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Analysis of the accuracy and completeness of cardiovascular health information on alcohol industry-funded websites

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Background: The Alcohol Industry (AI), and the Social Aspects/Public Relations Organisations (SAPRO) it funds, has been shown to mis-represent the risk of alcohol with respect to cancer and pregnancy. It is theorized that the AI would position alcohol as 'heart healthy' to further undermine public perceptions of risks from drinking. **Methods:** A comparative analysis (including content, thematic and context analyses) of cardiovascular health information published on the websites of AI-funded ($n = 18$, such as 'Drinkaware' and the 'Distilled Spirits Council of the US') and non-AI-funded ($n = 18$, such as 'NHS.uk') organizations based in multiple high-income jurisdictions. **Results:** Websites of non-industry-funded health organizations were more likely than AI/SAPRO websites to label alcohol as a risk factor for a range of important cardiovascular diseases (such as myocardial infarction, congestive cardiac failure, hypertension and stroke). Conversely, AI/SAPRO websites were more likely to suggest alcohol was protective in the development of some heart conditions. AI/SAPRO websites frequently referenced the J-shaped curve as proof of benefit from moderate alcohol consumption; suggested a balance between the benefits and harms from drinking; positioned alcohol as consistent with a 'healthy lifestyle'; and framed drinking as a social norm. **Conclusions:** AI-funded health organizations mis-represent the evidence on cardiovascular effects of moderate alcohol consumption. Healthcare professionals should appreciate the role of funding source in biasing content, and exercise caution when directing patients to content funded by the AI. Tighter regulation of messaging that AI/SAPRO's provide to the public is required, to avoid the dissemination of harmful misinformation.

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Introduction

In the UK, over 10 million individuals drink at levels that negatively impact their health, resulting in an economic burden of between 1.3% and 2.7% of the national gross domestic product.[1] Globally, over 5% of deaths are secondary to alcohol.[2] Cardiovascular disease (CVD) accounts for over 25% of these deaths,[3] though there is uncertainty about the effects of low levels of alcohol consumption on CVD outcomes. Systematic reviews[4,5] have pointed to the cardioprotective potential of light alcohol use (the 'J-shaped curve'), as well as the specific benefit to ischaemic stroke mortality.[6] However, residual confounding and various selection biases (such as sick quitter, reporting and healthy survivor bias) may explain the phenomenon[7] and does not take into account any health externalities from alcohol consumption, such as intimate partner violence or road traffic accidents.[8]

Conversely, novel studies utilizing Mendelian randomization[9,10] (and therefore less prone to biases) have shown that rates of stroke, hypertension and many other CVDs increase uniformly with any level of alcohol intake, and that there is no J-shaped curve in the risk of myocardial infarction (MI). Moreover, population-based studies that point to a J-shape curve tend to identify a cardioprotective effect from alcohol only amongst select populations, and at low levels of consumption; the modelling informing the current UK Chief Medical Officers' alcohol guidelines suggest that any benefit is confined to women over the age of 55 who consume on average one unit of alcohol per day, and the negative health impacts at a population level likely outweigh any potential benefits.[11]

Despite these uncertainties, there is a public perception that alcohol is 'heart healthy'.[12] This perception may be fostered by the alcohol industry (AI), which disseminates information to the public on the health effects of alcohol consumption, including CVD. It does this through funding of 'responsible' drinking bodies [referred to as 'Social Aspects/Public Relations Organisations' (SAPRO's)], such as the UK-based 'Drinkaware',[13] and via their own corporate websites or those of trade associations (such as the 'Distilled Spirits Council of the US'[14]). A recent systematic review found no evidence that SAPRO's have resulted in improved public health, but instead have had negative impacts.[15]

There is reason to be concerned about the reliability of health information which AI-funded bodies disseminate to the public, given their significant conflict of interest; they have been shown to mis-represent the evidence on alcohol harms in relation to pregnancy,[16] and cancer.[17] This is consistent with evidence from other industries, such as the tobacco industry,[18] which used considerable resources to establish alternative explanations for the association between smoking and cancer and CVD.[19]

There has been no systematic analysis of the accuracy and framing of CVD information, which the AI/SAPRO's disseminate to the public. Importantly, in the contemporary neoliberal political climate dominant in many countries, the prominence given to individual responsibility for health, and a reliance on awareness and educational campaigns potential solutions to public health issues, necessitates greater understanding of the reliability of AI-funded health information.

