World Health Organization
European Region

Alcohol health warning labels: a public health perspective for Europe

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Abstract

In the European Union the per capita alcohol consumption among adults (15+ years) in 2019 was twice the world average, with one in 19 adults dying from alcohol-attributable causes, and three out of every 10 alcohol-attributable deaths due to cancers. WHO endorses alcohol labelling as a policy option to reduce alcohol-related harm. This can involve providing information on packaging about alcohol content, ingredients, nutritional information and health warnings. This report situates health warning labels within the broader context of alcohol policy, highlighting their roles in raising risk awareness, increasing support for other alcohol policies, and decreasing product appeal. The impact of these warnings will, however, depend on their content and design. The research summarized in this report shows that awareness of the link between alcohol and cancer among Europeans needs to be improved and that it could be significantly enhanced by use of a health warning giving information about alcohol as a cause of breast and colon cancer. Compared to other topics, cancer-specific warnings are more relevant and likely to prompt discussions about alcohol risks and encourage reconsideration of alcohol consumption. The report also addresses digital information provision, concluding that it cannot replace on-label information without losing message reach.

Keywords

ALCOHOL DRINKING – prevention and control
ALCOHOL DRINKING – adverse effects
CONSUMER HEALTH INFORMATION
LABELING
HEALTH POLICY
RISK FACTORS

ISBN: 9789289061681 (PDF)
ISBN: 9789289061698 (print)

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Foreword

The European Union (EU) has the highest levels of alcohol consumption in the world, twice the global average. This staggering statistic underscores a significant public health challenge: in 2019 over 5% of all deaths in the EU were alcohol-related, with cancer the leading cause.

To tackle this issue, a multifaceted approach is essential. The European Framework for Action on Alcohol, endorsed by all 53 Member States of the WHO European Region, outlines six key action areas. One of these is health information provision, with a focus on labelling. Alcohol labelling has long been seen as a less effective and relevant intervention – often poorly focused and not designed in an attention-grabbing manner. However, with a new recognition of the importance of content and design in the effectiveness of labels in reducing alcohol-related harm, labelling is increasingly considered a powerful tool to bring about change, as already proven in the fields of nutrition and tobacco.

Labelling is not just powerful; it is necessary. Many people are unaware of the harms caused by alcohol. In an online survey, only 39% of respondents were aware that alcohol causes colorectal cancer, despite it representing a third of all new alcohol-related cancer cases in the EU; and – shockingly – only 15% of respondents knew that alcohol causes breast cancer, despite mounting evidence that even low levels of consumption can lead to breast cancer and that, overall, there is no safe level when it comes to cancer risk.

This report offers a new, broader perspective on alcohol health warning labels. It considers their multiple possible roles, which go beyond short-term behaviour change – as a tool to raise awareness and increase support for other alcohol policies, while at the same time decreasing the potential of product packaging as a marketing tool. The evidence presented in the report demonstrates that well-designed health warning labels, especially those highlighting the alcohol–cancer link, can significantly enhance public knowledge and stimulate discussion about alcohol-related risks, contributing to a much-needed shift in Europe's narrative on alcohol.

Despite the growing trend towards label information moving online, this report also demonstrates that this essential information on alcohol-related harm must be readily accessible to consumers on the product itself. Relying solely on digital means risks excluding significant parts of the population and reducing the overall reach of these important messages.

As we move forward, policy-makers, public health officials and other stakeholders must prioritize the implementation of mandatory health warning labels, resisting all the pressure that will inevitably come from commercial actors. Alcohol producers often claim these labels are ineffective, yet the way they set themselves against clear, evidence-based warnings tells a very different story.

Considering all the information now available on the cancer risk and other harms caused by alcohol, it is difficult to accept that alcoholic beverages still lack clear warnings for consumers on their labels. This report lays a solid foundation for future initiatives, offering a clear summary of the background evidence and conceptual frameworks, while highlighting the need for continued research and evaluation.

I urge all involved to consider the findings of this report and work together towards a healthier future for Europe.

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Acknowledgements

This report was developed by Daša Kokole (WHO Regional Office for Europe, Denmark), who took the primary role in drafting the report, Daniela Correia (WHO Regional Office for Europe, Denmark), Maria Neufeld (WHO Regional Office for Europe, Denmark), Jürgen Rehm (Centre for Addiction and Mental Health, Toronto, Canada) and Alex Tran (Centre for Addiction and Mental Health, Toronto, Canada). It was coordinated by Carina Ferreira-Borges (WHO Regional Office for Europe, Denmark) and Gauden Galea (WHO Regional Office for Europe, Denmark).

The WHO Regional Office for Europe is grateful to the following reviewers of the document: Aleksandra Olsen (WHO Regional Office for Europe, Denmark), Benn McGrady (WHO headquarters, Switzerland), Elisabet Ruiz Cairó (WHO headquarters, Switzerland) and Oliver Bartlett (Maynooth University, Ireland).

The WHO Regional Office for Europe would like to extend gratitude to the members of the WHO Technical Advisory Group on Alcohol Labelling (TAG-AL), who have at various stages provided their input and feedback on the structure and content of the report, as well as the various studies that have informed the report: Nathan Crichtlow (University of Stirling, United Kingdom); Gloria Dossou (University of Lille, France); Olivier Droulers (University of Rennes 1, France); Eugenia Fadeeva (National Research Centre on Addictions, Russian Federation); Ulrich Frick (University of Würzburg, Germany); Karine Gallopel Morvan (EHESP School of Public Health, France); Nikhil Gokani (University of Essex, United Kingdom); David Hammond (University of Waterloo, Canada); Erin Hobin (Public Health Ontario, Canada); Frank Houghton (Technological University of the Shannon, Ireland); Inge Kersbergen (University of Sheffield, United Kingdom); Eunan McKinney (independent adviser, Ireland); Paula O'Brien (University of Melbourne, Australia); Simone Pettigrew (George Institute for Global Health, Australia); Maria Renström (Chair of TAG-AL, Sweden); Tim Stockwell (University of Victoria, Canada); Orratai Waleewong (International Health Policy Program, Thailand); and Claire Wilkinson (University of New South Wales, Australia). TAG-AL was created in 2022 to act as an independent advisory body to the WHO Regional Office for Europe on scientific and technical issues related to strategies, activities, programmes, data and evidence in the field of alcohol labelling. The experts of TAG-AL act in their personal capacity and do not represent any external entity, authority or government. Their role includes evaluating scientific and strategic aspects of labelling, identifying challenges, advising on policy and research, and advancing the international research agenda on alcohol labelling.

