol Abuse and the Desire to Receive Mental Health Counselling Predict Suicidal Thoughts/Thoughts of Self-Harm among Female Residents of Fort McMurray. *International Journal of Environmental Research and Public Health* 2022; 19(20): 13620	Exclusion reason: Outcome not of interest
3	Ahlner, F.; Erhag, H. F.; Johansson, L.; Fassberg, M. M.; Sterner, T. R.; Samuelsson, J.; Zettergren, A.; Waern, M.; Skoog, I. Patterns of Alcohol Consumption and Associated Factors in a Population-Based Sample of 70-Year-Olds: Data from the Gothenburg H70 Birth Cohort Study 2014-16. *International Journal of Environmental Research and Public Health* 2022; 19(14): 8248	Wrong study design (for outcome of interest)
4	Ahmed, A.E.; Yim, M.H.; Dawood, J.; Olsen, C.H.; Waters, A.J.; Singer, D.E.; Mancuso, J.D. Suicidal behaviors among active-duty us service members: data from the 2018 health-related behaviors survey. *Psychology research and behavior management* 2023; 16: 4599-4615	Wrong study design (for outcome of interest)
5	Ahuja, M; Jain, M; Mamudu, H; Al Ksir, K; Sathiyaseelan, T; Zare, S; Went, N; Fernandopulle, P; Schuver, T; Pons, A; Dooley, McK; Nwanecki, C; Dahal, K. Substance Use Disorder and Suicidal Ideation in Rural Maryland. *Chronic stress* 2024; 8	Population with clinical health condition or AUD
6	Aliy, H. M.; Getahun, H. A.; Dadi, L. S. Magnitude and Associated Factors of Suicidal Ideation and Attempts among High School Adolescents of Jimma Town, Ethiopia. *Ethiopian Journal of Health Sciences* 2023; 33(6)	Information on levels of alcohol consumption not distinctly reported
7	Al-Mamun, F.; Al Habib, A.; Islam, J.; Almerab, M. M.; Mamun, M. A.; Muhit, M. Lifetime and past-year suicidal behaviors among adolescents in Bangladesh: A two-stage stratified cluster sampling study. *Global Mental Health* 2025; 12(e24)	Information on levels of alcohol consumption not distinctly reported
8	Alpert, Hillel R.; Slater, Megan E.; Freeman, Robert C. Relations between proximal and distal predictors of suicide risk among college students. *Psychology of Violence* 2025	Information on levels of alcohol consumption not distinctly reported
9	Arqueros, M.; Perez-Diez, I.; Garcia-Ramos, A.; Ayad-Ahmed, W.; Sanchez, A.; de la Torre-Luque, A. Addiction profile is associated with suicidal behavior and repetition of non-suicidal self-injury: A latent profile analysis study in a schooled adolescent. *European Child & Adolescent Psychiatry* 2025	Wrong exposure
10	Avci, D.; Kilic, M.; Akgul Gundogdu, N. Relationship between suicide risk, and violence tendency and eating attitude in working and non-working adolescents: a comparative study. *Psychology, Health & Medicine* 2022; 27(3): 626EP - 637	Information on levels of alcohol consumption not distinctly reported

11	BaÃ±uelos Barrera, Yolanda; PÃ©rez Briones, Nancy Griselda; Trejo Ortiz, Perla MarÃ-a; Lara Reyes, Braulio JosuÃ©; Ruiz SÃinchez, EloÃ-na; Javier ArgÃ¼ello, E. Predictive factors for suicidal behaviors among university students in the north-central region of Mexico. *Salud Mental* 2024; 47(2): 81-87	Information on levels of alcohol consumption not distinctly reported
12	Badarch, J.; Chuluunbaatar, B.; Batbaatar, S.; Paulik, E. Suicide Attempts among School-Attending Adolescents in Mongolia: Associated Factors and Gender Differences. *International Journal of Environmental Research and Public Health* 2022; 19(5): 2991	Population with clinical health condition or AUD
13	Bailey, S.; Lin, A.; Cook, A.; Winter, S.; Watson, V.; Toussaint, D.W.; Barrett, E.L.; Newton, N.C.; Perry, Y.; Grummitt, L.; Strauss, P. Contextualising experiences of co-occurring mental ill-health and substance use among trans, non-binary, and gender diverse young people: Implications for tailored harm reduction approaches. *Community Mental Health Journal* 2025; 61(1): 181-192	Information on levels of alcohol consumption not distinctly reported
14	Berg, N.; Kiviruusu, O. Trends in the co-occurrence and association between heavy episodic drinking and generalized anxiety among adolescents between 2013 and 2023 in Finland. *International Journal of Mental Health and Addiction* 2024	Wrong study design (for outcome of interest)
15	Blais, R. K.; Pedersen, E. R.; Brand, S.; Xie, Z. Binge drinking and veteran status increase risk for suicide planning in U.S. adults. *Psychology of Addictive Behaviors* 2025.	Wrong study design (for outcome of interest)
16	Blais, R. K.; Xu, B.; Tannahill, H.; Dulin, P. Male sex and hazardous alcohol use following military sexual assault increase suicide risk among US service members and veterans. *European Journal of Psychotraumatology* 2024; 15(1): 2312756	Population with clinical health condition or AUD
17	Boyle. Suicide risk and prevalence of depression among certified registered nurse anaesthetists. *Wilkes University The Passan School of Nursing ProQuest Dissertations & Theses* 2023; 84	Wrong publication type
18	Burlaka, V.; Hong, J.S.; Serdiuk, O.; Krupelnytska, L.; Paschenko, S.; Darvishov, N.; Churakova, I. Suicidal behaviors among Ukrainian college students: The role of substance use, religion, and depression. *International Journal of Mental Health and Addiction* 2021; 19(6): 2392-2406	Information on levels of alcohol consumption not distinctly reported
19	Caravaca-SÃinchez, Francisco; Muyor-RodrÃ-guez, JesÃºs; FernÃindez-Prados, Juan SebastiÃin Risk and protective factors associated with suicidal behaviour during the COVID-19 pandemic crisis amongst college students in Spain. *Social Work in Mental Health* 2022; 20(6): 625-644	Information on levels of alcohol consumption not distinctly reported
20	CastaÃ±o CastrillÃ³n, JosÃ© Jaime; CaÃ±Ã³n Buitrago, Sandra Constanza; LÃ³pez Tamayo, Juan JosÃ. Riesgo suicida en estudiantes universitarios de Manizales (Caldas, Colombia). *Informes PsicolÃ³gicos* 2022; 22(1): 77-95	Information on levels of alcohol consumption not distinctly reported
21	Celik, I.; Cakar, B. Exploring Risk and Protective Factors for Suicidality and Physical Self-Harm: A Cross-Sectional Analysis in Nordic Adolescents. *Issues in mental health nursing* 2025; 46(2); 165EP - 179	Information on levels of alcohol consumption not distinctly reported
22	Chang, Y-C.; Lee, Y-H.; Chiang, T.; Liu, C-T. Associations of Smoking and Alcohol Consumption with Loneliness, Depression, and Loss of Interest Among Chinese Older Males and Females. *International journal of mental health and addiction* 2022	Information on levels of alcohol consumption not distinctly reported

23	Cheek, S.M.; Grove, J.L.; Barnes, S.E.; Goldston, D.B. Alcohol and Cannabis Use Trends Among Adolescents With and Without a History of Recent Suicidal Thoughts and Behavior: 1991-2023. *The Journal of adolescent health : official publication of the Society for Adolescent Medicine* 2025	Outcome not of interest
24	Chen, M.; Wang, X.; Tan, D. S.; Wang, H.; Guo, J.; Li, J.; Zou, Z.; Jiang, Y.; Liang, W. Tobacco and alcohol use; suicide ideation, plan, and attempt among adolescents; and the role of legal purchase age restrictions: a pooled population-based analysis from 58 countries. *BMC Medicine* 2025; 23(5): 163	Information on levels of alcohol consumption not distinctly reported
25	Cheslack-Postava, K.; Forthal, S.; Musa, G. J.; Ryan, M.; Bresnahan, M.; Sapigao, R. G.; Lin, S.; Fan, B.; Svob, C.; Geronazzo-Alman, L.; Hsu, Y. J.; Skokauskas, N.; Hoven, C. W. Persistence of anxiety among Asian Americans: racial and ethnic heterogeneity in the longitudinal trends in mental well-being during the COVID-19 pandemic. *Social Psychiatry and Psychiatric Epidemiology* 2024; 59(4): 599EP - 609	Outcome not of interest
26	Chitty, K. M.; Cvejic, R. C.; Heintze, T.; Srasuebkul, P.; Morley, K.; Dawson, A.; Carter, G.; Dinh, M.; Buckley, N. A.; Trollor, J. N. The Association Between Problematic Use of Alcohol and Drugs and Repeat Self-Harm and Suicidal Ideation. *Crisis* 2023; 44(4): 309EP - 317	Information on levels of alcohol consumption not distinctly reported
27	Chiu, H.; Vargo, E. J. Bullying and other risk factors related to adolescent suicidal behaviours in the Philippines: a look into the 2011 GSHS Survey. *BMC Psychiatry* 2022; 22(1): 445	Information on levels of alcohol consumption not distinctly reported
28	Chomon, R. J. Depression and suicidal ideation among medical students in a private medical college of Bangladesh. A cross-sectional web based survey. *PLoS ONE* 2022; 17: e0265367	Information on levels of alcohol consumption not distinctly reported
29	Claborn, K.; Lippard, E.; Conway, F. Longitudinal Correlates of Suicide Ideation in People who use Drugs during the COVID-19 Pandemic. *Research square;* 2022	Wrong publication type
30	Coryell, W.; Horwitz, A.; Albucher, R.; Zheng, K.; Pistorello, J.; Eisenberg, D.; Favorite, T.; King, C. Alcohol intake in relation to suicidal ideation and behavior among university students. *Journal of American college health* 2023; 71(6): 1680EP - 1684	Wrong study design (for outcome of interest)
31	Coryell, W.; Horwitz, A.; Albucher, R.; Zheng, K.; Pistorello, J.; Eisenberg, D.; Favorite, T.; King, C. Suicidality and Alcohol Use as Predictors of Future Suicidal Behavior in College Students. *Alcohol and Alcoholism* 2022; 57(6): 643EP - 647	Wrong comparator
32	Crossin, R.; Cleland, L.; Beautrais, A.; Witt, K.; Boden, J. M. Acute alcohol use and suicide deaths: an analysis of New Zealand coronial data from 2007-2020. *New Zealand Medical Journal* 2022; 135(1558): 65EP - 78	Population with clinical health condition or AUD
33	Crossin, R.; Cleland, L.; McLeod, G. F. H.; Beautrais, A.; Witt, K.; Boden, J. M. The association between alcohol use disorder and suicidal ideation in a New Zealand birth cohort. *Australian and New Zealand Journal of Psychiatry* 2022; 56(12): 1576EP - 1586	Population with clinical health condition or AUD
34	Crossin, R.; Dikstaal, J.; McKerchar, C.; Cleland, L.; Beautrais, A.; Witt, K.; Boden, J. M. Sex-specific analysis of acute alcohol use in suicides and reporting of alcohol as a contributor to suicide deaths in New Zealand 2007-2020: a cross-sectional study of coronial data. *New Zealand Medical Journal* 2024; 137(1604): 62EP - 72	Population with clinical health condition or AUD
35	Da Silva, L. S.; Da Silva, P. A.; Demenech, L. M.; Vieira, M. E. C. D.; Silva, L. N.; Dumith, S. C. Suicide risk in high school students: who are the most vulnerable groups? *Revista Paulista de Pediatria* 2023; 41: e2021236	Information on levels of alcohol consumption not distinctly reported

36	Davila-Cervantes, C. A.; Luna-Contreras, M. Suicide attempts in the adult Mexican population: an analysis of sociodemographic characteristics and associated factors. *Revista Brasileira de Epidemiologia* 2024; 27: e240014	Information on levels of alcohol consumption not distinctly reported
37	De Leon, A. N.; Peterson, R.; Leary, A. V.; Burr, E. K.; Cora, J. L.; Dvorak, R. D. Protective behavioral strategies as a protective factor against suicidal ideation among college student drinkers. *Journal of American college health* 2024; 72(3): 947EP - 956	Information on levels of alcohol consumption not distinctly reported
38	Dong, X. S.; Brooks, R. D.; Brown, S.; Harris, W. Psychological distress and suicidal ideation among male construction workers in the United States. *American journal of industrial medicine* 2022; 65(5): 396EP - 408	Information on levels of alcohol consumption not distinctly reported
39	Dunn, Michael S.; Yannessa, John F. Suicide ideation and behavior and ATOD use among bisexual high school students. *Journal of Substance Use* 2024; 29(5); 864-868	Information on levels of alcohol consumption not distinctly reported
40	Evans, S. L. Health-related behaviours and depression incidence amongst UK adults aged 50+: Evidence from the English Longitudinal Study of Ageing. *Journal of Public Health (Germany)* 2025	Wrong study design (for outcome of interest)
41	Fernandes Martins Molina, N. P.; Pereira Junior, A. D. C.; Di Donato, G.; Pillon, S. C.; Giacchero Vedana, K. G.; de Medeiros Alves, V.; Miasso, A. I. Factors associated with suicide risk among Brazilian graduate students during the COVID-19 pandemic. *Death studies* 2024; 48(9): 894EP - 904	Wrong study design (for outcome of interest)
42	Finlay, Evan; Ying, Saixia; Mabila, Sithembile L.; Stahlman, Shauna L. Non-medical risk factors influencing health and association with suicidal ideation or attempt, U.S. active component, 2018-2022. *Armed Forces Health Surveillance Center* 2025; 32(3)	Information on levels of alcohol consumption not distinctly reported
43	Fitzgerald, A.; Mahon, C.; Shevlin, M.; Dooley, B.; Reilly, A. O. Exploring changing trends in depression and anxiety among adolescents from 2012 to 2019: Insights from My World repeated cross-sectional surveys. *Early Intervention in Psychiatry* 2025; 19(1): e13562	Wrong comparator
44	Fleming, Charles B.; Duckworth, Jennifer C.; Rhew, Isaac C.; Abdallah, Devon Alisa; Guttmannova, Katarina; Patrick, Megan E.; Lee, Christine M. Young adult simultaneous alcohol and marijuana use: Between- and within-person associations with negative alcohol-related consequences, mental health, and general health across two-years. *Addictive Behaviors* 2021; 123	Wrong exposure
45	Fonseca, L. B.; Pereira, L. P.; Rodrigues, P. R. M.; Muraro, A. P.; Andrade, A. C. S.; Pereira, R. A.; Ferreira, M. G. Incidence of depressive symptoms and its association with sociodemographic factors and lifestyle-related behaviors among Brazilian university students. *Psychology, health & medicine* 2022; 27(6): 1311EP - 1325	Outcome not of interest
46	Furihata, R.; Ishida, M.; Nakagami, Y.; Yanase, M.; Uwatoko, T.; Okabayashi, S.; Kiyohara, K.; Kawamura, T. A 2-year longitudinal study of the association between unhealthy lifestyle factors and the development of depressive symptoms in university students. *PCN reports : psychiatry and clinical neurosciences* 2024; 3(4): e70020	Information on levels of alcohol consumption not distinctly reported
47	Garbus, P.; Gonzalez-Forteza, C.; Cano, M.; Jimenez, A.; Juarez-Loya, A.; Wagner, F. A. Suicidal behavior in Mexican adolescents: A test of a latent class model using two independent probability samples. *Preventive Medicine* 2022; 157: 106984	Wrong study design (for outcome of interest)