Our aim was to analyze the completeness and accuracy of cardiovascular health information disseminated by AI/SAPRO's, compared

to information from non-AI-funded sources; given previous findings, we hypothesized that AI/SAPRO websites were more likely to contain misleading or inaccurate representations of the risk to cardiovascular health from drinking.

Methods

We applied document analysis methods, which had previously been used in research on the tobacco industry.[20] English language websites of leading AI companies, and AI-funded SAPRO's, were selected for analysis ($n = 18$). AI companies were included if they were members or affiliates of the International Alliance for Responsible Drinking[21], all of which are leading alcohol producers based on global turnover[22]); SAPRO's were selected based on their inclusion in similar previous studies[16,17] and all receive at least part of their funding directly from the AI. Materials (webpage text and other linked documents) describing alcohol consumption and CVD outcomes from these organizations were analyzed and compared to a representative sample of 18 websites of government health departments or non-industry-funded charities (table 1).

Websites were accessed during the period 24 June–30 June 2019. Websites were searched by directly accessing the homepage, navigating to the location of health information pages and following internal links; we also used any website search functionality to identify further pages related to CVD. Where a website had multiple (>3) webpages with a health information basis, the most relevant page(s) was used for the analysis (based on CVD focus and publication

date). This approach identified health information on 44 individual webpages that constitute the dataset: information from 23 webpages across 18 AI/SAPRO websites, and 21 webpages across 18 non-industry-funded websites. All 44 webpages were archived for posterity using 'Archive.Today'.[23]

Firstly, each webpage was searched (independently, by two authors) for reference to MI; ischaemic (or coronary) heart disease; (congestive) heart failure; cardiomyopathy; hypertension; atrial fibrillation (or arrhythmia); peripheral vascular disease; and stroke (haemorrhagic or ischaemic). A distinction was drawn between 'myocardial infarction' and 'ischaemic heart disease' (which includes angina) due to evidence in the literature on the specific benefit to MI risk with moderate alcohol intake. Where a disease was mentioned, it was noted whether alcohol was stated to be a risk factor or protective. There was very high reliability between the results from the two authors (94.4% agreement, Cohen's $\kappa = 0.79$).

Secondly, thematic analysis[24] was used to identify topic areas and content patterns by generation of sub-themes (or 'codes'; short summaries of topic areas), which were grouped into overarching themes. These themes and sub-themes were then used as a framework for a comparative analysis of the sampled non-AI-funded webpages. This analysis was performed by one author initially (L.P.); a second author (M.P.) re-read the webpages to identify any missed examples of themes and sub-themes.

Finally, we analyzed the context within which the identified health information was presented, through critical analysis of the webpages' introductory paragraphs (the leading text was judged to be either