The WHO Regional Office for Europe would also like to thank Joan Colom, Lidia Segura Garcia and Pol Rovira (WHO Collaborating Centre on Substance Use, Noncommunicable Disease and Policy Impact, Barcelona, Spain) for the development and implementation of the Quick Response (QR) code study described in this report. Thanks are also extended to the various experts who supported the development and implementation of the first European online experiment on alcohol labelling, the results of which are presented in this report – specifically, Tiina Likki (WHO Regional Office for Europe, Denmark), Carolin Kilian (Centre for Addiction and Mental Health, Canada) and Jakob Manthey (University Medical Center Hamburg-Eppendorf, Germany). The following experts provided assistance with the translation and dissemination of the study materials (affiliations reflecting those during the time of the involvement): Daniel

Bergsvik (Norwegian Institute of Public Health), Nicky Dirkx (Hogeschool Gent, Belgium), Herdis Dugstad (Ministry of Health and Care Services, Norway), Paula Ericson (Ministry of Health and Social Affairs, Sweden), Jeroen Freriks (Ministry of Health, Welfare and Sport, the Netherlands), Sheila Gilheany (Alcohol Action Ireland), Torleif Halkjelsvik (Norwegian Institute of Public Health), Soledad Justo (Ministry of Health, Spain), Paula Leonard (Alcohol Forum Ireland), Siobhan McNamara (Department of Health, Ireland), Raúl Melo (Ministry of Health, Portugal), Brigitta Õunmaa (Ministry of Health, Estonia), Sandra Radoš-Krnel (National Institute of Public Health, Slovenia), Claudia Rafling (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, Austria), Anna Raninen (Systembolaget, Sweden), Ingeborg Rossow (Norwegian Institute of Public Health), Manuela Schumann (Federal Ministry of Health, Germany), Lidia Segura Garcia (Government of Catalonia, Spain), Mindaugas Štelemėkas (Lithuanian University of Health Sciences, Lithuania), Anne Swaluë (FPS Public Health, Belgium), Jelena Talačkienė (Ministry of Health, Lithuania), Maja Weemes Grøtting (Norwegian Institute of Public Health), Ines Zuza (Ministry of Health, Spain), and Elēna Zviedre (Ministry of Health, Latvia).

Thanks are due to Harriet Rumgay (International Agency for Research on Cancer, France) for providing the most recent data on alcohol-attributable cancers among the 27 Member States of the European Union and to Alexandra Zuckermann (Public Health Agency of Canada, Canada) for providing early access to their research findings and database of identified alcohol labelling literature.

This publication was produced with the financial support of the European Union. Its contents are the sole responsibility of the WHO Regional Office for Europe and do not necessarily reflect the views of the European Union. Additional financial support was received from the governments of Denmark, Estonia, Finland, France, Iceland, Ireland, Latvia, Lithuania, Luxembourg, Norway, Slovenia and Sweden.

Co-funded by the European Union

Abbreviations

ABV	alcohol by volume
APC	alcohol per capita consumption
DALY	disability-adjusted life year
EU	European Union
EU-27	27 Member States of the European Union
EVID-ACTION	Evidence into Action Alcohol Project
GLOBOCAN	Global Cancer Observatory
IARC	International Agency for Research on Cancer
NCD	noncommunicable disease
QR code	Quick Response code
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
TAG-AL	Technical Advisory Group on Alcohol Labelling
TFEU	Treaty on the Functioning of the European Union

Executive summary

Background

- Europe's Beating Cancer Plan sets as one of its targets "achieving a relative reduction of at least 10% in the harmful use of alcohol by 2025" by supporting European Union (EU) Member States and stakeholders to implement best practices and capacity-building activities. One of the key alcohol-related initiatives is development of proposal for health warnings on alcoholic beverages.
- Health warnings on alcohol labels have been recognized as a key component of comprehensive alcohol policy by WHO, both globally and regionally, in the Global Alcohol Action Plan 2022–2030 to strengthen the implementation of the Global Strategy to Reduce the Harmful Use of Alcohol, and the WHO European Framework for Action on Alcohol 2022–2025.
- This report sets the stage for future policy initiatives related to health warnings on alcohol labels by:
  - summarizing the most recent data on alcohol consumption and alcohol-attributable harm in the EU;
  - describing the role of labelling and health warnings from the consumer protection and public health perspectives;
  - identifying the key research gaps and considerations for future research; and
  - presenting new evidence on the impact and perceptions of health warnings in the EU based on the results of a multi-country online experiment, as well as on the use of digital provision of health information.

Alcohol in Europe: is there a need to reduce alcohol-related harm?

- Alcohol consumption is a causal factor in more than 200 diseases, injuries and other health conditions, including at least seven types of cancer.
- The EU is the heaviest-drinking area in the world; in 2019 seven of the 10 countries with the highest per capita alcohol consumption were in the EU.
- This translates into high alcohol-attributable harm: in 2019 the average total alcohol per capita consumption among adults (15+) in the 27 EU Member States (EU-27)) was 11.0 litres of pure alcohol, twice the world average, with every 19th adult death and almost every fourth death among 20–40-year-olds attributable to alcohol.
- There is an established causal link between alcohol use and the development of at least seven types of cancer: cancers of the oral cavity, pharynx, oesophagus, liver, larynx, colorectum and female breast cancer. Overall, there is no safe amount of alcohol consumption when it comes to cancer risk.
- In 2020 there were 111 298 new alcohol-attributable cancer cases and 53 254 alcohol-attributable cancer deaths in the EU-27, with colorectal and female breast cancer representing the largest proportion of the new cancer cases (33% and 22% respectively).

- In 2019 alcohol-attributable cancers represented almost a third (three out of every 10) of all alcohol-attributable deaths in the EU.
- In 2020, 12% of all new alcohol-attributable cancer cases and 34% of alcohol-attributable female breast cancers occurred among people consuming 20 g of alcohol per day or less, equivalent to two small glasses of wine daily.

Key roles and objectives of health warnings on labels

- Health warnings are one of the possible labelling elements and aim to inform and alert consumers about potential risks or dangers associated with product use.
- Providing this information through the product label, accessible at the point of purchase and consumption, reaches a broader range of consumers than information provided through other channels.
- From the consumer protection perspective, the availability of information on the product label (at the point of purchase and consumption) can lead to informed consumers empowered to make informed decisions.
- From the public health perspective, health warnings can raise awareness of alcohol-attributable risks and contribute to an overall reduction of alcohol-attributable harm through a multitude of functions that go beyond individual behaviour change, such as increasing support for alcohol policies and decreasing product appeal.
- To ensure that the label will be attended to by consumers and provide evidence-based messages, a mandatory approach is recommended. While legislation on its own does not necessarily guarantee optimal design of health warnings, policy-makers at least have the option to develop regulations specifying the content and format of warnings such that they are aligned with the best current public health evidence, thus making them more conspicuous and likely to have an impact.
- Providing information through the product label can be complemented by providing it through other channels as well, but labelling is unique in achieving the greatest reach among consumers, while representing low cost for governments.

Status of knowledge on alcohol health warning labels

- As of 2024, there are four EU Member States with legislation on health warnings on alcohol container labels: France, Germany, Ireland and Lithuania. Ireland will be the first country in the EU with a warning referring to cancer (next to a warning referencing liver disease and a pregnancy symbol), due to be implemented in May 2026.
- To date, there has been limited evaluation of the impact of mandatory health warnings on labels in Europe. Most evaluation has been done for the French pregnancy pictogram, which is insufficiently visible because of its small size and location on the label. Overall, the number of studies evaluating alcohol health warning labels is currently rather low and mainly limited to a narrow range of English-speaking countries.