48	Garcia-Ramirez, G.; Shamblen, S. R.; Kaner, E.; Moore, R. S. The Interaction Between Alcohol Misuse and Belongingness on Suicidal Ideation Among Military Personnel. *International Journal of Environmental Research and Public Health* 2025; 22(2): 246	Information on levels of alcohol consumption not distinctly reported
49	Gaume, J.; Carrard, V.; Berney, S.; Bourquin, C.; Berney, A. Substance use and its association with mental health among Swiss medical students: A cross-sectional study. *International Journal of Social Psychiatry* 2024; 70(4): 808-817	Association in the opposite direction to the direction of interest
50	Geda, N.; Feng, C.; Peters, B. Suicidal ideation among Canadian adults during the COVID-19 pandemic: the role of psychosocial factors and substance use behaviours. *BMC Psychiatry* 2022; 22(1): 711	Wrong study design (for outcome of interest)
51	George, E. S.; Davidson, I.; El Masri, A.; Meade, T.; Kolt, G. S. Unhealthy Lifestyle Behaviours and Psychological Distress: A Longitudinal Study of Australian Adults Aged 45 Years and Older. *International Journal of Environmental Research and Public Health* 2022; 19(7): 4399	Wrong study design (for outcome of interest)
52	Georgiadou, E.; Muller, A.; Koopmann, A.; Kiefer, F.; Hillemacher, T. Alcohol Consumption and Psychological Distress during the Second Lockdown in Healthcare Workers and Persons from Other Fields. *Sucht* 2023; 69(6): 274EP - 284	Wrong study design (for outcome of interest)
53	Gerke, D. R.; Call, J.; Atteberry-Ash, B.; Katz-Kattari, S.; Kattari, L.; Hostetter, C. R. Alcohol use at the intersection of sexual orientation and gender identity in a representative sample of youth in Colorado. *American Journal on Addictions* 2022; 31(1): 61EP - 68	Outcome not of interest
54	Gohari, M. R.; Patte, K. A.; MacKillop, J.; Waloszek, A.; Leatherdale, S. T. An Examination of Bidirectional Associations Between Alcohol Use and Internalizing Symptoms Among Adolescents During the COVID-19 Pandemic. *Journal of Adolescent Health* 2024; 74 (4): 739EP - 746	Information on levels of alcohol consumption not distinctly reported
55	Griffin, K.; Twynstra, J.; Gilliland, J.A.; Seabrook, J.A. Correlates of self-harm in university students: A cross-sectional study. *Journal of American college health* 2021; 71(3)	Information on levels of alcohol consumption not distinctly reported
56	Guan, T.; Zhang, C.; Zou, X.; Chen, C.; Zhou, L.; Wu, X.; Hao, J. The Influence of Alcohol Consumption, Depressive Symptoms and Sleep Duration on Cognition: Results from the China Health and Retirement Longitudinal Study. *International Journal of Environmental Research and Public Health* 2022; 19(19): 12574	Outcome not of interest
57	Gueltzow, M.; Bijlsma, M. J.; Van Lenthe, F. J.; Myrskyla, M. The Contribution of Health Behaviors to Depression Risk Across Birth Cohorts. *Epidemiology* 2022; 33(6): 880EP - 889	Population with clinical health condition or AUD
58	Guevara-Tirado, A. Profile of psychoactive substance consumption associated with risk levels of suicidal behavior in Argentine adolescents. *Revista Facultad Nacional de Salud Publica* 2025; 43: e358005	Information on levels of alcohol consumption not distinctly reported
59	Guevara-Tirado, A. Perfil de consumo de sustancias psicoactivas asociadas a niveles de riesgo de comportamiento suicida en adolescentes argentines. *Universidad de Antioquia* 2025; 43	Information on levels of alcohol consumption not distinctly reported
60	Guillot, C. R.; Pang, R. D.; Vilches, J. R.; Arnold, M. L.; Cajas, J. O.; Aleman, A. M.; Leventhal, A. M. Longitudinal Associations Between Anxiety Sensitivity and Substance Use in Adolescents: Mediation by Depressive Affect. *Experimental and Clinical Psychopharmacology* 2014; 32(1): 90EP - 103	Association in the opposite direction to the direction of interest

61	Halladay, J.; Freibott, C. E.; Lipson, S. K.; Zhou, S.; Eisenberg, D. Trends in the co-occurrence of substance use and mental health symptomatology in a national sample of US post-secondary students from 2009 to 2019. *Journal of American college health* 2024; 72(6): 1911EP - 1924	Information on levels of alcohol consumption not distinctly reported
62	Hamdan, S.; Guz, T.; Zalsman, G. The Clinical Sequelae of the COVID-19 Pandemic: Loneliness, Depression, Excessive Alcohol Use, Social Media Addiction, and Risk for Suicide Ideation. *Archives of suicide research* 2025; 29(1): 238EP - 251	Information on levels of alcohol consumption not distinctly reported
63	Hammami, N.; Katapally, T. R. Do associations between suicide ideation and its correlates (substance use, anxiety, and depression) differ according to victimization type among youth? A Smart platform study. *Preventive Medicine Reports* 2022; 29: 101944	Information on levels of alcohol consumption not distinctly reported
64	Hammerton, G.; Lewis, G.; Heron, J.; Fernandes, G.; Hickman, M.; Lewis, G. The association of alcohol dependence and consumption during adolescence with depression in young adulthood, in England: A prospective cohort study. *The Lancet Psychiatry* 2023; 10(7): 490-498	Information on levels of alcohol consumption not distinctly reported
65	Hernandez-Vasquez, A.; Vargas-Fernandez, R.; Bendezu-Quispe, G. Binge drinking and suicidal ideation in Peruvian adolescents: Evidence from a pooled cross-sectional survey. *Journal of Affective Disorders* 2023; 340: 321EP - 326	Wrong study design (for outcome of interest)
66	Hwang, J.W.; Eun, Y.; Song, C-H. Associations of Alcohol Consumption and Smoking Behaviors with Depressed Mood According to Gender in Korean Young Adults. *Korean journal of family medicine* 2023; 44(5): 274-280	Wrong study design (for outcome of interest)
67	Iyanda, A. E.; Krishnan, B.; Adeusi, T. J. Epidemiology of suicidal behaviors among junior and senior high school adolescents: Exploring the interactions between bullying victimization, substance use, and physical inactivity. *Psychiatry Research* 2022; 318: 114929	Information on levels of alcohol consumption not distinctly reported
68	Jo, H.; Park, J.; Lee, K.; Lee, H.; Son, Y.; Kang, J.; Lee, S.; Choi, Y.; Lee, J. H.; Fond, G.; Boyer, L.; Smith, L.; Lee, J.; Lopez Sanchez, G. F.; Dragioti, E.; Tully, M. A.; Rahmati, M.; Woo, H. G.; Woo, S.; Yon, D. K. Nationwide trends in sadness, suicidal ideation, and suicide attempts among multicultural and monocultural adolescents in South Korea during the COVID-19 pandemic, 2011-2022. *World Journal of Pediatrics* 2024; 20(12): 1249EP - 1269	Information on levels of alcohol consumption not distinctly reported
69	Johannesen, S.; Weihe, P. M.; Wang, A. G. Suicidal behaviour among youngsters in a suicide low-incidence population. *Danish Medical Journal* 2025; 72(4): A02240126	Wrong study design (for outcome of interest)
70	Jollant, F.; Leon, C. Suicidal transition rates and their predictors in the adult general population: a repeated survey over 21 years in France. *European Psychiatry* 2024; 67(1): e74	Population with clinical health condition or AUD
71	Jorgensen, M.; Wold, B.; Smith, O. R. F.; Haug, E. Socioeconomic differences in adolescent health behaviors and their effect on inequalities in adult depressed mood: findings from a 27-year longitudinal study. *BMC Psychiatry* 2025; 25(1); 364	Information on levels of alcohol consumption not distinctly reported
72	Juan-Salvadores, P.; de la Torre Fonseca, L.M.; Perez, A.L.; Veiga, C.; Gonzalez-Novoa, J.A.; Romo, A.I.; Isorna, C.F. and Diaz, V.A.J. Binge Drinking and its Relationship with Suicidal Thoughts and Suicidal Attempts in University Students. *International Journal of Mental Health and Addiction* 2024; 23: 2849-2860	Outcome not of interest

73	Kang, J.; Jang, S. N.; Kim, H. S. What differentiates suicidal ideation from depressive symptoms amongst Korean young adults aged 20-39 years? *International Review of Psychiatry* 2024; 36: 315EP - 325	Information on levels of alcohol consumption not distinctly reported
74	Kellerman, J. K.; Rizvi, S. L.; Duberstein, P. R.; Kleiman, E. M. Suicidal ideation in the context of alcohol use among college students: differences across sexual orientation and gender identity. *Social psychiatry and psychiatric epidemiology* 2024; 59(11): 1943EP - 1952	Wrong comparator
75	Keyes, D.; Talarico, P.; Hardin, B.; Molter, A.; Lee, H.; Valiuddin, H.; Moore, B. Suicidal ideation and sobriety: Should acute alcohol intoxication be taken into account for psychiatric evaluation? *Alcoholism: Clinical and Experimental Research* 2022; 46(7): 1306EP - 1312	Population with clinical health condition or AUD
76	Ki, M.; Shim, H. Y.; Lim, J.; Hwang, M.; Kang, J.; Na, K. S. Preventive health behaviors among people with suicide ideation using nationwide cross-sectional data in South Korea. *Scientific reports* 2022; 12(1): 11615	Information on levels of alcohol consumption not distinctly reported
77	KiliÃ‡, Osman Hasan Tahsin; Aksoy, Ã°hsan; Anil, Murat; Varol, Umut; Varol, Yelda; Kirci DallioÄžLu, Ã‡iÄŸdem; Ã‡EtÃ°N, Afra Sevde; Mumcu, Ece; ÃœStÃœN, Nida. Suicide Risk Burnout and Risky Alcohol Use Among Physicians. *Forbes Journal of Medicine* 2023; 4(2): 211-217	Information on levels of alcohol consumption not distinctly reported
78	Kim, A.M.; Lee, J-S. The decrease in alcohol consumption and suicide rate during the COVID-19 pandemic and their association. *Alcohol* 2024; 121: 27-32	Wrong study design (for outcome of interest)
79	Kim, H.; Ryu, S.; Jeon, H. J.; Roh, S. Lifestyle factors and suicide risk: A nationwide population-based study. *Journal of Affective Disorders* 2023; 328: 215EP - 221	Wrong study design (for outcome of interest)
80	Kim, J. Cigarette use and binge drinking among Korean adolescents: examining the moderating role of multicultural status. *Journal of Ethnicity in Substance Abuse* 2023; 22(3): 626EP - 643	Association in the opposite direction to the direction of interest
81	Krokstad, M. A.; Sund, E.; Rangul, V.; Bauman, A.; Olsson, C.; Bjerkeset, O. Secular trends in risk factors for adolescent anxiety and depression symptoms: the Young-HUNT studies 1995-2019, Norway. *European Child and Adolescent Psychiatry* 2024; 33(11): 3819EP - 3827	Wrong study design (for outcome of interest)
82	Kumar, V.; Mateen, A.; Aziz, T.; Singh, A. K.; Mahto, M.; Rai, R. K. Prevalence and Various Risk Factors Associated with Suicidal Ideation Thoughts in Medical Students from a Medical College in Northern India. *Annals of African Medicine* 2025; 24(2): 468EP - 473	Information on levels of alcohol consumption not distinctly reported
83	Lai, W.; Wu, H.; Yang, L.; Chen, R.; Xin, Z.; Zhang, X.; Wang, W.; Guo, L.; Huang, G.; Lu, C. Prevalence of unhealthy behaviors and their associations with non-suicidal self-injury, suicidal ideation and suicide attempt among Chinese adolescents. *Child and Adolescent Psychiatry and Mental Health* 2024; 18(1): 61	Information on levels of alcohol consumption not distinctly reported
84	Lange, S.; Zhu, Y.; Probst, C. Evaluation of the risk relationship between average alcohol volume consumed and suicide: An analysis of mortality linked cohort data. *medRxiv* 2023	Wrong publication type
85	Lee, M. S.; Lee, H. Latent class analysis of health behaviors, anxiety, and suicidal behaviors among Korean adolescents. *Journal of Affective Disorders* 2024; 354: 339EP - 346	Information on levels of alcohol consumption not distinctly reported
86	Lee, M.S; Lee, H. Associations between binge drinking experience, depressive mood, and suicidality in adolescents: Based on the 2021 Korea Youth Risk Behavior Web-based Survey. *Journal of Affective Disorders* 2023; 323: 386-391	