Table 1 Sample of websites included for analysis

Non-industry-funded health information websites

Alcohol Focus (Scotland)[57,69]	Charity	#2 Google search (Scotland): 'Alcohol health risks'
American Heart Association[38]	Charity	#1 Google search (USA): 'Alcohol heart effects'
Ask About Alcohol (Ireland)[44,64]	Government	#2 Google search (Ireland): 'Alcohol health risks'
British Heart Foundation[39]	Charity	#1 Google search (UK): 'Alcohol heart effects'
BUPA (UK)[40]	Private	#3 Google search (UK): 'Alcohol health risks'
Centre for Disease Control (USA)[70]	Government	#3 Google search (USA): 'Alcohol health risks'
Department of Health (Australia)[61]	Government	Official patient info source for Australia healthcare
Government of Canada, Health Dept[41]	Government	Official patient info source for Canada healthcare
Health Direct (Australia)[52]	Government	#2 Google search (Australia): 'Alcohol health risks'
HealthFinder.Gov (USA)[63]	Government	Official patient information source for USA healthcare
Healthline (USA)[66]	Private	#5 Google search (USA): 'Alcohol health risks'
Health Protection Agency (NZ)[42]	Government	#1 Google search (NZ): 'Alcohol health risks'
NHS.uk (England)[43,67]	Government	Official patient info source for NHS England
NHS Direct (Wales)[53]	Government	Official patient info source for NHS Wales
NHS Inform (Scotland)[68]	Government	Official patient info source for NHS Scotland
National Institute for Health (USA)[58]	Government	#2 Google search (USA): 'Alcohol health risks'
Northern Ireland Direct[59]	Government	Official patient info source for NI Healthcare
WebMD (USA)[45]	Private	#1 Google search (USA): 'Alcohol health risks'
Alcohol industry corporations/SAPRO's		
AB InBev[55]	IARD Co-signatory	
Bacardi[48]	IARD Co-signatory	
Beam Suntory[50]	IARD Co-signatory	
Brown-Forman[26]	IARD Co-signatory	
Carlsberg A/S[46]	IARD Co-signatory	
DrinkIQ (Diageo plc)[27,34]	IARD Co-signatory	
Heineken NV[65]	IARD Co-signatory	
Kirin Holdings[36]	IARD Co-signatory	
Molson Coors[28,75]	IARD Co-signatory	
Pernod Ricard[49]	IARD Co-signatory	
Distilled Spirits Council of US (USA)[29]	IARD Co-signatory	
DrinkAware (UK)[35,76,77]	Leading SAPRO, UK	
DrinkAware (Ireland)[60]	Leading SAPRO, Ireland	
DrinkWise (Australia)[30,37]	Leading SAPRO, Australia	
Educ'alcool (Canada)[31]	Leading SAPRO, Canada	
Responsible Drinking (EU)[51]	Leading SAPRO, EU	
Responsible Drinking (Int)[32,56]	Leading SAPRO, International	
Wine in Moderation (EU)[33]	Leading SAPRO, EU	

This table shows the alcohol industry websites ($n = 18$) included for qualitative analysis, as well as the non-industry-funded health information websites ($n = 18$) used for comparison. The public visibility of non-industry-funded websites was largely inferred by prominence within relevant country-specific Google searches.
IARD, International Alliance for Responsible Drinking; SAPRO, Social Aspects/Public Relations Organisations.

Table 2 Reference to important CVDs within health information on AI and non-industry-funded organization webpages

	Any mention of CV disease	MI	IHD	CCF	CAR	HTN	AF	PVD	STR
AI/SAPRO									
AB InBev[55]	No								
Bacardi[48]	No								
Beam Suntory[50]	No								
Brown-Forman[26]	Yes	green	green	green	green				green
Carlsberg A/S[46]	No								
DrinkIQ/Diageo[27,34]	Yes	red	green		red				red
Heineken NV[65]	Yes								
Kirin Holdings[36]	No								
Molson Coors[28,75]	Yes		green				red		
Pernod Ricard[49]	No								
Distil. Spi. Cou. of US (USA)[29]	Yes		green (i)						
Drinkaware (UK)[35,76,77]	Yes	yellow	red					red	
Drink Aware (Ireland)[60]	Yes		red						red
DrinkWise (Australia)[30,37]	Yes		yellow	red	red	yellow			green
Educ'alcool (Canada)[31]	Yes	green	green					green	green
Responsible Drinking (EU)[51]	Yes		red						
Responsible Drinking (Int)[32,56]	Yes		yellow (i)						
Wine in Moderation (EU)[33]	Yes	green	green			red			yellow (ii)
Non-industry-funded									
Alcohol Focus (Scotland)[57,69]	Yes		red			red			red
American Heart Association[38]	Yes	green	red		red	red		red (iii)	red
Ask About Alcohol (Ire)[44,64]	Yes		red		red	red		red	red
British Heart Foundation[39]	Yes		red		red (iv)	red			red
BUPA (UK)[40]	Yes		yellow (i)		red (iv)	red			red
Centre for Dis. Cont. (USA)[70]	Yes	red	red			red			red
Department of Health (Aus)[61]	Yes	red	red			red			red
Gov of Canada, Health Dept[41]	Yes	red	red			red		red (v)	red
Health Direct (Australia)[52]	Yes	red	red			red			red
HealthFinder.Gov (USA)[63]	Yes	red	red						red
Healthline (USA)[66]	Yes	red	red (vi)		red	red		red (vii)	red
Health Protection Agen. (NZ)[42]	Yes	yellow	yellow		red	red			yellow (ii)
NHS.uk (England)[43,67]	Yes	red	red		red	red			red
NHS Direct (Wales)[53]	Yes	red	red			red			red
NHS Inform (Scotland)[68]	Yes	red	red			red			red
NIH (USA)[58]	Yes	red	red		red	red			red
Northern Ireland Direct[59]	Yes	red	red			red			red
WebMD (USA)[45]	Yes	red	red (viii)						red