- Based on an examination of gaps in the existing literature and consultation with the WHO Technical Advisory Group on Alcohol Labelling, the following research areas have been identified as priorities in the EU context:
    - in the short term, the impact of health warnings that vary in content and format on EU respondents' attention, knowledge and risk perception, as well as their perceptions of messages;
    - in the longer term, evaluation of the impact of repeated exposure to health warnings in the real-world environment (physical or online, and including but not limited to retail settings); and
    - in the current policy context, consumer preferences and the actual use of digital provision of information, for example through a Quick Response (QR) code.

Empirical findings from EU studies conducted to inform this report

- An online experiment with almost 20 000 respondents was conducted between November 2022 and May 2023 in 14 European countries: Austria, Belgium, Estonia, France, Germany, Ireland, Latvia, Lithuania, Netherlands (Kingdom of the), Norway, Portugal, Slovenia, Spain and Sweden.
- The experiment aimed to compare the impact of different types of health messages (responsible drinking, general health harm and three variants of cancer message) on knowledge of alcohol-attributable harms and participants' perceptions of the label. A further aim was to investigate the role of images in the cancer message by comparing a text-only cancer label with a label including a warning symbol and another including an image depicting a cancer patient.
- Cancer warnings significantly increased knowledge of the link between alcohol and cancer in all the 14 European countries, from a low baseline of knowledge on specific cancers. Cancer warnings increased knowledge regardless of the respondent's age, gender or education.
- Compared to the general health harm message or responsibility message, the cancer warnings were also more likely to encourage discussion of alcohol-attributable risks and deter people from alcohol consumption.
- About a quarter (27%) of respondents participating in the online experiment agreed with the statement that they would scan a QR code if it was available on the product label.
- To test the actual usage rate of QR codes, a pilot study was devised in a supermarket in Barcelona (Spain) over a period of one week, in which point-of-sale signs with the message "Alcohol harms your health" and a QR code were placed in the supermarket. To estimate the usage rate of QR codes, a comparison was made between the number of visits to the website (which could be accessed through a QR code) and the number of customers in the supermarket (number of unique sales receipts) over the test week. Overall, six out of 7079 customers scanned the QR code during the week, corresponding to a usage rate of 0.085%. The usage rate was 0.26% among those who purchased alcohol.

Conclusions and next steps

- Cancer-specific health warnings seem to have a unique impact on consumers' knowledge; they are well received by Europeans whether presented in textual form or accompanied by a warning symbol.
- A cancer message referring to alcohol causing specific cancers (such as breast and colon) addresses the lack of awareness about the link between alcohol and cancer in Europe; including such a message on alcohol labels is a promising tool to increase knowledge.
- Labels on product packaging are unique in providing information at the point of sale and consumption. If this information is provided only digitally, accessible through a QR code, fewer people will be exposed to it.
- From the consumer protection perspective, there is sufficient guidance available on minimum design standards and principles to develop and implement labels that provide relevant and easy-to-understand information to consumers in a way that will attract attention.
- From the public health perspective, future research could aim to maximize label impact by further exploring the impact of varying label designs in terms of size, colour and location.
- Future research can also explore how different label designs and repeated exposure to labels in real-life situations influence knowledge and understanding of alcohol-related harm, perceptions of the product (including product appeal) and alcohol consumption.

1. Background and objectives of the report

Based on 2019 data, seven out of the 10 countries with the highest level of alcohol consumption globally are European Union (EU) countries, and the high consumption levels are reflected in high alcohol-attributable burden of disease in the EU *(1)*. In spite of this, there has been a lack of coordinated policy response to alcohol as a public health issue at the EU level, and following the expiration of the EU Alcohol Strategy (2006–2012), alcohol was for a long time off the policy agenda *(2)*. Response to alcohol harm has been put back on the agenda with the adoption of Europe's Beating Cancer Plan in 2021, which sets as one of its targets "to achieve a relative reduction of at least 10% in the harmful use of alcohol by 2025" by supporting EU Member States and stakeholders to implement best practices and capacity-building activities *(3)*. As part of the Beating Cancer Plan, the following alcohol-related activities have been proposed: a review of EU legislation on taxation of alcohol; a proposal for mandatory labelling of the list of ingredients and nutrition declaration on alcoholic beverage products; a proposal for health warnings on alcoholic beverage products; implementation of evidence-based brief interventions; and monitoring of the implementation of the Audiovisual Media Service Directive focused on young people's exposure to online marketing of alcoholic beverages *(4)*.

The Evidence into Action Alcohol Project (EVID-ACTION) supports the implementation of Europe's Beating Cancer Plan initiative *(5)*; it aims to implement the EU4Health Programme's general objective of improving and fostering health in the EU and to reduce harm due to alcohol consumption across the EU through collaboration, coordination and support from the WHO Regional Office for Europe. The present report focuses on EVID-ACTION Specific Objective 1, "Health warning labels for alcoholic beverages"; its aim is to develop the evidence base on alcohol health warnings, with a specific focus on cancer risks, so as to inform the design and development of impactful alcohol health warnings and guidance on design and implementation for the European Commission and countries in scope (EU Member States, Iceland, Norway and Ukraine).

WHO has long recognized the necessity of informing consumers about health risks through product labels. Both the 2010 Global Strategy to Reduce the Harmful Use of Alcohol *(6)* and the European Action Plan to Reduce the Harmful Use of Alcohol 2012–2020 *(7)* call for the provision of "consumer information about, and labelling alcoholic beverages to indicate, the harm related to alcohol". In 2022, to strengthen the implementation of the Global Strategy to Reduce the Harmful Use of Alcohol, the World Health Assembly adopted the Global Alcohol Action Plan 2022–2030 *(8)*, which contains several provisions related to health warnings. At European level, the new WHO European Framework for Action on Alcohol 2022–2025 *(9)*, unanimously adopted by all Member States in the WHO European Region in September 2022, also highlights the provision of health information (with a focus on labelling) as one of its key areas.

This report builds upon previous EU-level work on alcohol labelling and health warnings.[1] The first part (sections 2–4) presents the most recent data on alcohol consumption and alcohol-related harm in the EU, describes the role of labelling and health warnings from the perspectives of consumer protection and public health, and identifies the key research gaps and considerations for future research. This part is based on a synthesis of existing literature and a consultation process conducted with the WHO Technical Advisory Group on Alcohol Labelling (TAG-AL).[2] In the second part (section 5), the collected empirical data are presented; the key focus here is on the presentation of an experimental online large-scale multi-country study on the impact of health warnings in the EU. A pilot initiative on consumer preferences and the use of digital provision of health information is also presented.

1 Earlier projects funded by the European Commission include the PROTECT project (Alcohol labelling policies to protect young people, 2011) *(10,11)*; de Cuyper, Tresignie & Botterman (2014), auditing the presence of health-related messages on alcohol containers in selected EU countries *(12)*; and the AlHaMBRA Project (Alcohol Harm Measuring and Building Capacity for Policy Response and Action, 2020–2022), with one of the working packages focusing on health warnings on labels and commercial communications.