87	Lee, S. K.; Kwon, Y. J. Socioeconomic disparities in alcohol-related depression: a national cohort study of low-income medical aid beneficiaries and national health insurance beneficiaries in Korea. *BMC public health* 2024; 24(1): 2189	Wrong comparator
88	Li, C. C.; Hsieh, K.; Chang, P. C.; Chang, H. J. Prevalence of suicide attempts and related factors among adolescents in Taiwan using a nationally representative survey. *Journal of the Formosan Medical Association* 2025	Information on levels of alcohol consumption not distinctly reported
89	Li, J.; Bornheimer, L. A.; Fernandez, L.; Dagher, J. The Relationships Between Risk-Taking, Depression, and Alcohol Use in the Experience of Suicidal Ideation Among Adults in the General Population. *Crisis* 2022; 43(3): 228EP - 235	Information on levels of alcohol consumption not distinctly reported
90	Li, J.; Jin, Y.; Xu, S.; Wilson, A.; Chen, C.; Wang, Y. The influence of the severity of gender dysphoria on anxiety, depression, suicidal ideation, and non-suicidal self-injury in Chinese transgender, nonbinary, and gender-diverse youth. *International journal of transgender health* 2024; 25(3): 456-470	Information on levels of alcohol consumption not distinctly reported
91	Liu, Y.; Schnitzer, M.E.; Herrera, R.; DÃ-az, I.; O'Loughlin, J.; Sylvestre, M-P. The application of target trials with longitudinal targeted maximum likelihood estimation to assess the effect of alcohol consumption in adolescence on depressive symptoms in adulthood. *American Journal of Epidemiology* 2024; 193(6): 835-845	Outcome not of interest
92	Luceno-Moreno, L.; Vaizquez-Estavez, D.; MartÃ-n-GarcÃ-a, J.; Talavera-Velasco, B. Factors associated with suicidal ideation in college students of health sciences. Wiley 2025.	Wrong study design (for outcome of interest)
93	Martinez-Fierro, M. L.; Reyes-Hurtado, J. R.; Ayala-Haro, A. E.; Avila-Carrasco, L.; Ramirez-Hernandez, L. A.; Lozano-Razo, G.; Zavala-Rayas, J.; Vazquez-Reyes, S.; Mauricio-Gonzalez, A.; Velasco-Elizondo, P.; Juarez-Alcala, V.; Flores-Vazquez, R.; Delgado-Enciso, I.; Rodriguez-Sanchez, I. P.; Garza-Veloz, I. The hidden risk factors behind of suicidal behavior in medical students: a cross-sectional cohort study in Mexico. *Frontiers in Psychiatry* 2025; 16: 1505088	Wrong study design (for outcome of interest)
94	Mason, A.; Riordan, B. C.; Morley, K.; Winter, T.; Haber, P.; Scarf, D. High Risk or Risky Highs: Understanding the Links Between Alcohol and Cannabis Use on the Transition From Suicidal Ideation to Attempts in Australian Men. *Archives of suicide research* 2024; 28(2): 600EP - 609	Information on levels of alcohol consumption not distinctly reported
95	McCabe, C. J.; Brumback, T.; Brown, S. A.; Meruelo, A. D. Assessing cross-lagged associations between depression, anxiety, and binge drinking in the National Consortium on Alcohol and Neurodevelopment in Adolescence (NCANDA) study. *Drug and Alcohol Dependence* 2023; 243: 109761	Association in the opposite direction to the direction of interest
96	Melo, T. Q.; Aquino, D. M. F.; Peixoto, A. M. C. L.; Lisboa, J. L.; Ferreira, R. C.; Zarzar, P. M. P. A.; Colares, V.; Laureano, F. G. B. B.; Santos, C. D. F. B. F.; Vieira, S. C. M.; Menezes, V. A. Is Binge Drinking Associated with Suicidal Behaviors among Brazilian Adolescents? *Substance use & misuse* 2022; 57(9): 1365EP - 1373	Wrong study design (for outcome of interest)
97	Michelsen, M. E.; Gronkjaer, M.; Mortensen, E. L.; Wimmelmann, C. L. Social, psychological and health characteristics associated with stability and change in adult alcohol consumption. *PLoS ONE* 2022; 17: e0277511	Association in the opposite direction to the direction of interest

98	Mokaya, A. G.; Kikuvi, G. M.; Mutai, J.; Khasakhala, L. I.; Memiah, P. Factors associated with the risk of suicidal behavior among adolescents transitioning to secondary school in Nairobi County, Kenya: a cross-sectional study. *Pan African Medical Journal* 2022; 43: 180	Information on levels of alcohol consumption not distinctly reported
99	Motsa, M.P.S.; Chiou, H-Y.; Chen, Y-H. Association of chronic diseases and lifestyle factors with suicidal ideation among adults aged 18-69 years in Eswatini: evidence from a population-based survey. *BMC Public Health* 2021; 21(1)	Information on levels of alcohol consumption not distinctly reported
100	Narishige, R; Otaka, Y; Tateno, A. Sociological characteristics of alcohol-induced suicide attempters: A retrospective study. *PCN reports : psychiatry and clinical neurosciences* 2025; 4(1): e70086	Population with clinical health condition or AUD
101	Nichols, Z. C.; Lee, U.; Mills, D. J.; Comiskey, G. Problem Drinking, Perceived Burden, Depression, and Suicide Ideation: A Conceptual Model. *Alcoholism Treatment Quarterly* 2023; 41(1): 15EP - 30	Wrong study design (for outcome of interest)
102	Nii-Boye Quarshie, E.; Andoh-Arthur, J. Suicide Attempts Among 1,437 Adolescents Aged 12-17 Years Attending Junior High Schools in Ghana. *Crisis* 2022; 43(1): 8EP - 17	Information on levels of alcohol consumption not distinctly reported
103	Ocakoglu, B. K.; Oguz, M.; Ipek, Z. The Retrospective Evaluation of the Suicide Attempts which Occurred in the Batman Province in between 2013-2018. *Turkish Journal of Child and Adolescent Mental Health* 2023; 30(1): 61EP - 69	Population with clinical health condition or AUD
104	O'Loughlin, C.M.; Park, Y.; Ammerman, B.A. Suicide Ideation, Distress, and Peer Perceptions as Predictors of Substance Use. *Substance Use & Misuse* 2023; 58(4): 560-569	Information on levels of alcohol consumption not distinctly reported
105	O'Rourke, T.; Humer, E.; Plener, P. L.; Pieh, C.; Probst, T. Moderation effects of health behaviors on stress and suicidal ideation in adolescents: a cross-sectional survey during COVID-19. *Scientific reports* 2023; 13(1): 21376	Wrong exposure
106	Palmu, R.; Koskinen, S.; Partonen, T. Both self-report and diagnostic interview for anxiety disorder reveal suicidal ideation in a population-based study. *Psychiatry Research Communications* 2023; 3(3): 100133	Wrong exposure
107	Park, D.; Ha, J. Factors Influencing Suicidal Ideation in Korean Youth: A Secondary Data Study Using Longitudinal Data from the Korean Youth Panel Survey. *Iranian journal of public health* 2023; 52(7): 1367-1377	Information on levels of alcohol consumption not distinctly reported
108	Park, E.; Lee, H. Y. The residential, area-specific prevalence and associated factors of suicidal ideation among South Korean adolescents. *Preventive Medicine Reports* 2024; 41: 102698	Wrong comparator
109	Patel, T. A.; Cole, S. L.; Cougle, J. R. Correlates of alcohol use and alcohol use disorder among individuals with DSM-5 social anxiety disorder: A population-based study. *Journal of Affective Disorders* 2024; 360: 55EP - 61	Population with clinical health condition or AUD
110	Peeters, M.; Prior, K.; Salemink, E.; Sunderland, M.; Stevens, G.; Oldehinkel, T.; Stapinski, L. Dynamic Associations Between Anxiety Symptoms and Drinking Behavior From Early Adolescence to Young Adulthood. *Journal of Adolescent Health* 2024; 74(5): 933EP - 940	Information on levels of alcohol consumption not distinctly reported
111	Peng, M. M.; Liang, Z.; Wang, P. Lifestyle factors, physical health, and life satisfaction under different changes in depressive symptoms among Chinese community-dwelling older adults: A longitudinal analysis. *The International journal of social psychiatry* 2024; 70(6): 1062EP - 1074	Information on levels of alcohol consumption not distinctly reported

112	Pengpid, S.; Peltzer, K.; Efraime, B. Suicidal behaviour, depression and generalized anxiety and associated factors among female and male adolescents in Mozambique in 2022-23. *Child and Adolescent Psychiatry and Mental Health* 2024; 18(1): 142	Information on levels of alcohol consumption not distinctly reported
113	Pengpid, S; Peltzer, K. Health risk behaviour and persistent and incident depression among middle-aged and older adults in South Africa. *South African journal of psychology* 2023; 53(1); 134-142	Information on levels of alcohol consumption not distinctly reported
114	Percy Y.M.; Yony Q.M.; Heber C.B. Factors associated with suicidal ideation in veterinary medicine students. *Revista de Investigaciones Veterinarias del Peru* 2024; 35(5): e29254	Information on levels of alcohol consumption not distinctly reported
115	Porter, A. C.; Carrasquillo, K. D.; Ashrafioun, L. Differences in the relation of binge drinking and prescription drug misuse to suicide ideation and attempts between college-aged adults and adults above the age of 25: Findings from the 2015-2019 National Survey on Drug Use and Health (NSDUH). *Journal of Psychiatric Research* 2024; 173: 281EP - 285	
116	Presseau, C.; Fischer, I.C.; Aunon, F.M.; Webermann, A.R.; Pietrzak, R.H. Differentiating uS Military women veterans with suicidal ideation, suicide attempts, and no suicidal ideation or attempts. *Military Psychology*	Information on levels of alcohol consumption not distinctly reported
117	Quijada, Y.; Bustos Navarrete, C.; Inostroza, C.; Hausmann-Stabile, C. Suicidal ideation risk among Chilean high school students: An analysis of social, educational, and psychological mediator factors. *Psychological Studies* 2024; 69(3): 319-330	Information on levels of alcohol consumption not distinctly reported
118	Rahal, D.; Bower, J. E.; Irwin, M. R.; Fuligni, A. J. Associations between emotional reactivity to stress and adolescent substance use: Differences by sex and valence. *Stress and Health* 2024; 40(5): e3420	Outcome not of interest
119	Rainbow, C.; Baldwin, P.; Hosking, W.; Blashki, G.; Batterham, P. J. The 'Abstainer Question': Relationships between alcohol use and suicidal ideation in Australian online help-seekers. *Journal of Affective Disorders Reports* 2023; 14: 100659	Population with clinical health condition or AUD
120	Ranjan, R.; Yadav, J.; Ranjan, V.; Venkateswaran, C.; John, D. Association of Self-reported Depressed Mood and Alcohol or Tobacco Use Among Older Adults in India: A Study Based on Longitudinal Aging Study India Wave-1. *Indian journal of psychological medicine* 2024	Wrong study design (for outcome of interest)
121	Reina-Aguilar, P.; DÃ-az-JimÃ©nez, R.M.; Caravaca-SÃinchez, F. Suicide Risk among University Students in Spain: Implications for Social Work. *Social work* 2023; 68(4): 299-306	Wrong exposure
122	Remmerswaal, K. C. P.; Ten Have, M.; de Graaf, R.; van Balkom, A. J. L. M.; Penninx, B. W. J. H.; Batelaan, N. M. Risk factors of chronic course of anxiety and depressive disorders: a 3-year longitudinal study in the general population. *Social psychiatry and psychiatric epidemiology*2024; 59(9): 1607EP - 1615	Population with clinical health condition or AUD
123	Reynolds, A.; Paige, K. J.; Colder, C. R.; Mushquash, C. J.; Wendt, D. C.; Burack, J. A.; O'Connor, R. M. Negative Affect and Drinking among Indigenous Youth: Disaggregating Within- and Between-Person Effects. *Research on child and adolescent psychopathology* 2024; 52(6): 865EP - 876	Outcome not of interest
124	Rhew, I. C.; Graupensperger, S.; Martinez, G.; Lee, C. M. Monthly patterns of depressive symptoms and substance use and their relation to longer-term hazardous substance use and mental health problems: Examining mutual maintenance using monthly data from young adults. *Addictive Behaviors* 2025; 166: 108326	Wrong publication type

125	Richardson, L.; Marvin, C.; Mitchell, S. M.; Petrovic, J.; Victor, S. E.; Mills, D. J. Hazardous Drinking Amplifies the Association Between Emotion-Based Impulsivity and Negative Thoughts Related to Suicide Ideation Among Adults. *Archives of suicide research* 2025	Population with clinical health condition or AUD
126	Rimkeviciene, J.; Grigiene, D.; Dadasev, S.; Skruibis, P.; Gailiene, D. Unravelling the complexity of suicidality: a network analysis of theory-driven and culturally relevant suicide risk factors in a country with high suicide rates. *Nordic Journal of Psychiatry* 2024; 78(8): 743EP - 751	Information on levels of alcohol consumption not distinctly reported
127	Risbud, R. D.; Guyer, A. E.; Robins, R. W.; Hastings, P. D. Development of Comorbid Alcohol Use and Depressive Symptoms During Late Adolescence: Examining the Roles of Emotion Regulation and Gender Differences. *Research on child and adolescent psychopathology* 2024; 52(12): 1931EP - 1943	Information on levels of alcohol consumption not distinctly reported
128	Rodriguez-Cano, Ruben; Paulus, Daniel J.; Derrick, Jaye L.; Blalock, Janice A.; Zvolensky, Michael J. Emotion dysregulation and hazardous drinking in relation to suicidal ideation among Spanish-speaking Latinx daily-smokers. *Journal of substance abuse treatment* 2022; 132: 108508	Population with clinical health condition or AUD
129	Rosales, R.; Sellers, C. M.; Lee, C. S.; Santos, B.; O'Brien, K.; Colby, S. M. Examining Racial/Ethnic Differences in the Association of Victimization and Suicidal Thoughts and Behaviors with Alcohol Use Among Sexual Minority Youth. *LGBT health* 2023; 10(2): 109EP - 120	Information on levels of alcohol consumption not distinctly reported
130	Rotunda, R. J.; Herzog, J.; Dillard, D. R.; King, E.; O'Dare, K. Alcohol Misuse and Correlates with Mental Health Indicators among Firefighters. *Substance use & misuse* 2025; 60(2): 236EP - 243	Information on levels of alcohol consumption not distinctly reported
131	Saeed, F.; Ghalehnovi, E.; Saeidi, M.; Ali Beigi, N.; Vahedi, M.; Shalbafan, M.; Kamalzadeh, L.; Nazeri Astaneh, A.; Jalali Nadoushan, A.H.; Shoib, S. Factors associated with suicidal ideation among medical residents in Tehran during the COVID-19 pandemic: A multicentric cross-sectional survey. *PloS one* 2024; 19(3): e0300394	Information on levels of alcohol consumption not distinctly reported
132	Salama, E.; Castaneda, A. E.; Suvisaari, J.; Rask, S.; Laatikainen, T.; Niemela, S. Substance use, affective symptoms, and suicidal ideation among Russian, Somali, and Kurdish migrants in Finland. *Transcultural Psychiatry* 2022; 59(21): 37EP - 51	Wrong study design (for outcome of interest)
133	Saldivia, S.; Aslan, J.; Cova, F.; Bustos, C.; Inostroza, C.; Castillo-Carreno, A. Life satisfaction, positive affect, depression and anxiety symptoms, and their relationship with sociodemographic, psychosocial, and clinical variables in a general elderly population sample from Chile. *Frontiers in Psychiatry* 2023; 14: 1203590	Outcome not of interest
134	Sanchez-Neyra, A. C.; Lloclla-Gonzales, H.; Silva-Diaz, H. Factors associated with suicidal ideation in adults from the lambayeque region, peru, during the covid-19 pandemic. *Revista de la Facultad de Medicina Humana* 2024; 24(1): 51EP - 57	Outcome not of interest
135	Sapranaviciute-Zabazlajeva, L.; Sileikiene, L.; Luksiene, D.; Tamosiunas, A.; Radisauskas, R.; Milvidaite, I.; Bobak, M. Lifestyle factors and psychological well-being: 10-year follow-up study in Lithuanian urban population. *BMC public health* 2022; 22(1): 1011	Outcome not of interest
136	Schafer, A. A.; Santos, L. P.; Quadra, M. R.; Dumith, S. C.; Meller, F. O. Alcohol Consumption and Smoking During Covid-19 Pandemic: Association with Sociodemographic, Behavioral, and Mental Health Characteristics. *Journal of community health* 2022; 47(4): 588EP - 597	Association in the opposite direction to the direction of interest