This table illustrates the webpages, which describe an association between alcohol and eight important cardiovascular diseases. Alcohol could be described as a risk factor (red) for a condition, or a protective factor (green). Messaging could also be mixed (yellow)—e.g. high alcohol intake described as risky and moderate intake as protective. Blank cells indicate that no mention was made.

Non-industry-funded websites were far more likely to mention cardiovascular disease and implicate alcohol as a risk factor in their development. In contrast, AI/SAPRO webpage were less likely to mention some conditions (such as stroke or hypertension), and more likely to suggests a protective association for some conditions (such as MI).

i: 'cardiovascular disease'. ii: alcohol increases risk for haemorrhagic stroke, but is protective for ischaemic stroke. iii: 'circulation problems'. iv: 'muscle damage'. v: 'blood vessel disorders'. vi: 'difficulty pumping blood'. vii: 'numbness' and 'pain' in limbs. viii: 'increased heart size'. MI, myocardial infarction/heart attack; IHD, ischaemic heart disease/coronary heart disease/'heart damage'; CCF, congestive cardiac failure/heart failure; CAR, cardiomyopathy/'weakened muscle'; HTN, hypertension/'raised blood pressure'; AF, atrial fibrillation/'irregular heartbeat'/'irregular heart rate'; PVD, peripheral vascular disease/'circulation problems'; STR, stroke (haemorrhagic or ischaemic).

supportive of alcohol, negative, or balanced). This is important because it is known that the credibility and interpretation of information is strongly shaped by how it is framed; the weight of the first impression is such that subsequent information is mostly ignored.[25]

The SRQR (Standards for Reporting Qualitative Research) checklist was used in the reporting of the study . The authors are experienced public health researchers with expertise in analysis of AI strategies, which may have helped interpretation and contextualization of the findings.

Results

Content analysis

Sampled webpages from 12 of the 18 AI/SAPRO sources refer specifically to the cardiovascular impacts of drinking. Of those 12, 9 (75%) state that alcohol consumption is associated with a reduced risk of at least one cardiovascular condition (see table 2). Ischaemic heart disease (IHD) is the most frequently mentioned condition (11 instances); alcohol is described as protective against IHD on eight of these webpages.[26–33] Peripheral vascular disease,[31] atrial fibrillation[34,35] and cardiomyopathy[30,34,35] are infrequently mentioned.

By comparison, the sampled webpages from all 18 non-industry-funded health websites refer to the cardiovascular impacts from alcohol consumption. Stroke ($n = 17$), hypertension ($n = 16$) and MI or IHD ($n = 14$) are the conditions most consistently mentioned. Alcohol is almost exclusively cited as a risk factor (as opposed to a protective factor) in the development of such conditions by non-industry-funded sources.

Thematic analysis

Thematic analysis identified 10 sub-themes, combined into five overarching themes. Illustrative examples of text described by each sub-theme are presented in table 3.