2 TAG-AL was created in 2022 to act as an independent advisory body to the WHO Regional Office for Europe on scientific and technical issues related to strategies, activities, programmes, data and evidence in the field of alcohol labelling. Its role includes evaluating scientific and strategic aspects of labelling, identifying challenges, advising on policy and research, and advancing the international research agenda on alcohol labelling.

2. Overview: alcohol in Europe

This section briefly describes alcohol consumption and alcohol-attributable health harm in the EU, with an emphasis on cancer. "Attributable" is defined here as the portion of harm caused by alcohol that would not have occurred without alcohol consumption *(13,14)*. In particular, the most recent data on the incidence and burden of disease from alcohol-attributable cancers in the EU are presented,[3] as well as the existing data on public awareness of the alcohol–cancer link. Alcohol labelling and alcohol health warnings are then introduced as one of the key policy options to help reduce alcohol-attributable harms.

2.1 Alcohol use and harm in Europe

2.1.1 Alcohol use

Alcohol is a leading risk factor for morbidity and premature mortality and was responsible in 2019 for an estimated 2.6 million deaths worldwide, of which about 240 000 occurred in EU countries *(1,15)*. According to WHO statistics from 2019, 56% of the global population (aged 15+ years) did not consume alcohol: 65% women and 48% men. The situation was completely different in EU countries, where 77% of the population aged 15 years and older consumed alcohol in 2019 – 69% of females and 84% of males. Moreover, heavy episodic drinking (defined by WHO as consuming six or more standard drinks of alcohol,[4] or 60 g of pure alcohol, on a single occasion) was fairly common in the EU, with about 30% of adults in the population engaging in this hazardous drinking pattern, compared to a global average of 18% *(15)*.

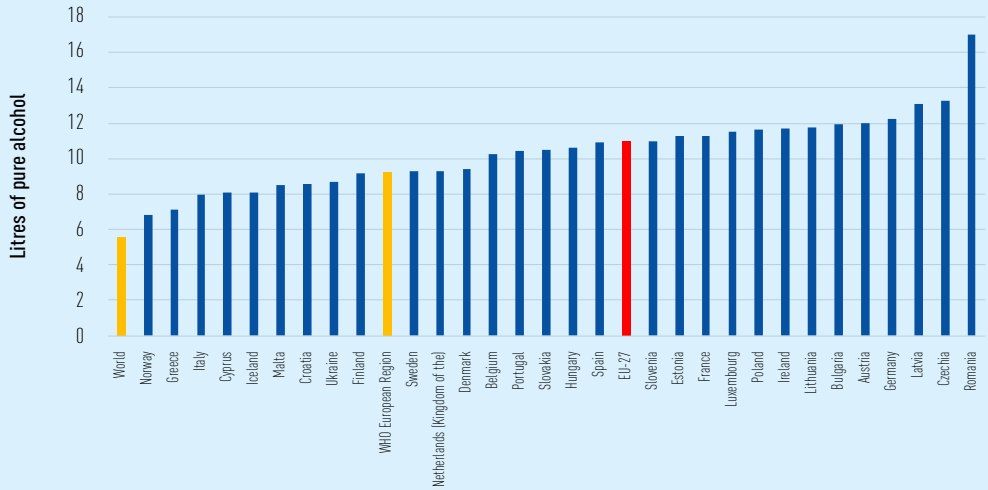
According to 2019 data, seven of the 10 countries with the highest level of alcohol per capita consumption (APC) in the world were located in the EU *(1)*. In that year, the average total APC among adults (15+ years) in the EU was 11.0 litres of pure alcohol, which was about double the global average of 5.5 litres and still markedly in excess of the average for the entire WHO European Region of 9.2 litres (Fig. 1) *(1)*.[5]

3 For exposure, drinking status and cause-specific alcohol mortality measures, data from the WHO Global Information System on Alcohol and Health *(15)* have been used for EU-specific calculations. These data rely on systematically collected or estimated data that are comparable across regions and validated by the Member States *(16)*, and were recently summarized in the report describing progress towards achieving Sustainable Development Goal 3.5 *(1)*. Cause-specific alcohol-attributable morbidity and mortality in the Global Information System on Alcohol and Health were calculated based on WHO's Global Health Estimates *(17,18)*.

4 A standard drink is defined as 10 g of pure alcohol, which is approximately equivalent to a small (300 ml) can of beer, a 100 ml glass of wine or a single shot of spirits.

5 Unless otherwise specified, the graphs and tables of this report refer to the 27 EU Member States (EU-27) as of 2024.

Fig. 1. Total APC (15+ years) in litres of pure alcohol in the EU-27, by country (2019 data)



Source: WHO (2023) *(1)*.

Although alcohol consumption declined between 2010 and 2019 in the WHO European Region as a whole (which comprises a total of 53 countries, including EU countries), this was achieved mainly because of the relative contribution of some non-EU countries. Overall, drinking levels in EU countries were relatively stable, and very little or no progress was made in reducing APC. The 2019 data indicate that several EU Member States were not on track to achieve the global target from the Global Action Plan for the Prevention and Control of Noncommunicable diseases (NCDs), which aims for a minimum 10% relative reduction in APC between 2010 and 2025 *(19,20)*. Indeed, some EU Member States even increased their APC between 2010 and 2019.

2.1.2 Alcohol's burden of disease

According to the International Classification of Diseases (ICD-10), a globally recognized system for categorizing diseases and health conditions, alcohol use is directly linked to more than 230 different health issues across various categories, and over 40 of these categories are fully attributable to alcohol *(21)*. For 2019, WHO estimates that alcohol caused about 240 000 alcohol-attributable deaths in the EU-27, amounting to 5.2% of all deaths, or every 19th adult death *(17)*. Table 1 gives an overview of the distribution of alcohol-attributable deaths, by cause of death. NCDs and, within NCDs, cancers were the biggest category of deaths – three out of every 10 alcohol-attributable deaths were due to cancer. The second biggest category was gastrointestinal diseases, where liver cirrhosis made up the majority of deaths. Concerning morbidity, alcohol use disorders and injury comprised over 50% of all disability-adjusted life years (DALYs), while cancers were responsible for 17.7%.