137	Serebriakova, J.; Kemmler, G.; Deisenhammer, E. A. Proximal and Distal Factors Distinguishing between Individuals with Suicidal Ideation only and Suicide Attempters. *Journal of Nervous and Mental Disease* 2024; 212(1): 12EP - 15	Information on levels of alcohol consumption not distinctly reported
138	Sierra, V. Q. Predicting Suicidal Ideation Among Native American High Schoolers in California. *Archives of suicide research* 2025	Information on levels of alcohol consumption not distinctly reported
139	Smith, L; Shin, J.I.; Carmichael, C.; Oh, H.; Jacob, L.; LÃ³pez SÃinchez, G.F.; Tully, M.A.; Barnett, Y.; Butler, L.; McDermott, D.T.; Koyanagi, A. Prevalence and correlates of multiple suicide attempts among adolescents aged 12â€“15 years from 61 countries in Africa, Asia, and the Americas. *Journal of Psychiatric Research* 2021; 144: 45-53	Information on levels of alcohol consumption not distinctly reported
140	Tachikawa, H.; Takahashi, S.; Nemoto, K.; Yonemoto, N.; Oda, H.; Miyake, Y.; Hirayasu, Y.; Arai, T.; Kawanishi, C. Predictive factors for recurrent suicide attempts: evidence from the ACTION-J study. *PCN reports: psychiatry and clinical neurosciences* 2022; 1(2): e7	Population with clinical health condition or AUD
141	Tervo-Clemmens, B; Gilman, J.M.; Evins, A.E; Bentley, K.H.; Nock, M.K.; Smoller, J.W.; Schuster, R.M. Substance Use, Suicidal Thoughts, and Psychiatric Comorbidities Among High School Students. *JAMA Pediatrics* 2024; 178(3): 310-313	Wrong publication type
142	Thompson, M. F.; Schwandt, M. L.; Ramchandani, V. A.; Diazgranados, N.; Goldman, D.; Luk, J. W. Stress and alcohol-related coping mechanisms linking lifetime suicide ideation and attempt to multidimensional quality of life. *Journal of Affective Disorders* 2024; 351: 729EP - 737	Information on levels of alcohol consumption not distinctly reported
143	Tillman, L.L. Suicidal ideation among American Indian and Alaska Natives in the United States. 2022; 83	Wrong publication type
144	Varin, M.; Liu, L.; Gabrys, R.; Gariepy, G.; MacEachern, K. H.; Weeks, M. Increased alcohol use, heavy episodic drinking, and suicide ideation during the COVID-19 pandemic in Canada. *Canadian journal of public health* 2023; 114(1): 33EP - 43	Outcome not of interest
145	Vasiliadis, H. M.; Spagnolo, J.; Bartram, M.; Fleury, M. J.; Gouin, J. P.; Grenier, S.; Roberge, P.; Shen-Tu, G.; Vena, J. E.; Lamoureux-Lamarche, C.; Wang, J. Factors associated with change in moderate or severe symptoms of anxiety and depression in community-living adults and older adults during the COVID-19 pandemic. *Canadian journal of public health* 2024; 115(2): 230EP - 243	Outcome not of interest
146	Villanueva-Blasco, V. J.; Lozano-Polo, A.; Guillamo Minguez, C.; Villanueva-Silvestre, V.; Isorna Folgar, M.; Gea-Caballero, V.; Vazquez-Martinez, A. The Healthcare Profession as a Determinant of Depression, Suicidal Ideation, and Drug Use in Spain During the COVID-19 Pandemic Crisis. *Journal of Psychoactive Drugs* 2025	Wrong study design (for outcome of interest)
147	Wang, C.D.C.; Anderson-White, E.; Jin, L. Adult attachment, maladaptive coping, alcohol consumption, and drinking-related problems. *Counselling Psychology Quarterly* 2022; 35(1): 43-60	Outcome not of interest
148	Wang, M.; Qin, A.; Wei, Z.; Sun, L. Differentiating the associations between alcohol use, cigarette smoking, and conditional suicidal behaviors among adolescents. *Journal of Affective Disorders* 2023; 341: 112EP - 118	Information on levels of alcohol consumption not distinctly reported
149	Wang, N.; Yan, X.; Imm, K.; Xu, T.; Li, S.; Gawronska, J.; Wang, R.; Smith, L.; Yang, L.; Cao, C. Racial and ethnic disparities in prevalence and correlates of depressive symptoms and suicidal ideation among adults in the United States, 2017-2020 pre-pandemic. *Journal of Affective Disorders* 2024; 345: 272EP - 283	Information on levels of alcohol consumption not distinctly reported

150	Werneck, A.O.; Vancampfort, D.; Schuch, F.; Aldisi, D.; Al-Daghri, N.; Baca, A.; Smith, L.; Firth, J.; Stubbs, B. What is the relationship between individual and clusters of lifestyle behaviours during early adolescence with future youth mental health? a prospective cohort study. *Springer Science and Business Media LLC* 2025	Information on levels of alcohol consumption not distinctly reported
151	Williams, G. C.; Patte, K. A.; Ferro, M. A.; Leatherdale, S. T. Exploring the Bi-Directional Associations between Poly-Substance Use and Symptoms of Anxiety and Depression among a Large Sample of Canadian Adolescents. *Canadian Journal of Addiction* 2022; 13(2): 7EP - 16	Wrong exposure
152	Wong, S. M. Y.; Ip, C. H.; Hui, C. L. M.; Suen, Y. N.; Wong, C. S. M.; Chang, W. C.; Chan, S. K. W.; Lee, E. H. M.; Lui, S. S. Y.; Chan, K. T.; Wong, M. T. H.; Chen, E. Y. H. Prevalence and correlates of suicidal behaviours in a representative epidemiological youth sample in Hong Kong: the significance of suicide-related rumination, family functioning, and ongoing population-level stressors. *Psychological medicine* 2023; 53(10): 4603EP - 4613	Information on levels of alcohol consumption not distinctly reported
153	Woo, H. G.; Park, S.; Yon, H.; Lee, S. W.; Koyanagi, A.; Jacob, L.; Smith, L.; Cho, W.; Min, C.; Lee, J.; Lee, H.; Kwon, R.; Fond, G.; Boyer, L.; Joo, Y. Y.; Choi, Y. S.; Yeo, S. G.; Rhee, S. Y.; Shin, J. I.; Yon, D. K. National Trends in Sadness, Suicidality, and COVID-19 Pandemic-Related Risk Factors Among South Korean Adolescents From 2005 to 2021. *JAMA Network Open* 2023; 6(5): E2314838	Wrong study design (for outcome of interest)
154	Wu, D.; Zhong, X.; Deng, R.; Pan, H.; Gao, Y.; Lin, B.; Tang, X.; Dai, J.; Liang, H.; Huang, A. Study on anxiety and depression of men who have sex with men: An application of group-based trajectory model. *Frontiers in psychology* 2022; 13: 857203	Information on levels of alcohol consumption not distinctly reported
155	Xiang, J.; Peng, F.; Jiao, J.; Tan, T.; Liu, L.; Chen, M.; Wang, J.; Luo, D.; Liu, S. Health risk behaviors, depressive symptoms and suicidal ideation among college students: A latent class analysis in middle China. *Journal of Affective Disorders* 2025; 375: 205EP - 213	Information on levels of alcohol consumption not distinctly reported
156	Xu, C.; Wang, S.; Bin Su, B.; Ozuna, K.; Mao, C.; Dai, Z.; Wang, K. Associations of adolescent substance use and depressive symptoms with adult major depressive disorder in the United States: NSDUH 2016-2019. *Journal of Affective Disorders* 2024; 344: 397-406.	Wrong study design (for outcome of interest)
157	Yan, C.; Ding, Y.; He, H.; Lyu, J.; Zhao, Y.; Yang, Z.; Meng, H. Heavy alcohol consumption, depression, their comorbidity and risk of all-cause and cause-specific mortality: a prospective cohort study. *Social psychiatry and psychiatric epidemiology* 2025	Outcome not of interest
158	Yang, E.; Woo, H. Lifestyle health behaviors and experience of depression among middle and high school students in South Korea: A comparison between 2010-2013 and 2020-2023. *Preventive Medicine Reports* 2025; 55: 103102	Wrong study design (for outcome of interest)
159	Yang, G.; D'Arcy, C. The changing relationship between health risk behaviors and depression among birth cohorts of Canadians 65+, 1994-2014. *Frontiers in Psychiatry* 2022; 13: 1078161	Wrong study design (for outcome of interest)
160	Yang, Y. Suicidal Thoughts and Behaviors Among US Adolescents: The Cumulative Effects of Polysubstance Use Behaviors. *Substance use & misuse* 2024; 59(13): 1930EP - 1937	Wrong exposure
161	Yang, Y. Lifetime use of multiple substances and youth suicide risk: Assessing the role of depressive symptoms using structural equation modelling. *Public Health* 2024; 234: 71-76	Information on levels of alcohol consumption not distinctly reported

162	Yap, L. K.; Peltzer, K.; Lkhamsuren, Z.; Suanrueang, P. Suicide attempt among school-based adolescents in Bolivia: Risk factors and gender differences. *International Journal on Disability and Human Development* 2023; 22(2): 189EP - 195	Information on levels of alcohol consumption not distinctly reported
163	Yeskendir, A.; Eisenberg, D.; Kaplan, M. S. Acute use of alcohol before suicide in Kazakhstan: A population-wide study. *Journal of Affective Disorders* 2023; 321: 134EP - 139	Population with clinical health condition or AUD
164	Yim, M.; Kim, H.; Kim, G.; Hur, J. W. Acute Alcohol Use and Suicide. *JAMA Network Open* 2025: e2461409	Population with clinical health condition or AUD
165	Yu, X.; Gain, E. P.; Kedia, S. K. Bidirectional associations between alcohol drinking and depressive symptom scores among US older adults. *Journal of Affective Disorders* 2024; 349: 48EP - 53	Information on levels of alcohol consumption not distinctly reported
166	Zhan, Y.; Wang, P.; Zhan, Y.; Lu, Z.; Guo, Y.; Ahmad, N.A.; Owusu, A.; Chher, T.; Hinneh, J.T.; Aryal, K.K.; Darwish, N.; Senanayake, S.J.; Mufadhal, B.A.A.; Rady, A.; Bassier-Paltoo, M.; Batbaatar, S. Clustering of lifestyle risk factors in relation to suicidal thoughts and behaviors in young adolescents: a cross-national study of 45 low- and middle-income countries. *BMC global and public health* 2024; 2(1): 24	Wrong study design (for outcome of interest)

Appendix C – Studies included from the Cochrane Canada update

No.	Article
1	An, R. and Xiang, X. Smoking, heavy drinking, and depression among U.S. middle-aged and older adults. *Prev Med.* 2015, 18; 295-302
2	Ahuja M, Awasthi M, Records K, Lamichhane RR. Early age of alcohol initiation and its association with suicidal behaviors. *Substance use & misuse*. 2021 Jul 29;56(9):1332-8.
3	Armeli S, Sullivan TP, Tennen H. Drinking to cope motivation as a prospective predictor of negative affect. *Journal of Studies on Alcohol and Drugs*. 2015 Jul;76(4):578-84.
4	Augestad LB, Slettemoen RP, Flanders WD. Physical activity and depressive symptoms among Norwegian adults aged 20–50. *Public health nursing*. 2008 Nov;25(6):536-45.
5	Bell S, Britton A. Drinking pattern during midlife and risk of developing depression during 28 years of follow-up: a prospective cohort study. *Drug and alcohol dependence*. 2015 Oct 1;155:111-7.
6	Bots S, Tijhuis M, Giampaoli S, Kromhout D, Nissinen A. Lifestyle-and diet-related factors in late-life depression—a 5-year follow-up of elderly European men: the FINE study. *International Journal of Geriatric Psychiatry*. 2008 May;23(5):478-84.
7	Bulloch A, Lavorato D, Williams J, Patten S. Alcohol consumption and major depression in the general population: the critical importance of dependence. *Depression and anxiety*. 2012 Dec;29(12):1058-64.
8	Byers AL, Vittinghoff E, Lui LY, Hoang T, Blazer DG, Covinsky KE, Ensrud KE, Cauley JA, Hillier TA, Fredman L, Yaffe K. Twenty-year depressive trajectories among older women. *Archives of general psychiatry*. 2012 Oct 1;69(10):1073-9.
9	Cabello M, Miret M, Caballero FF, Chatterji S, Naidoo N, Kowal P, D'Este C, Ayuso-Mateos JL. The role of unhealthy lifestyles in the incidence and persistence of depression: a longitudinal general population study in four emerging countries. *Globalization and health*. 2017 Mar 20;13(1):18.
10	Carvalho AF, Stubbs B, Maes M, Solmi M, Vancampfort D, Kurdyak PA, Brunoni AR, Husain MI, Koyanagi A. Different patterns of alcohol consumption and the incidence and persistence of depressive and anxiety symptoms among older adults in Ireland: A prospective community-based study. *Journal of affective disorders*. 2018 Oct 1;238:651-8.
11	Cerdá M, Prins SJ, Galea S, Howe CJ, Pardini D. When psychopathology matters most: identifying sensitive periods when within-person changes in conduct, affective and anxiety problems are associated with male adolescent substance use. *Addiction*. 2016 May;111(5):924-35.
12	Chan GC, Kelly AB, Toumbourou JW. Accounting for the association of family conflict and heavy alcohol use among adolescent girls: The role of depressed mood. *Journal of Studies on Alcohol and Drugs*. 2013 May;74(3):396-405.
13	Chang SC, Pan A, Kawachi I, Okereke OI. Risk factors for late-life depression: a prospective cohort study among older women. *Preventive medicine*. 2016 Oct 1;91:144-51.
14	Cheng HG, Chen S, McBride O, Phillips MR. Prospective relationship of depressive symptoms, drinking, and tobacco smoking among middle-aged and elderly community-dwelling adults: Results from the China Health and Retirement Longitudinal Study (CHARLS). *Journal of affective disorders*. 2016 May 1;195:136-43.
15	Chou KL, Liang K, Mackenzie CS. Binge drinking and Axis I psychiatric disorders in community-dwelling middle-aged and older adults: results from the National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). *The Journal of clinical psychiatry*. 2011 Jan 25;72(5):1895.