Table 3 Examples of sub-themes using website quotes

The benefits of drinking: J-shaped curve

'People who drink moderately have overall lower mortality than those who drink large amounts or none at all, this positive effect is called the "j-shaped curve"'.
Kirin holdings[36] (AI/SAPRO)

'The previously held position that some level of alcohol was good for the heart has been revised. It's now thought that the evidence on a protective effect from moderate drinking is less strong than previously thought'.
NHS.uk, England[43] (Non-AI funded)

The benefits of drinking: description of biological mechanisms

'The protective effect comes primarily from the fact that, over the long term, [moderate alcohol consumption] increases the level of high density lipoproteins (HDL, or the "good" cholesterol) in the blood. HDL helps clear "bad" cholesterol (fat molecules or LDL) from arterial walls to prevent build-up and blockages'.
Educ'alcool[31] (AI/SAPRO)

'You may know about the dangers of blood clots and high levels of fats and cholesterol in your body. Alcohol makes both things more likely'.
WebMD[45] (Non-AI funded)

The benefits of drinking: the balance of harms and benefits

'Scientific research has shown a variety of long-term effects from low to moderate consumption of alcohol—some positive and some negative'.
DrinkIQ (Diageo plc)[27] (AI/SAPRO)

'For many adults in many cultures, enjoying a beer, spirits, or wine is an important part of their social lives. Many lifestyle choices carry potential risks and benefits'. This section also includes only CVD benefits, and omits mention of CVD harms.
Molson Coors[28] (AI/SAPRO)

The benefits of drinking: normalization of drinking within a healthy lifestyle

'Many people drink moderately and as part of a healthy lifestyle'.
Bacardi[48] (AI/SAPRO)

'Many of us drink alcohol to relax and socialise. Alcohol can be part of a healthy lifestyle if you drink in moderation and also exercise and have a good diet. But drinking too much can affect your physical and mental health and body'.
Health Direct, Australia[52] (Non-AI funded)

Complexity arguments: defining a 'safe' level, such as through conflicting national guidelines

'Countries vary in guidance on dietary guidelines for moderate alcohol consumption'.
Beam Suntory[50] (AI/SAPRO)

'Drinking any amount of alcohol increases the risk of damage to health and that risk generally increases in line with how much you drink'.
Alcohol Focus, Scotland[69] (Non-AI funded)

Complexity arguments: drinking patterns and ambiguity around 'heavy' or 'moderate' intake

'Heavy drinking [undefined] can cause you to have an irregular heart beat (arrhythmia) and over time it can weaken the heart muscles… However, research has shown that drinking moderate amounts of alcohol [undefined] in middle age and older adults is associated with a lower risk of coronary heart disease'.
DrinkIQ (Diageo plc)[34] (AI/SAPRO)

'Regularly drinking too much [undefined] can raise blood pressure over time'.
Alcohol Focus, Scotland[57] (Non-AI funded)

Complexity arguments: distraction through discussion of other health risk factors

'An individual's risk for a given disease is also influenced by their family history of disease, current health status, nutrition, and lifestyle and environmental factors'.
Responsible Drinking, EU[51] (AI/SAPRO)

Misrepresentation of evidence: inappropriate extrapolation of evidence

'Studies show it is the ethanol (alcohol) in all types of beverage alcohol—distilled spirits, beer or wine—that, when consumed in moderation, is associated with a lower risk of cardiovascular disease'.
Distilled Spirits Council of US[29] (AI/SAPRO)

'Some evidence has shown that drinking a small amount of alcohol (rather than abstaining completely) may benefit your heart health. It's thought to reduce the risk of some heart problems for a select group of people—but doctors can't be completely sure'.
BUPA, UK[40] (Non-AI funded)

Prevention focus: a focus on primary and/or secondary prevention

'For people with particular health issues or a family history of certain diseases, the best course of action is to refrain from drinking altogether'.
AB InBev[55] (AI/SAPRO)

Emphasis of individual responsibility: onus on the individual

'Those choosing to drink have a responsibility to get the facts about how alcohol affects them, and make smart choices when they consume alcohol. This means making a plan when you chose to drink, sticking to it, and exercising care for those around you'.
Beam Suntory[50] (AI/SAPRO)

'If you think you might have a problem with alcohol, get help. Talk to your doctor, therapist, or an addiction specialist. Find online support groups. Some people manage to kick the habit on their own. But if you feel you need extra help, you may want to check out your local branch of Alcoholics Anonymous'.
WebMD[45] (Non-AI funded)

Theme A: the benefits of drinking

J-shaped curve

The J-shaped curve, or health benefits from low levels of alcohol consumption relative to abstinence, is mentioned in the text of sampled webpages from 10 of the 18 AI/SAPRO websites.[26–29,31–33,35–37] In half of those instances,[27,28,32,35,37] the association includes a caveat by reference to specific age groups or with qualifying descriptors, such as 'may have a protective effect'.