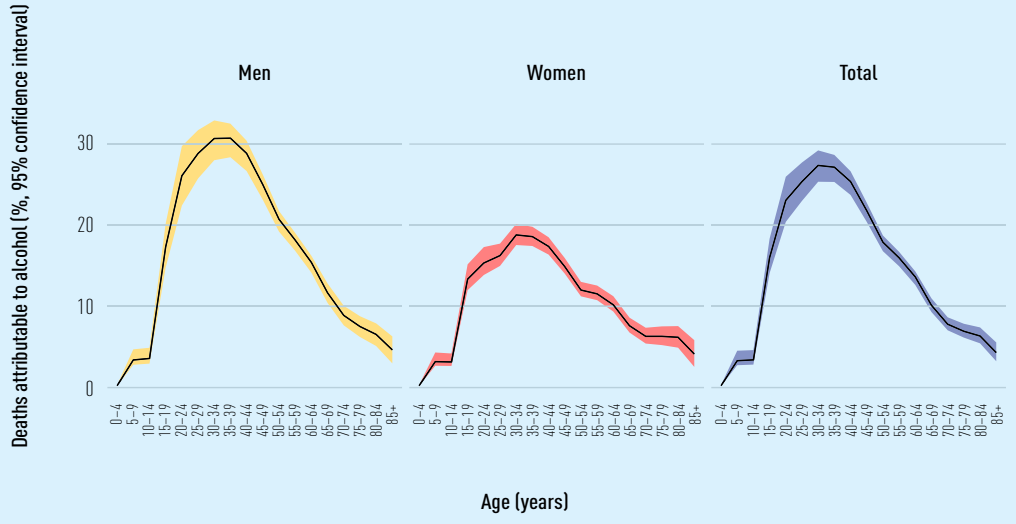
Table 1. Distribution of alcohol-attributable deaths and DALYs in the EU-27, by major disease category, 2019[a]

	Deaths (%)	DALYs (%)
Infectious diseases	5.1	2.4
NCDs	74.6	63.7
Cancers	29.2	17.7
Cardiovascular disease	14.3	7.2
Gastrointestinal disease	22.0	16.9
Alcohol use disorders	9.0	21.4
Other	0.2	0.5
Injury	20.3	33.9
Unintentional injury	14.7	27.4
Intentional injury	5.6	6.4
All	**100.0**	**100.0**

[a] Authors' calculations based on WHO Global Health Estimates *(17,18)*.

While the absolute number of alcohol-attributable deaths was highest later in life, mostly due to alcohol-attributable liver disease and cancer, the proportion of alcohol-attributable deaths among all deaths was highest in early adulthood (Fig. 2). In contrast to other major risk factors such as tobacco, alcohol harms can occur early in life, mostly in the form of road traffic injury, falls, drowning, suicides and other external causes of death. Globally, alcohol use is the leading risk factor for the burden of disease in people under the age of 40 *(22)*. In 2019 alcohol use in the EU-27 contributed to almost every fourth death among the population aged 20–40 *(17)*.

Fig. 2. Proportion of all deaths attributable to alcohol by age and sex in the EU-27, 2019



Source: WHO Global Health Estimates *(17)*.

2.1.3 Alcohol's harm to others

The burden of disease from alcohol extends beyond the individual consuming alcohol, as it can have significant social consequences for second and third parties in the form of road traffic accidents, violence (including intimate partner violence and sexual assault), child neglect, and prenatal alcohol exposure and its consequences, such as fetal alcohol spectrum disorders *(23)*. Estimated prevalence of fetal alcohol syndrome in the general population (per 10 000) is among the highest in the world in EU countries, where it ranges from 3.0 in Luxembourg to 115.2 in Croatia *(24,25)*. According to a recent systematic review of the prevalence of interpersonal violence from others' alcohol use *(26)*, 16.8% of men and 28.3% of women in populations with available data (including European countries) were found to be affected by emotional violence; 5.3% of men and 3.3% of women by physical violence; and 1.3% of men and 3.4% of women by sexual violence. EU-wide survey data show that 38.0% of respondents reported having experienced some harm from others' drinking in the previous 12 months, while 22.3% of respondents reported some kind of adverse childhood experience related to alcohol *(27)*.

While the total contribution to mortality and overall burden of disease due to alcohol's harm to others is currently not well researched in the EU, 4.3% of all alcohol-attributable deaths in the EU, Iceland, Norway and Switzerland in 2016 were estimated to be due to harm to others associated with road injury *(1)*.

2.1.4 Costs associated with alcohol

Although there is less research also in the area of economic costs of alcohol use, studies that attempt to look at these costs from a societal perspective estimate that, on average, about 1.5% of a country's gross domestic product is lost due to alcohol use, mainly in the form of indirect costs through productivity losses caused by (for instance) disability, premature mortality and alcohol-caused absenteeism *(28)*. Given that harms caused to people other than drinkers themselves mentioned in the previous section were not included, these costs are likely to be underestimated. According to a comprehensive study conducted in Australia, the costs associated with harm caused by alcohol consumption to individuals other than drinkers themselves amounted to nearly 20 billion Australian dollars in 2016; the tangible costs portion of that figure represented 0.7% of Australia's gross domestic product for that year, similar to the economic cost of harm experienced by alcohol consumers within the country *(29)*. Finally, analysis of the costs of premature deaths from alcohol-attributable cancers in Europe in 2018 showed that these amounted to €4.58 billion in productivity losses *(30)*.

2.2 Alcohol use and cancer

2.2.1 Epidemiology of alcohol use and cancer

Cancers constitute a major category of NCDs and are one of the leading causes of death worldwide. While the cancer burden of disease and mortality has been increasing in absolute numbers in the EU (and globally), the age-adjusted rates decreased between 1990 and 2019, though this trend has levelled off in recent years *(31)*. As other causes of death have decreased more rapidly, cancers are currently the second-leading broad category of death after circulatory

diseases, with the gap between the two categories narrowing (23% of all deaths in the EU in 2020 were attributable to cancer and 33% to cardiovascular diseases *(32,33)*). Cancer is mostly affected by the same modifiable behaviours as other NCDs: tobacco smoking, alcohol use, physical inactivity and unhealthy diets *(34)*. In the case of alcohol, there is an established causal link between alcohol use and development of at least seven types of cancer – namely, cancers of the oral cavity, pharynx, oesophagus, liver, larynx, colorectum and female breast cancer *(35)*. In the EU, in 2019, three out of every 10 deaths from alcohol-attributable causes were due to cancer (Table 1). In 2020 colorectal and female breast cancer were the most common alcohol-attributable cancers in the EU; there were 24 168 cases and 6024 deaths due to alcohol-attributable breast cancer in women, and 36 907 cases and 16 349 deaths due to alcohol-attributable colorectal cancer in women and men (Table 2). However, fatal outcomes from these cancer types were relatively low compared to other alcohol-attributable cancers, such as oral cavity, oesophagus and pharynx cancers, which occurred less frequently but proportionally more often led to death (Fig. 3).