16	Cisler JM, Begle AM, Amstadter AB, Resnick HS, Danielson CK, Saunders BE, Kilpatrick DG. Exposure to interpersonal violence and risk for PTSD, depression, delinquency, and binge drinking among adolescents: Data from the NSA - R. *Journal of traumatic stress*. 2012 Feb;25(1):33-40.
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Appendix D – Characteristics of studies included in the current update

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Armeli et al.,[29] USA Drinking to cope motivation in college as a predictor of post-college interpersonal problems and depressive symptoms. n = 888 Longitudinal study of college students (moderate-heavy drinkers). 5 years.	Symptoms of depression: Beck Depressive Inventory.	30-day daily diary One drink: one 12-oz. beer, 4-oz. wine, 12-oz. wine cooler, or 1-oz. liquor. Overall drinking composite=Social + non-social drinking; values >15 recoded to 15. Overall mean drinks per day=Mean levels of night-time +daytime drinking. Heavy drinking: ≥5 (males); ≥4 (females) drinks/day.
Armstrong et al.,[45] India Correlates of suicidal ideation and attempts among colleges students in India: A multi-state cross-sectional survey. n = 8,317 Cross-sectional study of college students. N/A	Symptoms of depression: Patient Health Questionnaire.	Alcohol Use Disorder Identification Test (AUDIT-C) tool to measure frequency of alcohol consumption (never, monthly or less, 2-4/month, 2-3/week, ≥4/week).
Bolstad et al.,[30] Finland The relationships between use of alcohol, tobacco and coffee in adolescence and mood disorders in adulthood.	Diagnosis of mood disorders (major depression & bipolar): ICD-10 codes from two national health registers.	Survey to measure mean alcohol volume: frequency & volume of drinking. Excessive drinking: ≥6 (males); ≥4 (females) drinks/day.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
n = 6,799 Northern Finland Birth Cohort 1986 Study. 17 years		
Campbell-Sills et al.,[42] USA Prospective associations of alcohol and drug misuse with suicidal behaviours among US Army soldiers who have left active service. n = 6,811 Longitudinal study of former military personnel. Mean (SD) of 17.4 (1.4) months.	Suicide ideation survey adapted from the Columbia-Suicide Severity Rating.	Substance use survey adapted from the Composite International Diagnostic Interview Screening Scales. Binge drinking: ≥5 (males) or ≥4 (females) drinks/day at least once in the last 30 days.
Cho et al.,[31] South Korea Associations of changes in alcohol consumption on the risk of depression/suicide among initial non-drinkers. n = 129,446 National Health Insurance Service Health Screening Cohort. 17 years	Incidence of major depression (with a single or recurrent episode, along with records of antidepressant prescription) over the follow-up period was diagnosed using ICD-10 codes. Suicide was defined by ICD-10 codes for intentional self-harm and sequelae of intentional self-harm.	Volume and frequency of alcohol consumption: Number of glasses per day: non-drinking (0) or >0–≤1, >1–≤2, >2–≤4 and >4. Frequency of weekly alcohol consumption: 0, 1, 2, 3–4, and 5–7 days per week. Amount of alcohol consumption: nondrinking or light drinking (>0–≤1 glass per day and 1 day per week), light-to-moderate drinking (>1–≤2 glasses and 2 days), moderate-to-heavy drinking (>2–≤4 glasses and 3–4 days) and heavy drinking (>4 glasses and 5–7 days).

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Dabravolskaj et al.,[32] Canada The impact of 12 modifiable lifestyle behaviours on depressive and anxiety symptoms in middle adolescence: prospective analyses of the Canadian longitudinal COMPASS study. n = 24,274 Longitudinal - annual cohort study - survey of lifestyle behaviours. 1 year	Self-report questionnaire, Centre for Epidemiologic Studies Depression Scale (CESD-R-10) - 10-item; depression in the last 7 days: none, <1 day, 1-2 days, 3-4 days and 5-7 days. Generalised Anxiety Disorder-7; frequency of generalised anxiety disorder symptoms in the last 2 weeks: not at all, 7 days, over half the days, and nearly every day.	Binge drinking: ≥5 drinks on one occasion.
Deng et al.[33] Europe An association study of depressive symptoms in adult couples over 50 years of age. n = 3,304 couples Longitudinal study of the Survey of Health, Ageing, and Retirement in Europe. 5 years	EURO-D scale: Each item was given a score of 0 or 1, with an overall score between 0 and 12, and a score of ≥ 4 was considered to have depressive symptoms.	Frequency alcohol consumption: "In the past 3 months, have you regularly consumed alcoholic beverages such as beer, cider, wine, spirits, or cocktails?" (Almost every day, three or four days a week, once or twice a week, once or twice a month, less than once a month, and not at all in the last 3 months).
Grove et al.,[46] USA Hazardous drinking and cannabis use in military veterans: Comparative associations with risk for suicidal and non-suicidal self-injury. n = 1,098	The Suicidal Behaviors Questionnaire-Revised: scores range from 1 to 18, higher scores = higher risk. "Elevated risk" total SBQR score of ≥ 7.	The Alcohol Use Disorders Identification Test (AUDIT-C). Hazardous drinking pattern is indicated if the score is ≥ 4 for a man, ≥ 3 for a woman.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Cross-sectional study of USA Gulf War veterans.		
Hammond et al.,[47] Norway The gendered relationship between illicit substance use and self-harm in university students. n = 49,825 Cross-sectional study 2018 Norwegian Students' Health and Wellbeing Study (SHoT2018).	Child and Adolescent Self-harm in Europe Study and from the Adult Psychiatric Morbidity Survey: Suicidal thoughts, and suicide attempt were each assessed with the following questions, respectively ▪ "Have you ever seriously thought of taking your life, but not actually attempted to do so?" (yes/no). ▪ "Have you ever made an attempt to take your life, by taking an overdose of tablets or in some other way?" (yes/no).	Frequency alcohol consumption: "How often do you have a drink containing alcohol?" (Never, "monthly or less", "2-4 times a month", "2-3 times a week" and "4 or more times a week"). AUDIT: Total scores range from 0 to 40 and a cut-off score of ≥ 8 was used to identify problematic. AUDIT scores <8 were considered to reflect low risk.
Hu et al.,[43] UK Composite lifestyle, genetic risk, blood biomarkers, and risk of suicide attempts: a prospective cohort study. n = 435,154 Longitudinal study using data from the UK Biobank 13.6 years	ICD codes from hospital inpatient records (for example, admission, diagnosed data): Hospital Episode Statistics for England, the Scottish Morbidity Record for Scotland, and the Patient Episode Database for Wales.	Alcohol frequency: 'About how often do you drink alcohol?' (Never, Special occasions only, One to three times a month, Once or twice a week, Three or four times a week, Daily or almost daily). A low-risk level was defined as consuming alcohol ≤3 times per week, while higher frequencies were categorised as high-risk.
Ju et al.,[34] China Interactive effect of sleep duration, lifestyle factors and comorbidity on depressive symptoms: Insights from the China health and retirement longitudinal study.	Center for Epidemiological Studies Depression Scale (CESD-10) - Depressive symptoms over the past week were evaluated via ten items: "(1) being bothered by trivial matters, (2) difficulty concentrating, (3) feeling depressed, (4) everything feeling like an effort, (5) feeling hopeless, (6) feeling fearful, (7) experiencing restless sleep, (8) feeling unhappy, (9) feeling lonely, and (10) feeling	Alcohol frequency - Two questions: 'In the past year, have you consumed alcohol, including beer, wine, rice wine, yellow wine, or spirits, including medicinal alcohol?' 'Over the past year, on average, how often did you consume alcohol per month?'

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
n = 8,234 Longitudinal of the China Health and Retirement Longitudinal Study 5 years	incapable of moving forward, with items 5 and 8 requiring reverse scoring". Scoring for each item was as follows: 0 (rarely or none of the time, <1 day), 1 (some or a little of the time, 1–2 days), 2 (occasionally or a moderate amount of time, 3–4 days), 3 (most or all of the time, 5–7 days) - CESD-10 total score range of 0–30 points. The cut-off point of depressive symptoms diagnosis score was 12. Participants with scores greater than or equal to 12 were classified as the "depressed group", while those with scores below 12 were categorised as the "non-depressed group".	(1. Once a month, 2. 2–3 times a month, 3. Once a week, 4. 2–3 times a week, 5. 4–6 times a week, 6. Once a day, 7. Twice a day, and 8. More than twice a day). Classification of drinking levels is aligned with the methodologies of the National Institute on Alcohol Abuse and Alcoholism in the United States, categorising individuals into: Non-drinkers (those who choose "3. I do not drink any alcohol" for the first question); Occasional drinkers (those selecting "2. I drink, but less than once per month"); Moderate drinkers (individuals answering "1. I drink more than once per month" and selecting either "2. 2-3 times per month" or "3. once a week" for the second question); Frequent drinkers (respondents indicating "1. I drink more than once per month" and choosing "4. 2-3 times a week"), and Heavy drinkers (those selecting "1. I drink more than once per month" for the first question and choosing "5. 4-6 times a week," "6. once a day," "7. twice a day," or "8. more than twice a day" for the second question).
Kim et al.,[35] Canada Do symptoms of depression and anxiety contribute to heavy episodic drinking? A 3-wave longitudinal study of adult community members.	Depressive Symptoms - Centre for Epidemiological Scale-Depression (CES-D-SF), Symptom Checklist Depression Subscale (SCL-90-D), Depression Anxiety Stress Scale Depression Subscale (DASS-21-D). The composite score was calculated by standardising and averaging these depressive measures. Anxiety Symptoms: Measured using the anxiety subscale of the	Heavy Episodic Drinking was measured using a composite index, which included: Frequency - Participants reported how often they consumed 4+ drinks (for females) or 5+ drinks (for males) within a 2-hour period in the past 7 days.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
n = 102 Longitudinal study of adult community members 6 months	Depression Anxiety Stress Scale (DASS-21-A): Participants responded to items (for example, "I felt close to panic") on a scale from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Items were summed for a total score.	Severity - Participants indicated the greatest number of drinks consumed in a 2-hour period during the past 7 days. Perceptions - Participants rated their agreement with statements about their drinking behaviour (for example, "I rapidly drank a very large amount of alcohol within a 2-hour period") on a 5-point scale. (One drink = 2-ounce beer, a 5-ounce wine, or a 1 shot of liquor or spirits. Sex-specific threshold for HED (4 + drinks [female participants]; 5 + drinks [male participants]) The composite score was calculated by standardising and averaging these components.
Lange et al.,[49] USA Evaluation of the risk relationship between average alcohol volume consumed and suicide in the USA: an analysis of mortality linked cohort data. n = 553,971 Cross-sectional study of the USA National Health Interview Survey (NHIS)	Death by suicide was measured using ICD codes.	The Average alcohol consumption in grams per day (g/day) was calculated by multiplying the self-reported number of days participants drank alcohol in the past year, divided by 365, and then the average number of drinks on days participants drank, multiplied by 14 g/g/drink, assuming 14 g of pure alcohol per standard drink. These were categorised as alcohol intake in the past 12 months as: (1) lifetime abstainer (never drank alcohol in the past 12 months and never had 12+ drinks in any 1 year; reference group); (2) former drinker (never drank alcohol in the past 12 months but had 12+ drinks in any 1 year);

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
		(3) past year daily average of >0- 20 g for both males and females; (4) past year daily average of >20- 40 g for males and>20 g for females; (5) past year daily average of >40- 60 g for males only and (6) past year daily average of >60 g for males only. The latter two categories were for males only, as there were relatively few females who consumed >40 g/day (those that had were combined with the former group, denoted as >20 g/day for females). Lifetime abstainers (rather than current abstainers) = reference group
Ledden et al.,[50] England Alcohol use and its association with suicide attempt, suicidal thoughts and non-suicidal self-harm in two successive, nationally representative English household samples. n = 14,949 Cross-sectional study of English household survey -Adult Psychiatric Morbidity Survey (APMS)	Suicide attempts, suicidal thoughts, and non-suicidal self-harm were assessed by the following questions as part of the Clinical Interview Schedule: "Have you ever made an attempt to take your life, by taking an overdose of tablets or in some other way? "Have you ever thought of taking your life, even though you would not actually do it?" "Have you ever deliberately harmed yourself in any way but not with the intention of killing yourself?". Those who answered positively to either of these questions were asked a follow-up question on when this had last occurred.	Harmful alcohol use – AUDIT tool. Risk categories align with WHO guidelines: a score of 0 - 7 indicates "low-risk", 8 - 15 "moderate-risk", and ≥16 "high-risk" alcohol use. Frequency and quantity - Two AUDIT items relating to the frequency and quantity of drinking per week: 0 - 6 drinks is categorised as "light drinking", 7 - 13 drinks is "moderate drinking", 14 - 20 drinks is "hazardous drinking", 21 - 30 drinks is "harmful drinking", and >30 drinks is "probable dependence". Binge drinking - single AUDIT item: "How often do you have six or more drinks on one occasion?" "less than monthly or never", "monthly", "weekly" and "daily or almost daily".