By contrast, 6[38–43] of the 18 non-industry-funded health information sources mention the J-shaped curve. In all instances there are associated qualifiers around age groups, or caveats on the quality of the research.

Description of biological mechanisms

Explanations as to how alcohol can, in theory, be beneficial to cardiovascular health is found on webpages of two AI/SAPRO's[31,35] and two non-industry-funded organizations.[38,42] A further three non-industry-funded websites outline mechanisms for how alcohol causes harm.[39,44,45]

The balance of harms and benefits

Industry-funded websites are much more likely to refer to CVD benefits. Sampled webpages from 2 of the 18 AI/SAPRO websites exclusively refer to the cardiovascular benefits of alcohol consumption,[26,31] and a further 7[27–29,32,33,36,46] use language, which appears to imply a balance between the pro's and con's (e.g. 'there are both positive and negative effects associated with drinking alcohol').[36]

In contrast, sampled webpages from 12 of the 18 non-industry-funded websites make no mention of benefits to cardiovascular health from alcohol consumption. Of the six that do mention potential benefits,[38–43] there is considerably more text devoted to discussion around cardiovascular harms (with the exception of the 'American Heart Association'[38] which has similar volumes of text for harms and benefits).

Normalization of drinking within a healthy lifestyle

Behaviour theory, including nudge theory,[47] demonstrates the importance of socials norms in determining attitudes. There are eight instances of AI/SAPRO apparently normalizing drinking,[26,28–30,32,36,48,49] (i.e. suggested that 'many' or 'most' people drink) and a further four draw associations between alcohol and a healthy lifestyle.[27,46,50,51] Sampled webpages from three non-industry-funded organizations also raise the normality of alcohol consumption and frame it as compatible to healthy living.[40,52,53]

Theme B: complexity arguments

Complexity in defining a 'safe' level, such as through conflicting national guidelines

It has been shown previously how the AI use discussion of complexity of aetiology to mis-represent the harms of their products.[54] Sampled webpages from five AI/SAPRO websites[46,50,51,55,56] mention varying international guidance, or complexity in defining a 'safe' level of alcohol intake. By contrast, all of the non-industry-funded webpages either state a clear definition based on local guidance, or explain that no level of alcohol consumption is safe.

Drinking patterns and ambiguity around 'heavy' or 'moderate' intake

Sampled webpages from seven of the AI/SAPRO websites[28,30,33,34,36,46,50] exclusively discuss the cardiovascular harms from 'heavy', 'excessive' or 'binge' drinking, without such terms being defined. Fewer non-AI-funded websites have similar ambiguity; only three non-industry-funded organizations[57–59] do not define terms, such as 'too much alcohol'.

Distraction through discussion of other health risk factors

It has been found previously that AI information on cancer, and foetal alcohol syndrome, emphasizes alternative risk factors as potential confounders in the relationship between alcohol consumption and harm.[16,17] Similarly, our analysis shows that sampled webpages from 12 AI/SAPRO websites[26,28,31,32,34,35,46,49–51,55,60] point to a range of factors, other than alcohol, that are either implicated in CVD or impact on how alcohol affects consumers. Such factors include family history, environment, weight, mood and poor nutrition. This is significantly less common in materials from non-industry-funded organizations (four such instances; $Z = 2.68$; 95% C.I. of difference $= 12.02$–76.95).[38,41,42,61]

Theme C: misrepresentation of evidence

Inappropriate extrapolation of evidence

As stated above, population-based studies would suggest the potential benefit from low alcohol consumption relates only to specific conditions (such as MI), in certain age groups.[11] Of the 10 AI/SAPRO webpages, which mention the J-shaped curve, 6 of them over-generalize this evidence to all adults or to all CVD.[26,28,29,31,33,36] This over-generalization was not found in references to the J-shaped curve on non-AI-funded webpages.