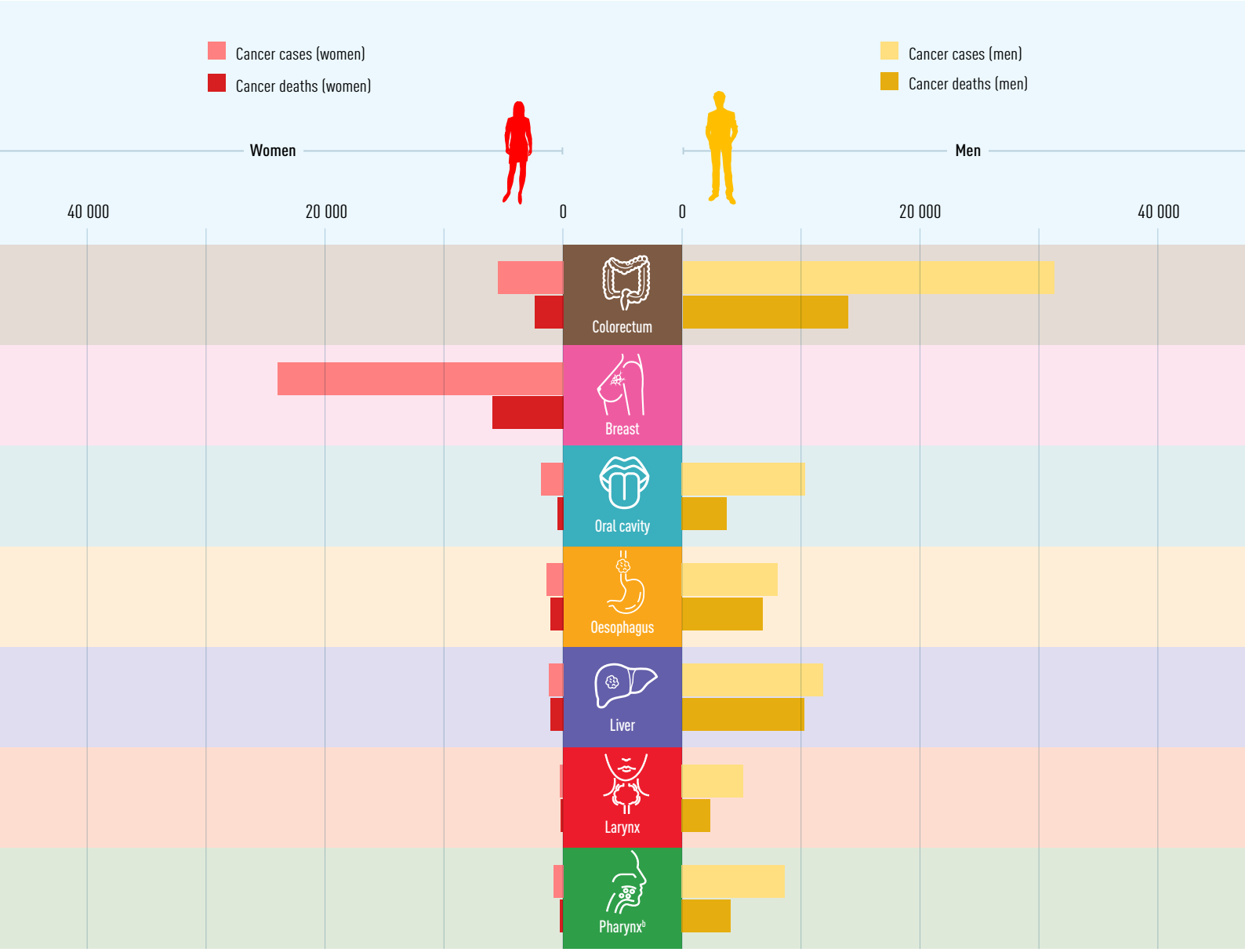
Table 2. Number of alcohol-attributable cancer cases and deaths in the EU-27, by sex and cancer type, 2020[a]

	Cases			Deaths		
	Men	Women	Total	Men	Women	Total
Colorectum	31 347	5 560	36 907	13 946	2 403	16 349
Breast	–	24 168	24 168	–	6 024	6 024
Oral	10 476	1 921	12 397	3 810	554	4 364
Oesophagus	8 125	1 424	9 549	6 885	1 117	8 002
Liver	11 949	1 243	13 192	10 328	1 123	11 451
Larynx	5 233	299	5 532	2 482	109	2 591
Pharynx[b]	8 706	847	9 553	4 187	286	4 473

[a] Authors' calculations based on Global Cancer Observatory (GLOBOCAN) data and methodology *(36,37)*.
[b] excluding nasopharyngeal

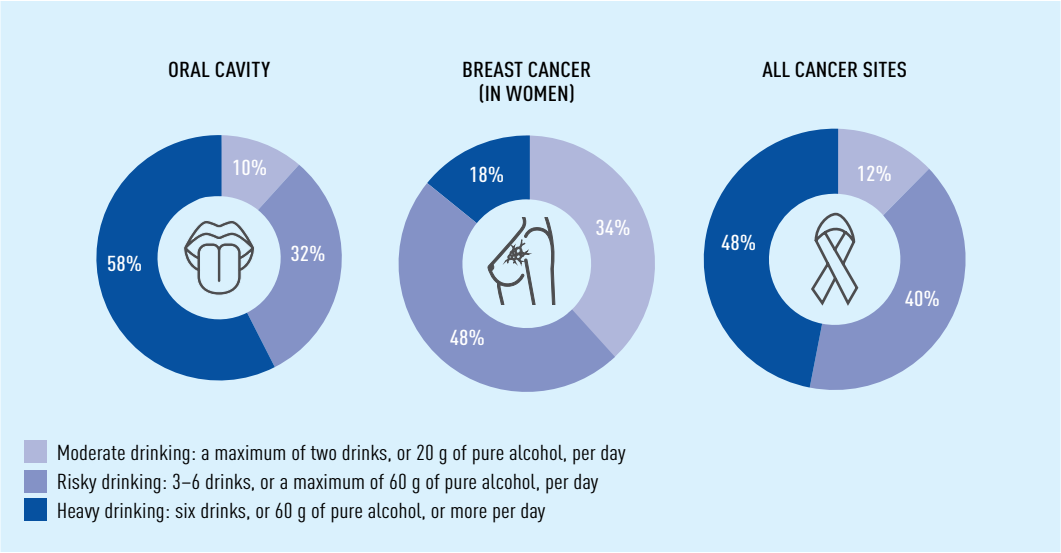
For all seven alcohol-attributable cancer types, a dose–response relationship has been established: the higher the level of alcohol use, the greater the risk of cancer. However, the slopes of the risk curves differ across different cancers, which has implications for the proportion of cancers in a population caused by different drinking levels. For example, most alcohol-attributable oral cancers in the EU in 2020 were caused by consuming 60 g or more of pure alcohol per day, while the majority of alcohol-attributable breast cancers were caused by far lower amounts (Fig. 4). The different dose–response curves may be linked to different biological mechanisms *(35)*.

Fig. 3. Visual representation of alcohol-attributable cancer cases (lighter colours) and deaths (darker colours) in the EU, by sex and cancer type, 2020[a]



[a] Authors' calculations based on GLOBOCAN data and methodology *(36,37)*.
[b] excluding nasopharyngeal

Fig. 4. Proportion of cancer cases due to alcohol in the EU, by cancer type and drinking level, 2020[a]



[a] Authors' calculations based on GLOBOCAN data *(36,37)*. The definition of drinking levels in terms of drinks per day is derived from SHAAP (2019) *(38)* and EMA (2010) *(39)*; the WHO Regional Office for Europe does not define risk levels in categories as such.