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
		Dependence symptoms - Summing the scores of three AUDIT items: Scores for dependence symptoms ranged from 0 to 12.
Levola et al.,[44] Finland Associations of adolescent alcohol use and self-reported alcohol tolerance with risk of self-harm and suicide in early adulthood: a birth cohort study. n=7,735 Longitudinal study. Northern Finland Birth Cohort 1986 Study. 17-18 years.	Suicide death - Data were collected from the Population Register Data and the Registry for Causes of Death, which cover all deaths in Finland: Cause of death was categorised based on ICD-10 codes.	Age of First Drink (AFD) - The participants were asked at what age they first drank the following alcoholic beverages: beer, wine, spirits. (Never; age 11 or under; 12; 13; 14; 15 or 16). Age First Intoxication (AFI) - The participants were also asked at what age they had first been intoxicated (same response options). (Never; age 11 or under; 12; 13; 14; 15 or 16). For AFD and AFI, these groups consisted of individuals who had had their first drink or had first been intoxicated at age 14 or younger, over the age of 14 years, and those who had not consumed alcohol or had never been intoxicated (reference groups). For frequency of intoxication - groups were defined as infrequent (1-2 times), frequent (≥3 times), and no intoxication during the past 30 days (reference group).
Mieze et al.,[51] Latvia Self-reported suicidal behaviours and associated factors in the general population of Latvia (2010-2018). n = 16,084	Suicidal Behaviour was assessed by the following questions: "Have you ever felt that life was not worth living?" "Have you ever wished you were dead – for instance, that you could go to sleep and not wake up?" "Have you ever thought of taking your life, even if you would not really do it?"	Episodes of Heavy Drinking (EHD) in the past 12 months (intake of six or more doses of alcohol at once) with the following response categories: Never/ Less than monthly / Monthly / Weekly / Every or almost every day.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Cross-sectional study of secondary data from the Health Behaviour Among Latvian Adult Population survey	"Have you ever reached the point where you seriously considered taking your life, or perhaps made plans on how you would go about doing it?" Response options: "often," "sometimes," "hardly ever," "never" (dichotomised into "yes" and "no" for analysis). "Have you ever made an attempt to take your own life?" (yes/no)	
Rakoff et al.,[52] Canada n = 5,912 Cross-sectional study of factors associated with suicide ideation in Ontario adolescents.	Suicide ideation was measured by the question - "In the last 12 months, did you ever seriously consider attempting suicide?" (yes/no).	Frequency of alcohol consumption "In the last 12 months, how often did you drink alcohol?" Alcohol use was grouped as "non-use", "occasional use" (monthly or less), and "regular use" (at least twice a month).
Sato et al.,[36] Japan A prospective study of the association between lifestyle and the risk of depressive symptoms. n = 6,629 Longitudinal study of adults who attended a health measurement course at the Osaka Centre for Cancer and Cardiovascular Disease Prevention. 5.06 years	Depressive symptoms - Primary Care Evaluation of Mental Disorders (PRIME-MD) questionnaire: "Little interest or enjoyment in doing anything (lack of interest)" and "Feeling depressed or hopeless (depressed mood)". Participants who answered "yes" to both questions were classified as having depressive symptoms.	Alcohol consumption was measured by asking participants about their drinking habits, defined as drinking at least once weekly: "Never drinking" - never consuming alcohol regularly in the past or present. "Former drinking" - previously drank at least once weekly but had stopped habitual drinking by the time of the survey. "Current drinking" - participants who reported habitual drinking were further categorised based on their average daily alcohol intake: ○ "Current drinking (≤2 drinks/day)" Consumed less than or equal to two "go" (a Japanese unit equivalent to 43.2 g of pure alcohol per day). ○ "Current drinking (>2 drinks/day)" Consumed more than two "go" per day.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Schmeckenbecher et al.,[54] Germany Prevalence and association of suicidal ideation and high risk drinking in men and women: results from a representative German household survey. n = 2,437 Cross-sectional study of the household survey of the general population.	The Suicidal Behaviour Questionnaire Revised (SBQ-R) - a 4-item self-report questionnaire evaluating suicidal thoughts and behaviours. Its items include: (Item 1) - lifetime history of suicidal thoughts and behaviours; (Item 2) - 12-month prevalence of suicidal ideation ever (range 1–5) was used to measure the frequency of suicidal ideation in the previous 12months); (Item 3) - informed others of suicidal thoughts or behaviours; (Item 4) - the likelihood of suicidal behaviour in the future. Participants responded on a Likert scale.	The Alcohol Use Disorders Identification Test (AUDIT-C): Participants respond on a 5-point Likert scale (0–4). It contains three items: "How often did you have a drink containing alcohol in the past year?" "How many drinks containing alcohol did you have on a typical day when you were drinking in the past year? " "How often did you have six or more drinks on one occasion in the past year?" AUDIT-C sum scores of 4 for females and 5 for males, respectively, indicate high-risk drinking.
Triolo et al.,[37] Sweden Mapping 15-year depressive symptom transitions in late life: population-based cohort study. n = 2,745 Longitudinal study of the Population-based Swedish National Study on Ageing and Care. 15 years	Depressive state transitions (no depression, subsyndromal symptomatic depression (SSD) - measured by DSM-IV-TR diagnosis by trained physicians using the Comprehensive Psychopathological Rating Scale (CPRS).	Alcohol consumption was measured through questionnaires administered by trained nurses. It was categorised as none/occasional (≤3 drinks/month) or moderate-to-heavy (≥1 drink/week).
Visontay et al.,[38] USA Moderate alcohol consumption and depression: a marginal structural model approach promoting causal inference. n = 3,593	Depression was measured using the Centre for Epidemiologic Studies Depression Scale–Short Form (CES-D-SF) - a seven-item version of the CES-D. Higher scores on the CES-D-SF indicate greater depressive symptoms. The scale was analysed both in its continuous form and dichotomised into non-depression (scores < 8) or probable	Alcohol consumption was measured based on participants' self-reported: Frequency: The number of drinking days in the previous month. Volume: The number of drinks per drinking day, with a drink defined as the equivalent of a can of beer, a glass of wine, or a shot of hard liquor.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
The NLSY79 (National Longitudinal Survey of Youth 1979) Mean age of 30.81 years at baseline, follow-up at age 50 (approximately 20 years)	depression (scores ≥ 8) based on suggested cut-offs for probable depression.	Heavy Episodic Drinking: Defined as consuming at least six drinks on a single occasion. Alcohol consumption was then categorised into four groups: Abstinence: No alcohol consumption. Occasional Consumption: Drinking less than 1 day per week with no heavy episodic drinking. Moderate Consumption: Drinking at least 1 day per week, with weekly drinks not exceeding 7 for females or 14 for males, and no heavy episodic drinking. Above-Guideline Consumption: Drinking at least 1 day per week, with weekly drinks exceeding 7 for females or 14 for males, and/or engaging in heavy episodic drinking.
Wang et al.,[55] China Differentiating the association between age of alcohol use initiation and conditional suicidal behaviours among adolescents. n = 17,209 Cross-sectional school-based study - Youth Risk Behaviour Survey	Suicidal behaviours were divided into conditional suicidal behaviours, including no suicidal behaviour (NS), Suicidal ideation without a plan or attempt (SINPA), suicidal plan without an attempt (SPNA) and suicide attempt (SA).	Age of alcohol use initiation was assessed using the question: "How old were you when you had your first drink of alcohol, other than a few sips?" Responses included: "I have never had a drink of alcohol other than a few sips,"" 8 years old or younger,"" 9 or 10 years old," "11 or 12 years old,"" 13 or 14 years old,"" 15 or 16 years old," and "17 years old or older." Age of alcohol use initiation was recoded as 1 for "never (never-drinkers)", 2 for "13 years or older," and 3 for "before age 13,".
Werneck et al.,[39] Europe	Elevated depressive symptoms measured via EURO-D 12-item scale. The scale is composed of 12 dichotomy (yes or not) items, which inquire about depressed mood, pessimism, suicidality, guilt,	Binge drinking - participants were asked "how often do you have six or more drinks on one occasion?", with the possible answers: "1) Daily or almost every

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Cross-sectional and prospective associations of lifestyle risk behaviours clustering with elevated depressive symptoms among middle-aged and older adults. n = 31,190 Longitudinal study of the Survey of Health, Ageing and Retirement in Europe (SHARE) 4 years	sleep, interest, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness. The final score ranges between 0 and 12 and the adopted cut-off point for indicating elevated depressive symptoms is ≥4.	day; 2) Five or six days a week; 3) Three or four days a week; 4) Once or twice a week; 5) Once or twice a month; 6) Less than once a month; 7) Not at all in the last 3 months". At least once a month was considered a positive screening for binge drinking.
Werneck et al.,[40] Brazil Prospective associations between multiple lifestyle behaviours and depressive symptoms. n = 4,725 Longitudinal study of adults who participated in routine health evaluation at the Jardins unit of the Hospital Israelita Albert Einstein 3.1 years	The Beck Depression Inventory - The questionnaire includes 21 Likert-scale questions about different depressive symptoms, such as sadness, anhedonia, lack of energy, feeling of guilt, sleep problems, among others. The cut-off point of ≥10 to indicate the presence of elevated depressive symptoms.	Alcohol consumption - Alcohol Use Disorders Identification Test (AUDIT) questionnaire and the cut-off point of 5 was adopted for risky alcohol consumption. No risky drinking, such as AUDIT<5.
Xu et al.,[56] USA Suicide risk in U.S. adults: alcohol misuse, veteran status, and urbanization comparison. n = 231,264	Suicide risk indicators included suicidal ideation, planning, and attempt, based on self-report survey data: Suicide risk was assessed with three dichotomously scored questions: (1) "At any time in the past 12 months, did you seriously think about trying to kill yourself?" (if yes, then asked Questions 2 and 3);	Substance Abuse and Mental Health Services Administration Alcohol misuse categorised as binge drinking and heavy drinking, based on self-report measures. Heavy drinking was defined as 5 or more days of binge drinking in past month.

Reference, country Study title # of participants Database and follow-up time	Measure of outcome*	Measure of alcohol consumption*
Cross-section study of the National Survey on Drug Use and Health	(2) "During the past 12 months, did you make any plans to kill yourself?"; (3) "During the past 12 months, did you try to kill yourself?" Participants were categorised into four groups: (a) no suicide risk (reference group, if no to Question 1); (b) suicidal ideation only (if yes to Question 1 and no to Questions 2 and 3), (c) suicide planning without attempt (if yes to Questions 1 and 2 and no to Question 3), and (d) suicide attempt (if yes to Questions 1 and 3 and either yes or no to Question 2).	
Yu et al.,[41] USA Bidirectional associations between alcohol drinking and depressive symptoms among us adults aged 50 to 75: the us health and retirement study. n = 11,057 Longitudinal study used data from the Health and Retirement Study. 16 years	Depressive symptoms - 8-item Center for Epidemiological Studies-Depression (CES-D) measure: If participants answered "yes" to "much of time" during the past week on the follow six items: "felt depressed", "felt everything an effort", "sleep was restless", "could not get going", "felt lonely", and "felt sad", a value of 1 was assigned to the item, while the two positive items, "enjoy life" and "was happy", were reverse coded as 0 for "yes". The CES-D score was the sum of these eight items, ranging from 0 to 8. A CES-D score ≥4 was used to indicate a high risk of depression.	Alcohol consumption: Participants were asked whether they ever drank any alcohol, and if they did, the average number of days per week they drank and the number of drinks per day when they drank. They were converted into the number of drinks per week: Number of drinks per week, self-reported): non-drinkers (0 drink/week), low/moderate drinkers (≤14 drinks/week for males, ≤7 drinks/week for females), and heavy drinkers (>14 drinks/week for males, and >7 drinks/week for females).

Key: AUDIT = Alcohol Use Disorder Identification Test; CES-D = Center for Epidemiological Studies-Depression; N/A = not applicable; USA = United States of America.

Appendix E – Risk of Bias assessment of studies included in the current update

	QUIPS domain						
Reference (Year)	**1**	**2**	**3**	**4**	**5**	**6**	**Overall Risk of Bias**
Armeli et al.[29] (2025)	H	L	M	L	M	L	M
Armstrong et al.[45] (2025)	M	L	L	L	M	L	M
Bolstad et al.[30] (2022)	L	M	L	L	L	L	L
Campbell-Sills et al.[42] (2025)	L	H	M	L	L	L	M
Cho et al.[31] (2024)	L	M	L	L	L	M	M
Dabravolskaj et al.[32] (2023)	L	M	M	L	L	L	M
Deng et al.[33] (2025)	L	H	M	L	M	L	M
Grove et al.[46] (2025)	L	M	L	L	L	L	M
Hammond et al.[47] (2022)	L	L	L	L	L	L	L
Hu et al.[43] (2025)	L	M	L	L	L	L	L
Ju et al.[34] (2025)	L	H	M	L	L	L	M
Kim et al.[35] (2022)	H	H	L	L	H	L	H
Lange et al.[49] (2024)	L	L	L	L	M	L	L
Ledden et al.[50] (2022)	L	M	L	M	L	L	M
Levola et al.[44] (2023)	L	L	M	L	L	M	M
Mieze et al.[51] (2023)	L	H	M	L	M	L	M
Rakoff et al.[52] (2023)	H	H	M	M	L	L	H
Sato et al.[36] (2025)	M	M	L	L	M	L	M
Schmeckenbecher et al.[54] (2025)	L	M	L	L	L	L	L
Triolo et al.[37] (2024)	L	M	H	L	L	L	M

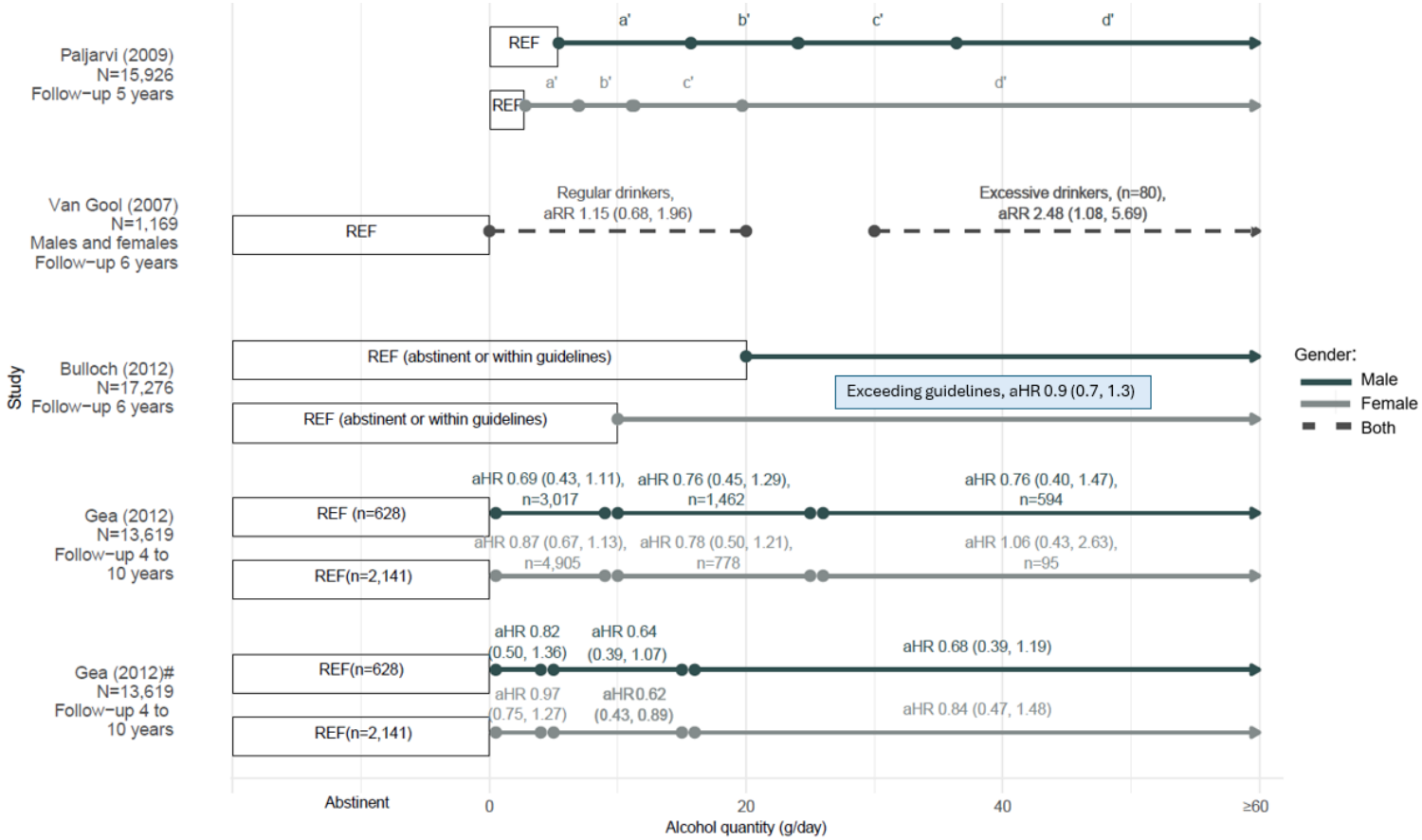
Visontay et al.[38] (2023)	L	M	L	L	L	L	L
Wang et al.[55] (2024)	L	M	L	L	M	L	M
Werneck et al.[39] (2022)	M	M	M	L	M	L	M
Werneck et al.[40] (2022)	M	H	L	L	L	L	M
Xu et al.[56] (2024)	L	M	L	L	L	L	L
Yu et al.[41] (2025)	L	M	M	L	M	L	M

Key: H = High risk of bias; M = Moderate risk of bias; L = Low risk of bias.