Theme D: prevention focus

A focus on primary and/or secondary prevention

It is likely that some consumers accessing health information on alcohol and heart disease may already have established cardiac diagnoses. However, across sampled webpages from both AI/SAPRO and non-industry-funded health websites, there is a primary prevention emphasis; there are eight[29–32,35,49,51,55] and three[42,62,63] instances, respectively, of at least brief secondary prevention advice.

Theme E: emphasis of individual responsibility

Onus on the individual

The premise of 'personal responsibility' is a common theme throughout the sampled webpages of AI/SAPRO websites; 10[29,36,46,48–51,55,56,60] organizations seem to place an onus wholly on the individual to be 'responsible', or know their limits, and only 3[26,27,35] point to sources of external help. By contrast, webpages from six non-industry-funded websites[38,40,45,53,63,64] offer advice, which directs consumers towards external sources of help, or provides solutions that did not simply rely on education and personal will.

Context analysis

In all but two instances (content from 'Pernod Ricard'[49] and 'Distilled Spirits Council of US'[29]), there is a clear introductory statement or paragraph within the sampled webpages of all organizations.

In total, in the opening statement or paragraph of 3 AI/SAPRO webpages[26,46,51] drinking is framed as a positive behaviour; the messaging from 12 was judged to be mixed[27,28,30–33,35,36,48,50,55,65] and 1 is negative.[60] In comparison, amongst the non-industry-funded organizations, no introductory statements frame drinking positively; there are 5 instances of mixed messaging[40,41,45,52,53] and 13 instances of a focus on the negative impacts of alcohol.[38,39,42,58,59,61,63,64,66–70] Examples of framing are provided in table 4.

Table 4 Framing and example website content

Positive framing
'Alcohol has a legitimate role in society when enjoyed responsibly by legal purchase age adults who choose to drink. When enjoyed in moderation, alcohol can be part of a healthy lifestyle that includes good diet and exercise'.
Responsible Drinking, EU[51] (AI/SAPRO)
Mixed framing
'Regular moderate wine consumption has been associated with several health benefits. However the risk increases with each drink above moderation!'
Wine in Moderation[33] (AI/SAPRO)
Negative framing
'Alcohol is a powerful chemical that can have a wide range of adverse effects on almost every part of your body, including your brain, bones and heart'.
NHS.uk[67] (Non-AI funded)

Discussion

Principal findings

The analysis has shown that websites funded by the AI are less likely than non-AI-funded health websites to discuss the range of CVDs associated with alcohol, and more likely to suggest that alcohol is protective against some heart conditions. Websites funded by the AI were found to more frequently reference the 'J-shaped curve', place responsibility on the consumer, and use ambiguous messaging relating to the risks of 'heavy' and 'moderate' drinking. They were more likely to frame alcohol consumption as positive than non-AI-funded organizations, and to emphasize the complex aetiology of CVD by discussing potential confounders of the alcohol–CVD relationship. The latter is a common strategy among unhealthy commodity industries, including the tobacco industry, and risks obscuring that alcohol are an independent risk factor.

Strengths and weaknesses of study

This study is the first to systematically investigate how the AI communicates the cardiovascular impact of drinking to the public. The analysis was based on a representative and relevant sample of alcohol producer webpages, developed *a priori*. The presence of a comparator group of non-industry-funded webpages was a key strength, and is something often lacking from similar document analyses of industry materials.

Another strength was the use of multiple coders and the high level of inter-rater reliability in the content analysis; although coders were not blinded, which is a limitation. Importantly, however, consistency in findings when compared to other studies of AI/SAPRO webpage content does support the reliability and robustness of our findings.

The content analysis included quantitative data (counts and percentages of webpages, which mentioned certain disease associations); statistical tests were not applied in most cases to the small sample size.