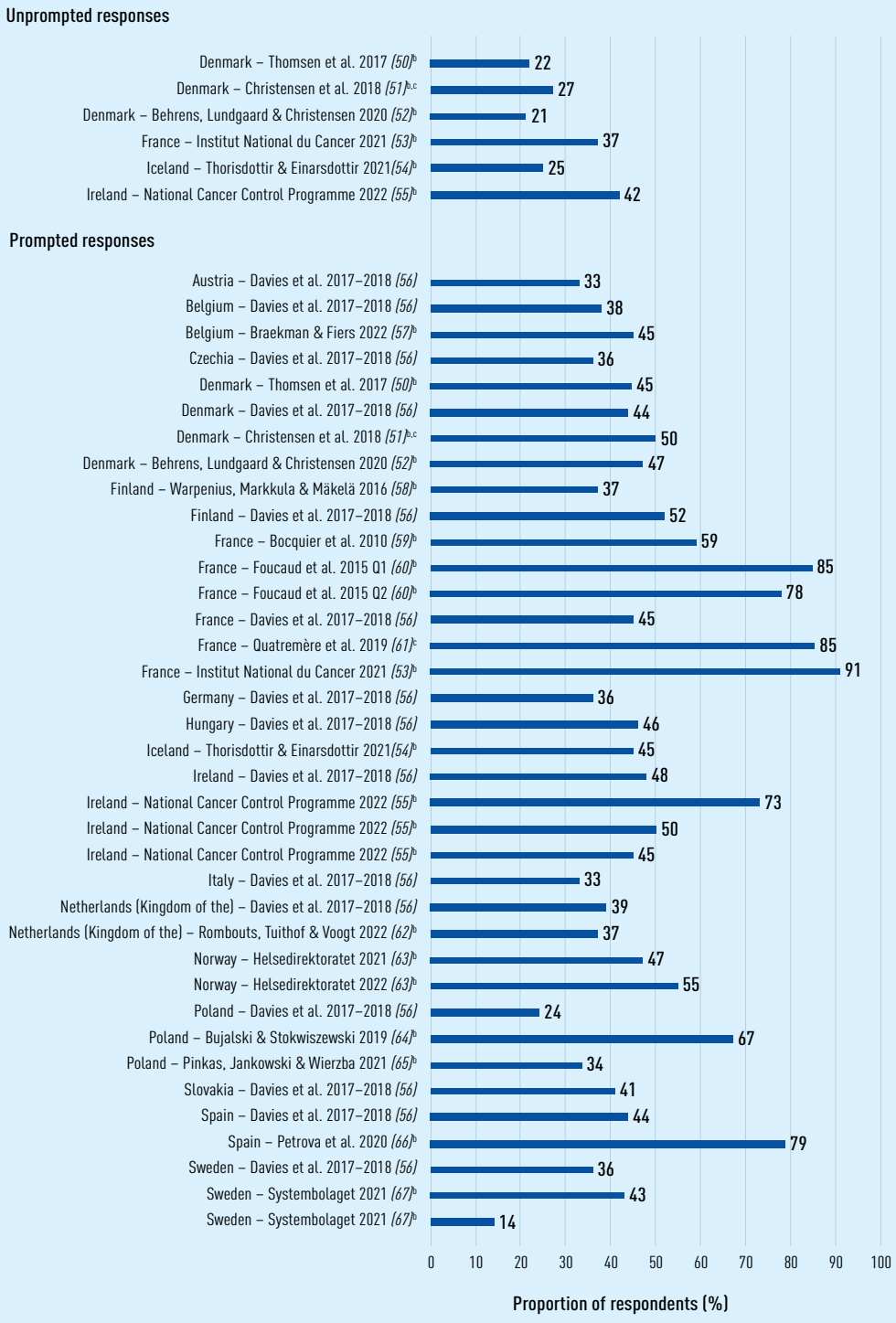
Two points in the causation of cancer by alcohol need to be emphasized: neither the potential biological pathways nor the epidemiology indicate any protective effects at any level of alcohol use. The current biological and epidemiological evidence base cannot indicate any particular lower threshold at which the carcinogenic effects of alcohol start to manifest in the human body *(40)*. However, various studies with different methodologies highlight that a large proportion of alcohol-attributable breast cancers occur at relatively low levels of alcohol use and suggest that, even at an average alcohol intake of one standard drink a day, there is a significant increase in risk of breast cancer *(41)*. According to GLOBOCAN EU data from 2020, 34% of alcohol-attributable female breast cancers occurred among women consuming 20 g of alcohol per day or less (equivalent to approximately 200 ml of wine) *(36,37)*.

2.2.2 Awareness of the relationship between alcohol and cancer

The evidence that alcohol causes cancer is not new: alcoholic beverages were declared "carcinogenic to humans" in the Monographs Programme of the International Agency for Research on Cancer (IARC) as early as 1988 *(42)*. "Ethanol in alcoholic beverages" has been classified as a Group 1 carcinogen by IARC, putting it in the group with sufficient evidence of this link in humans, alongside other well-known carcinogens such as tobacco smoking, asbestos exposure and ionizing radiation *(43)*. Studies that suggest and demonstrate a causal link between alcohol and several cancer types have existed for far longer than this (see, for example, *(44–49)*).

Yet, in Europe, the current levels of awareness of alcohol as a carcinogen do not fully reflect the scientifically established evidence, as demonstrated by Fig. 5 and 6. An overview of recent studies of alcohol and cancer awareness in Europe, in most of which data were collected between 2017 and 2022 *(50–73)*, shows that general awareness tends to be under 50% in the majority of countries, although data collected more recently tend to reflect higher awareness (Fig. 5). Awareness of the relationship between alcohol and specific cancers has been studied to a lesser extent, but it remains under half of the population in the studied countries (Fig. 6).

Fig. 5. Proportion of respondents aware of the link between alcohol and cancer in the EU, Iceland and Norway (prompted and unprompted)[a]