Note: Domains of the QUIPS tool: 1 = study participation; 2 = study attrition; 3 = prognostic factor measurement; 4 = outcome measurement; 5 = study confounding; 6 = statistical analysis and reporting.

Appendix F – Additional graphs for quantity of alcohol consumed and development of depression in adults (studies of moderate and high risk of bias)

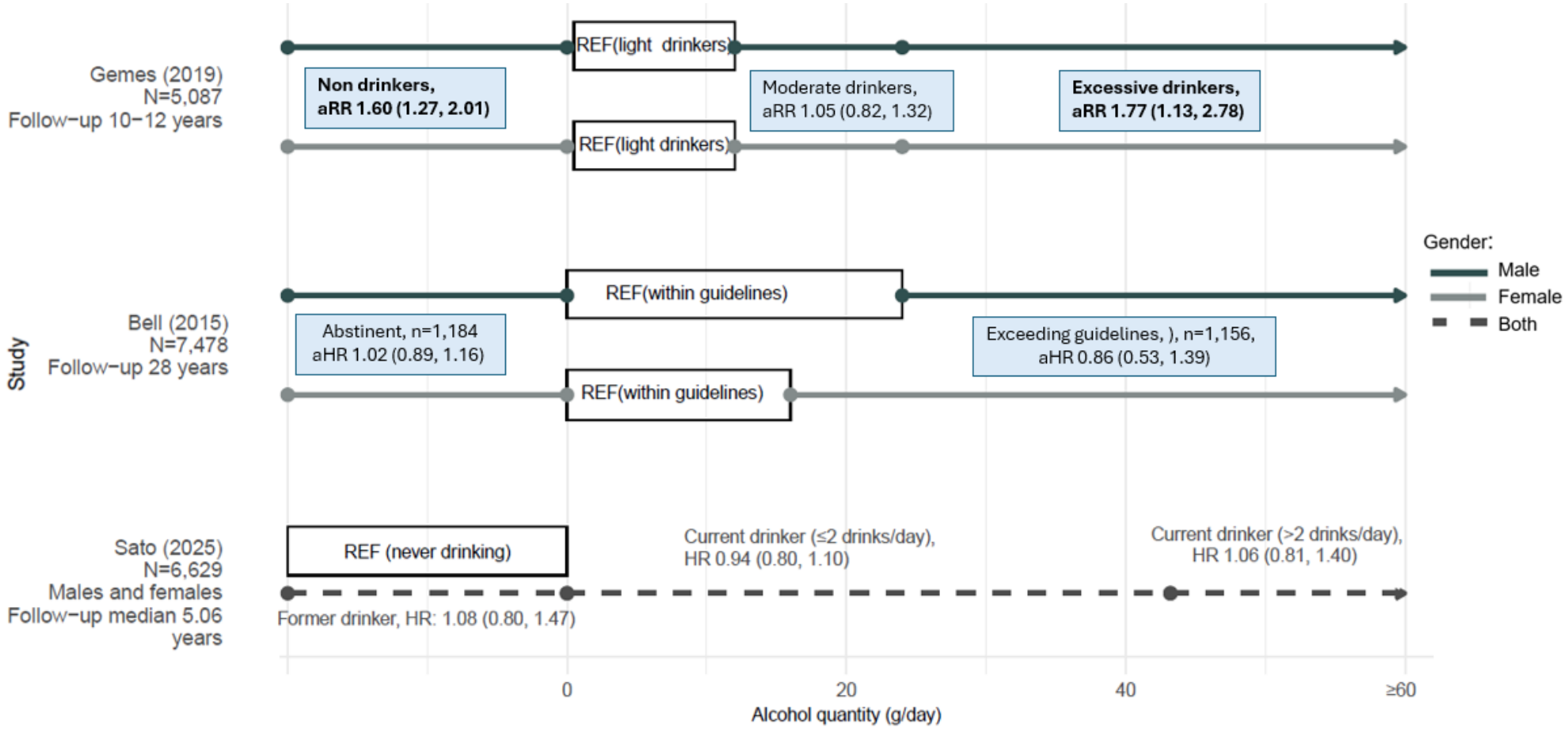
Appendix Figure. 1 Quantity of alcohol consumed and development of depression in adults (studies of moderate risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; aRR = adjusted risk ratio; Ref = reference group; a' = aOR 1.02 (0.89, 1.04), n = 6,059; b' = **aOR 1.11 (1.01, 1.21), p<0.05, n=3,126**; c' = **aOR 1.16 (1.04, 1.30), p<0.05, n = 1,500;** d' = **aOR 1.43 (1.28, 1.60), p<0.05. n=1,543.**
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category. Where both genders had the same alcohol category definitions and were analysed together a grey bar represents the drinking categories and the measures of association are in black. Gea et

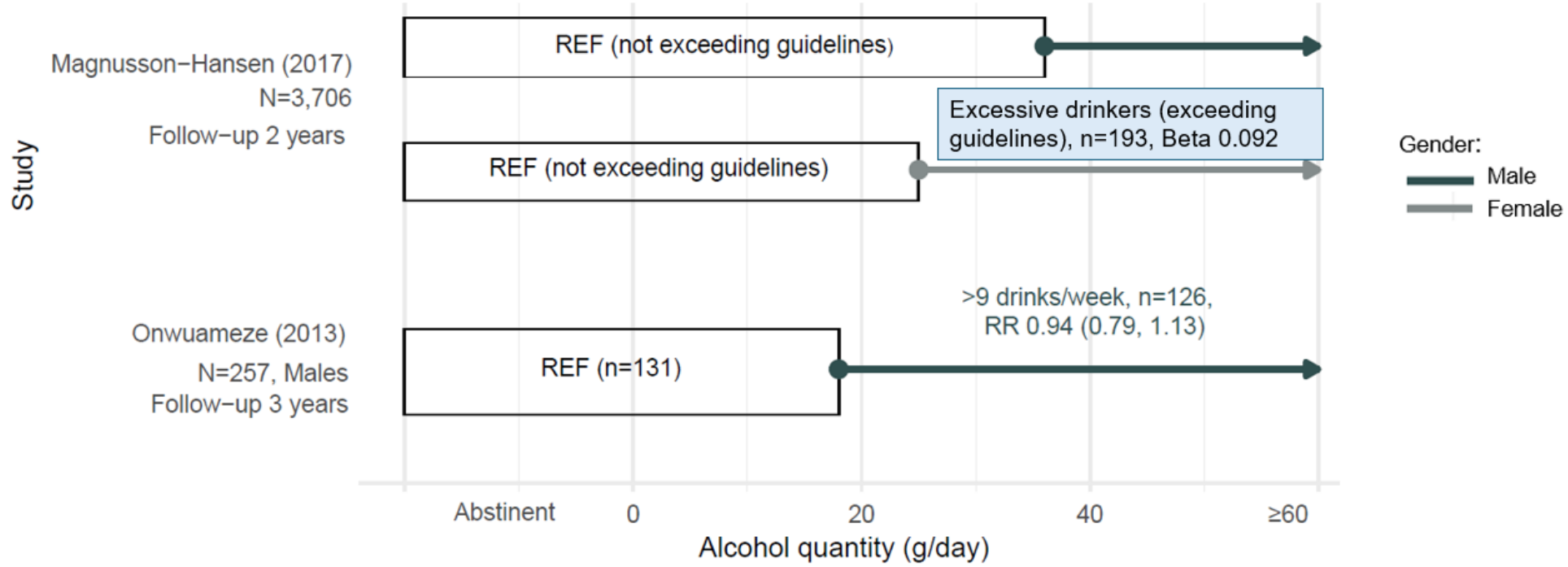
al.[71] analysed their data based on different categories, 'Gea 2012' is the original analysis, and 'Gea 2012#' is after the groups were redivided into different subgroups based on regression spline analysis. Lee et al.[166] was included in the Cochrane Canada rapid update for alcohol consumption and depression but was not deemed relevant in the current update.

Appendix Figure. 2 Quantity of alcohol consumed and development of depression in adults (studies of moderate risk of bias) (cont.)



Key: aHR = adjusted hazard ratio; aRR = adjusted risk ratio; HR = hazard ratio; OR = odds ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category. Where both genders had the same alcohol category definitions and were analysed together, a grey bar represents the drinking categories, and the measures of association are in black.

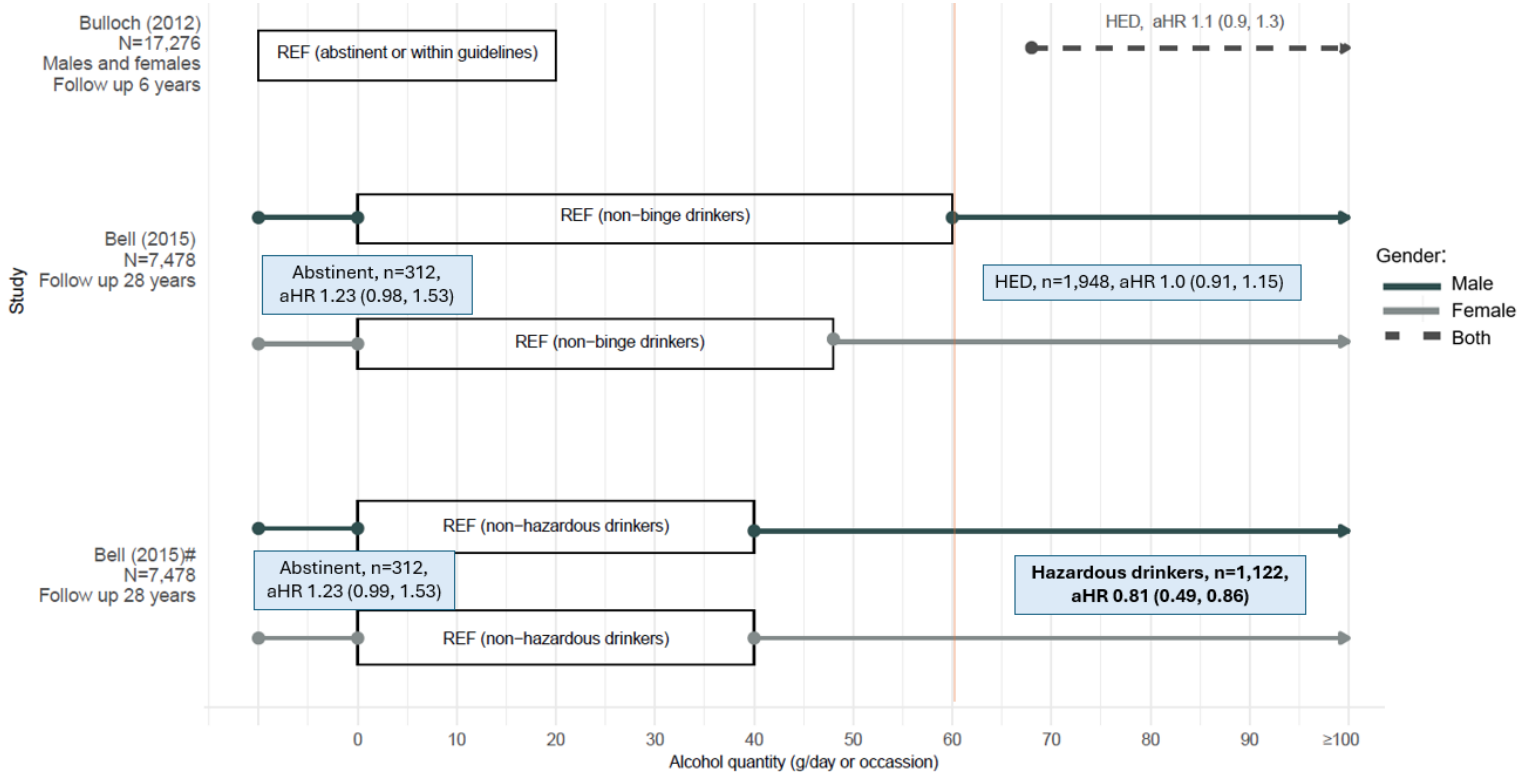
Appendix Figure. 3 Quantity of alcohol consumed and development of depression in adults (studies of high risk of bias)



Key: RR = risk ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. The blue box represents the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category. Mason et al.[58] was included in the Cochrane Canada rapid update for quantity of alcohol consumed and development of depression but was outlined in frequency of alcohol consumption in the current update.

Appendix G – Additional graphs and tables for HED or binge drinking and development of depression in adults (studies of moderate and high risk of bias)

Appendix Figure. 4 Heavy episodic or binge drinking and development of depression in adults (studies of moderate and high risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; HR = hazard ratio; OR = odds ratio; Ref = reference group.
Notes: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category. Red bar represents the definition of binge drinking in Ireland based on guidelines: Bell et al included two different analyses based on binge or hazardous drinking , both are represented here.