A final potential limitation lay in the difficulty of searching these websites, not all of which were well-structured. This necessitated searching and subjectively identifying the most relevant cardiovascular health-related webpages from each site, based on those which had the most detailed or comprehensive information. Not all websites had a search functionality, or signposted health information in the same way, and so it is possible some relevant content was missed. Notably, previous work has shown that AI websites sometimes make important health information difficult to access[16]; although not specifically assessed in this study, the volume of content on many AI/SAPRO webpages did mean that important health was often swamped by less important consumer information, which may

contribute to mixed messages. For example, the Pernod Ricard website includes a great deal of trivia alongside information on harms like Fetal Alcohol Syndrome and depression, such as 'Methyphobia is an intense, irrational fear of alcohol', 'Champagne is known for its chalky soil', and 'Serbia toasts with 'Živeli!' which means 'Let's live long!

Meaning of the study

This study adds weight to previous findings that suggest the AI misrepresents and understates the negative impacts of alcohol when communicating health information.[16,17] The AI frames alcohol consumption as being 'heart healthy', and the information they provide does not accurately reflect up-to-date evidence on the cardiovascular harms from drinking.

Some SAPRO's, such as 'Drinkaware', have extremely high public visibility; courtesy of the Portman Group's code of practice,[71] the 'Drinkaware' logo features on the vast majority of alcohol products sold in the UK, as well as any associated marketing material. Formal associations between SAPRO's and governmental bodies are only likely to increase the apparent reliability of these sources to the public. Moreover, leading alcohol producers point to the accessibility of information on their websites covering nutritional intake and healthy lifestyles as a defence against more stringent health labelling on their products.[72]

There are also findings relevant for non-AI-funded health organizations. For example, the rationale for any discussion around the 'J-shaped curve' (even if mentioned to discredit it) may be weak, especially given that many websites include the stipulation that any potential benefit is insufficient for abstainers to start drinking. Government-funded sources of health information, such as 'NHS.uk', should aim for greater rigour and transparency by using and citing the most up-to-date evidence. Moreover, including links to AI/SAPRO webpages (as done by the 'British Heart Foundation',[39] for example which signposts users to the Drinkaware website) implies endorsement that is ill-advised given the high risk of bias in health information provided; recently, the Irish government has advised against signposting to AI content.[73]

Unanswered questions and future research

Research in Australia suggests a lack of public awareness on how SAPRO's are funded,[74] with many believing they are government-backed. It remains to be seen what perceptions the British public have about UK-based SAPRO's; efforts should be made to increase awareness of their industry-backing.

It is concerning that organizations with significant conflicts of interest, which have been repeatedly shown to mislead the public on the issues of cancer, pregnancy harms and now CVD, are given a role to play in the dissemination of health information. It would likely be unacceptable to health professionals for the tobacco industry to have such a role, and would contravene the Framework Convention on Tobacco Control to which most countries are signatories. Future research needs to investigate the use and impact of AI-funded health information, and how the public can best access accurate, independent advice on alcohol consumption.

Conclusion

This study's findings suggest marked and concerning differences in the approaches used by AI/SAPRO and non-AI-funded organizations to convey cardiovascular risks (and supposed benefits) to the general public. Questions are raised about the extent to which independent health bodies (such as government health departments and independent charities) use or signpost to SAPRO's, such as 'Drinkaware', given that the information they provide has the characteristics of other unhealthy commodity industry-funded

misinformation, and significantly misrepresents the evidence across a range of health conditions.

Supplementary data

Supplementary data are available at *EURPUB* online.

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Key points

- Despite public perception, contemporary high-quality evidence suggests there is no strong, consistent evidence of benefit to cardiovascular health from 'moderate' alcohol consumption.
- The alcohol industry, and the Social Aspects/Public Relations Organisations they fund, often mis-represent the evidence on CVD or fail to mention the range of cardiovascular diseases that can result from alcohol consumption.
- Governments and the global public health community continue to struggle with the challenge of addressing misinformation and disinformation; industry-funded health information is adding to this burden.
- Clinicians and health agencies should be cautious when directing patients to content funded by the AI, as the health-related content may be at risk of significant bias.

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