Appendix Table. 1 Heavy episodic or binge drinking and the development of depression in adults

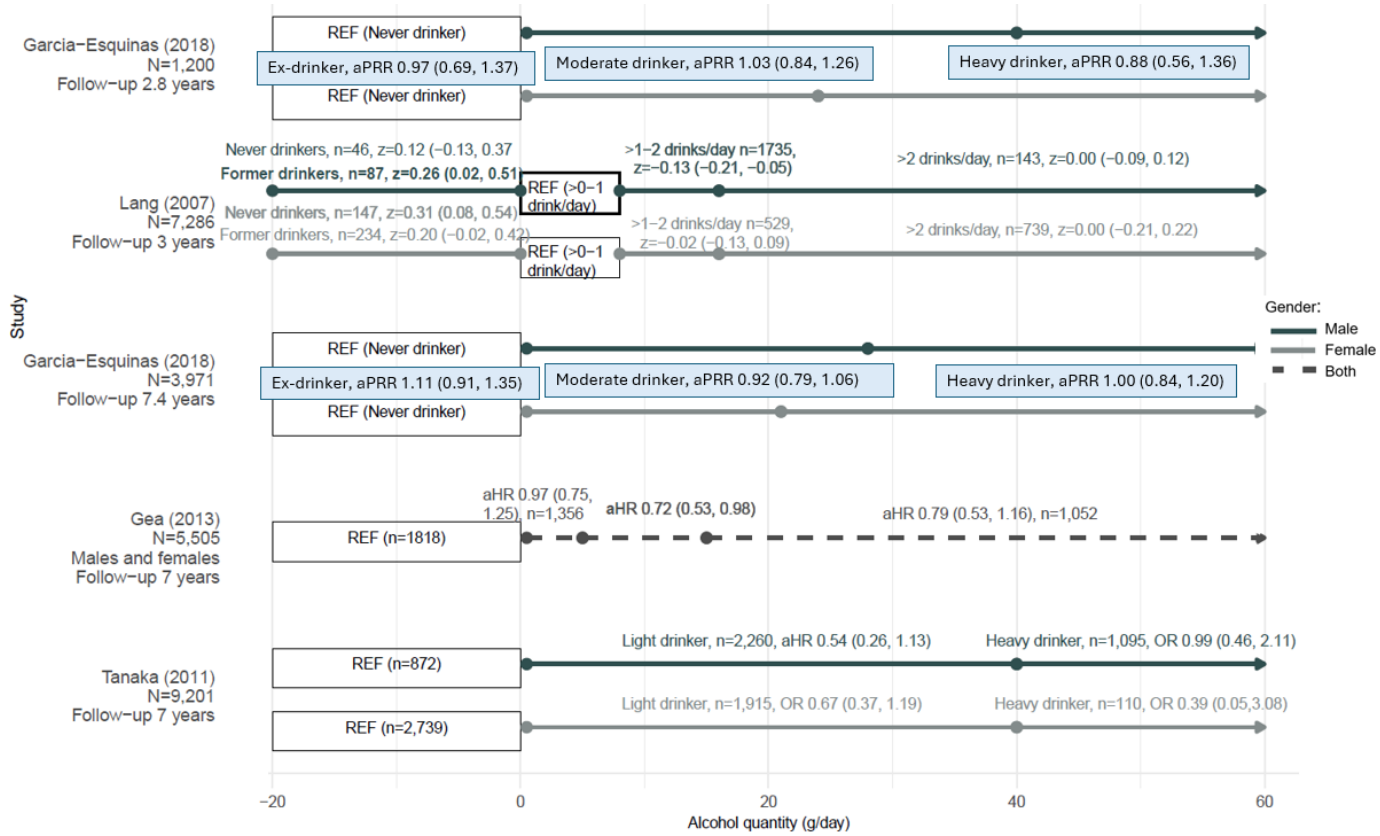
Study Country, number of participants; follow-up	Measurement of HED or binge drinking	Results	Association of HED or binge drinking and development of depression
Gustafson et al[80] USA, n = 3,194; up to 12 years	Participants were asked 'In the past 12 months, how many days did you have ≥5 drinks† in a row?'	Drinking measured at age 21 years, depression at age 27 years **Correlation value = - 0.05**	Small significant negative association
Piasecki et al.[81] USA, n = 986; 1 year	Participants were asked 'During the last 12 months, how often did you have ≥5 drinks† (males) or ≥4 drinks† (females) containing any kind of alcohol within a two-hour period?'	Correlation value = − 0.02 Beta coefficient = − 0.07	Non significant
Paljarvi et al.[68] Finland, n = 15,926; 5 years	Frequency of binge drinking per year (1 to 5 time, 6 times, 12 times, at least 24 times.)	No drinking (Reference group) Frequency of intoxication: aORs [95% CI] ranged from 1.02 [0.92, 1.13] for 1-5 times/year to 1.03 [0.89, 1.21] for ≥24 times/year.	Non significant
Sloan et al.[82] USA, n = 7,386; approximately 20 years	Participants were categorised into: Other drinkers and abstainers: 1.3g alcohol/day Occasional HED: 8.5g alcohol/day Frequent HED: 26.4g alcohol/day	Depressive symptoms score was measured at age 40 years and compared between drinking groups. Participants who reported frequent HED were statistically more depressed than those who reported occasional HED. Participants of frequent HED had a similar level of depression compared to other drinkers and abstainers.	Non significant to small significant association
Armeli et al.[29] USA, n = 888; 5 years	Heavy drinking day was defined as ≥5 drinks (males); ≥4 drinks (females)	Standardised beta coefficient = - 0.04	Non significant
Werneck et al.[39] Europe, n = 31,190; 4 years	Participants were asked, 'How often do you have ≥6 drinks on one occasion?', with the possible answers: 1) Daily or almost every day 2) Five or six days a week 3) Three or four days a week 4) Once or twice a week 5) Once or twice a month 6) Less than once a month 7) Not at all in the last 3 months.	aOR [95% CI] = 1.01 [0.93, 1.09]	Non significant

Study Country, number of participants; follow-up	Measurement of HED or binge drinking	Results	Association of HED or binge drinking and development of depression
	A positive screen for binge drinking was considered as at least once a month.		
Werneck et al.[40] Brazil, n = 4,725; mean (SD) 3.1 (1.6) years	Alcohol consumption was estimated through the AUDIT questionnaire, and the cut-off point of 5 was adopted for risky alcohol consumption.	Participants without risk drinking (Reference group) Participants with consistent risky alcohol drinking: **aRR [95% CI] = 1.64 [1.31, 2.05]** Participants who developed risky alcohol drinking over time: **aRR [95% CI] = 1.62 [1.15, 2.30]**	Moderate significant increases
Mason et al.[58] USA, n = 429; 4 years	Authors assessed the frequency of HED (defined as ≥3 drinks† in a row in the past month) at age 16 years as a categorical variable and their mean depressed mood score at age 18 years.	Depressive symptoms at age 18: Beta coefficient = 0.10 Depressive symptoms at age 22: **Beta coefficient = 0.21**	Non significant to a small significant increase
Kim et al.[35] Canada, n = 102; 6 months	Participants were asked: "During the past 7 days, how often did you have ≥4 drinks* (females) or ≥5 drinks* (males) within a 2-hour period?" Response scale was 0 times to 10 or more times.	Correlation value of 0.21	Non significant

Key: aOR = adjusted odds ratio aRR = adjusted risk ratio; CI = confidence interval; HED = heavy episodic drinking; USA = United States of America.
Note: Data which are statistically significant are presented in bold. Risk of bias assessment: green = low risk; yellow = moderate risk; red = high risk.
†A standard drink in the USA contains 14 grams of pure alcohol, with three drinks equalling 42 grams of pure alcohol; four drinks equalling 56 grams of pure alcohol; and five drinks equalling 70 grams of pure alcohol.
*A standard drink in Canada contains 13.45 grams of pure alcohol, with four drinks equalling 53.8 grams of pure alcohol and five drinks equalling 67.25 grams of pure alcohol.
Beta coefficient values were calculated using structural equation modelling analyses

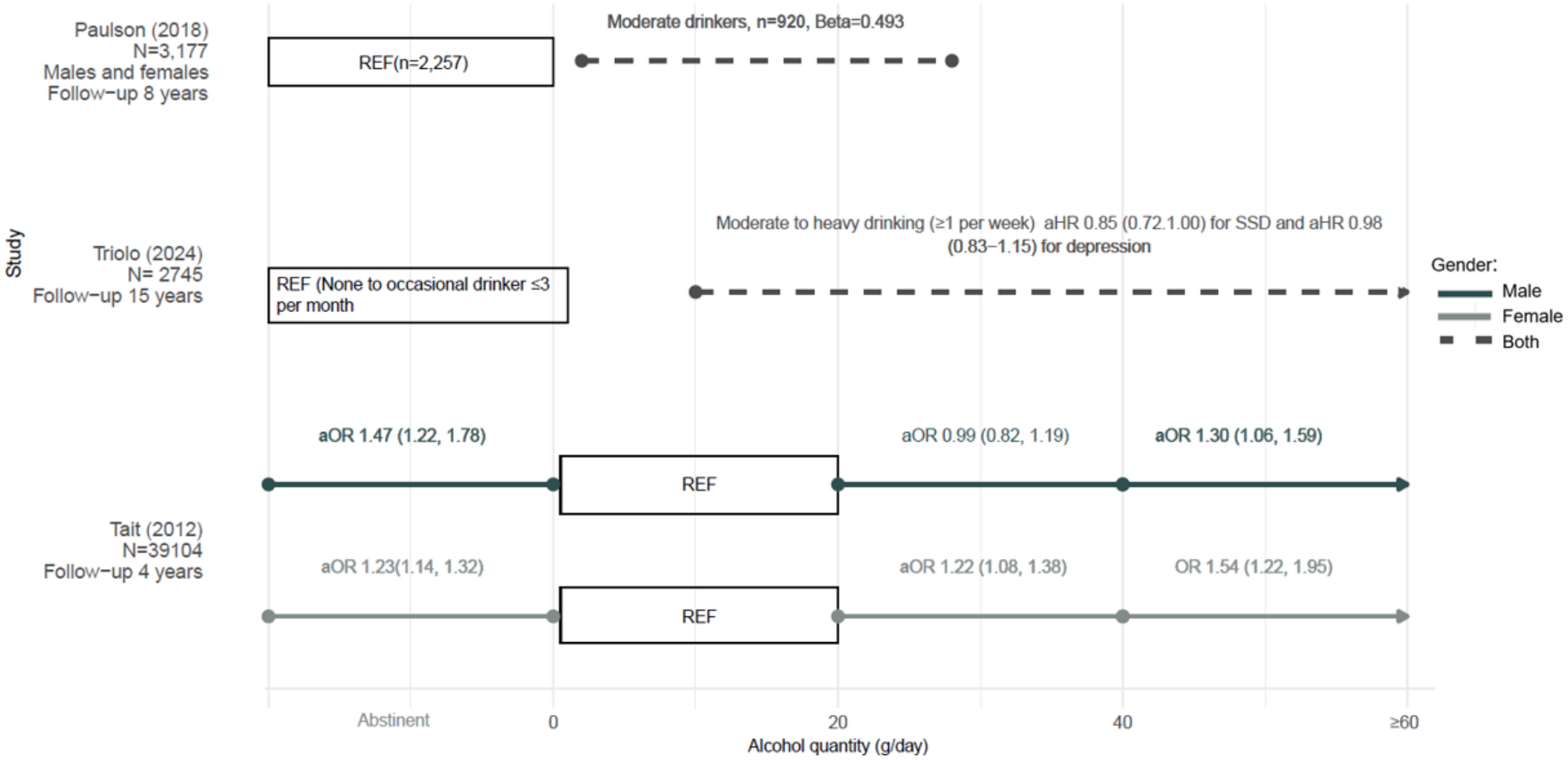
Appendix H – Additional graphs for quantity of alcohol consumed and development of depression in older adults (studies of moderate and high risk of bias)

Appendix Figure. 5 Quantity of alcohol consumed and development of depression in older adults (studies of moderate risk of bias)



Key: aHR = adjusted hazard ratio; aPRR = adjusted prevalence rate ratio; OR = odds ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category.

Appendix Figure. 6 Quantity of alcohol consumed and development of depression in older adults (studies of moderate and high risk of bias)



Key: aHR = adjusted hazard ratio; aOR = adjusted odds ratio; Ref = reference group.
Note: 95% CI presented in brackets where available. Statistically significant results are presented in bold. Blue boxes represent the measures of association for males and females collectively while the bars represent grams of alcohol/day included in each drinking category.

Appendix I – Studies investigating alcohol consumption and suicide mortality

In the two studies reporting an association between quantity and or a combined measure of quantity and frequency and suicide, mixed results were observed dependent on the level of alcohol consumption. One cross-sectional study reported similar rates of suicide in males who drink up to 40 grams of alcohol per day and females who drink 20 grams or more of alcohol per day, compared to lifetime abstainers.[49] The remaining longitudinal study reported similar rates of suicide in those who increased their drinking to light, and light-to-moderate amounts, compared to non-drinkers.[31] However, both studies reported moderate significantly increased rates of suicide (compared to non-drinkers) at levels above this (40-60 grams of alcohol per day in males,[49] and in those who increase their drinking to moderate-to-heavy-drinking,[31] respectively).

Level of alcohol intake and suicide in adults

Study Country, number of participants; follow-up	Measure of alcohol intake	Results	Association of level of alcohol intake and suicide
Lange et al.[49] USA, n = 553,971; NA	Quantity	*Males:* Lifetime abstainers [Reference group] **Former drinkers: aHR [95% CI] = 1.43 [1.03, 2.01]** >0-20 g/day: aHR [95% CI] = 0.92 [0.72, 1.17] >20-40 g/day: aHR [95% CI] = 1.05 [0.73, 1.51] **>40-60 g/day: aHR [95% CI] = 1.72 [1.14, 2.60]** >60 g/day: aHR [95% CI] = 1.15 [0.66, 1.99] *Females:* Lifetime abstainers [Reference group] Former drinkers: aHR [95% CI] = 1.65 [0.80, 3.42] >0-20 g/day: aHR [95% CI] = 1.18 [0.60, 2.32] >20 g/day: aHR [95% CI] = 1.36 [0.57, 3.23]	Non significant to small/moderate significant increases
Cho et al.[31]* South Korea, n = 129,446; 17 years	Frequency and quantity combined	Non-drinking [Reference] Initial non-drinkers who increased to light drinking (>0–≤1 glass per day and 1 day per week): aHR [95% CI] = 0.98 [0.64, 1.50] Those who increased to light-to-moderate drinking (>1–≤2 glasses and 2 days): aHR [95% CI] = 1.11 [0.56, 2.18] Those who increased to moderate-to-heavy drinking: >2–≤4 glasses and 3–4 days: **aHR [95% CI] = 2.25 [1.31, 3.87]** Those who increased to heavy drinking: >4 glasses and 5–7 days: aHR [95% CI] = 1.53 [0.71, 3.29]	Non significant to a moderate significant increase

Key: aHR = adjusted hazards ratio; CI = confidence interval; NA = not available (follow-up for cross-sectional studies); Ref = reference group; USA = United States of America.
Note: Data which are statistically significant are presented in bold.
Risk of bias assessment: green = low risk; yellow = moderate risk.
*In Cho et al.[31] regardless of beverage type, a standard single-serving unit was standardised to contain ten grams of pure alcohol.

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