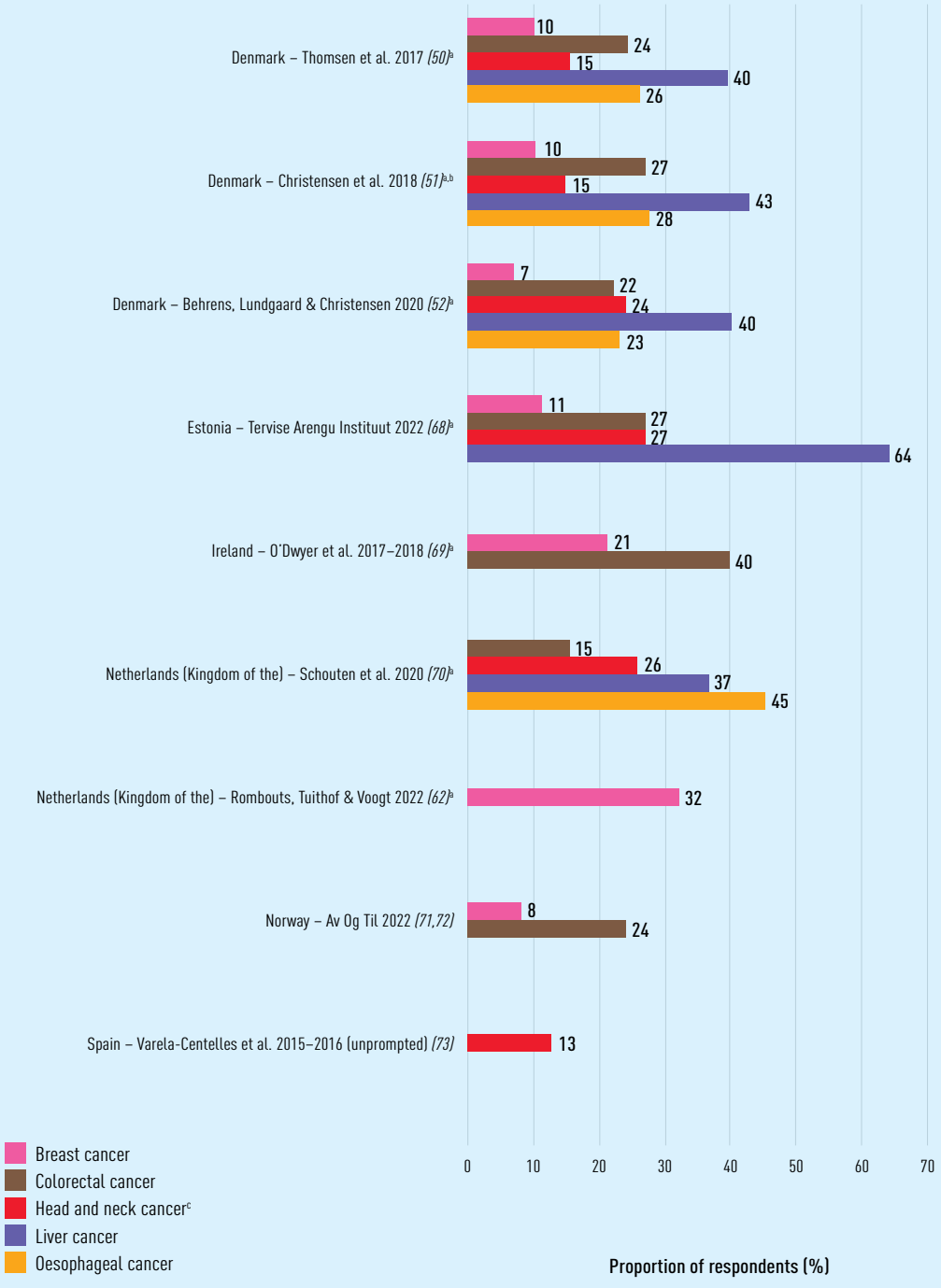


[a] Only studies involving the general population are included (representative and non-representative), based on a scoping review conducted by Kokole et al. *(74)* and expanded with studies from Iceland and Norway, and additional studies published in 2023. Davies et al. *(56)* and Quatremère et al. *(61)* focus on people who use drugs/alcohol. Where different percentages appear from the same source, this is because several different questions were posed within the same study. The percentages in the "Unprompted responses" section (top) represent the proportion of respondents correctly associating cancer with alcohol in unprompted (open) questions. The percentages in the "Prompted responses" section (bottom) represent the proportion of respondents correctly identifying the relationship between alcohol and cancer in response to a prompted question (yes/no question, agreement question). The exact question wording differed between studies. The year indicates the year of data collection.

[b] Data from representative sample. [c] Data from part of sample not exposed to communication campaign.

Key source: Kokole et al. (2023) *(74)*.

Fig. 6. Proportion of respondents aware of the link between alcohol and specific cancers[a]



[a] All studies used prompted questions unless otherwise indicated. Only studies involving the general population are included (representative and non-representative), based on a scoping review conducted by Kokole et al. *(74)*, expanded with studies from Iceland and Norway , and additional studies published in 2023. The percentages represent the proportion of respondents correctly associating cancer with alcohol in unprompted (open) questions, or correctly identifying the relationship in prompted questions (yes/no question, agreement question). The year indicates the year of data collection.

[b] Data from representative sample.

[c] Head and neck cancers refer to cancers that occur around the head and neck and affect body parts such as lips, mouth, throat, sinuses, salivary glands, larynx and ear. Questions under this umbrella term used different wordings: while some studies framed it as head and neck cancer, others framed it as oral, mouth, throat or, more specifically, pharyngeal (= throat) and laryngeal (= voice box) cancer.

Key source: Kokole et al. (2023) *(74)*.

These results demonstrate the need to improve the awareness of the link between alcohol and cancer, and especially of the relationship between alcohol and specific types of cancer. The findings corroborate results from similar studies at the global level, which demonstrate that, while the majority of respondents of population-based surveys correctly identify tobacco smoking as a risk factor for cancer, alcohol use is less commonly identified as such *(75–80)*. While less well researched, some emerging findings also suggest that people may accept that alcohol is a cause of cancer at higher drinking levels, but do not sufficiently recognize that it also causes cancer at lower levels *(55,67,73)*.

2.2.3 Alcohol health warnings and alcohol labelling as a policy option to reduce alcohol-attributable harm

The WHO Global Strategy to Reduce the Harmful Use of Alcohol (2010) *(6)* and the Global Alcohol Action Plan 2022–2030 *(8)* support the implementation of alcohol control policies as a strategy to reduce alcohol-attributable harm by outlining a set of best practices and policy responses to assist countries in reducing the alcohol-attributable burden of diseases, including alcohol-attributable cancers. The key interventions target the affordability, availability and acceptability of alcohol through taxation and pricing measures; restriction of purchase; regulation of production, wholesale, import and retail outlets; and advertising, promotion and sponsorship regulations *(81)*.

In recent years, labelling of alcoholic beverages has increasingly been discussed as an important policy option to influence the acceptability of alcoholic beverages and raise awareness of alcohol-related harm. The Global Alcohol Action Plan 2022–2030 to strengthen implementation of the WHO Global Strategy to Reduce the Harmful Use of Alcohol *(8)* urges WHO Member States to ensure appropriate consumer protection measures by developing and implementing labelling requirements for alcoholic beverages. The Action Plan further specifies that labels should display essential information for health protection – namely, health warnings and information on alcohol content, other ingredients and caloric value – in a way that can be understood by consumers. Additionally, the Action Plan specifies that WHO will commit to developing international guidance on the labelling of alcoholic beverages to inform consumers about the content of products and health risks associated with their consumption, while the proposed measures to regulate economic operators in alcohol production and trade are to ensure the presence of easily understood consumer information on the labels of alcoholic beverages (including composition, age limits, health warnings and contraindications for alcohol consumption).

Box 1 presents some key terminology related to labelling, with a focus on health warnings.

Box 1. Labelling and health warnings: the existing terminology

Labelling is defined by the Cambridge Dictionary as "the act of putting a label on something", with a label being considered "a piece of paper or other material that gives you information about the object it is attached to" *(82)*. Labelling is thus inherently associated with the product it provides the information on.

EU Regulation 1169/2011 defines "label" as "any tag, brand, mark, pictorial or other descriptive matter, written, printed, stencilled, marked, embossed or impressed on, or attached to the packaging or container of food"; and "labelling" as "any words, particulars, trademarks, brand name, pictorial matter or symbol relating to a food and placed on any packaging, document, notice, label, ring or collar accompanying or referring to such food" *(83)*. Codex Alimentarius's definitions align with the EU Regulation, taking an expansive view of labelling that goes beyond just the packaging label itself to include any associated informational materials *(84)*.

Martin-Moreno et al. (2013) identify five labelling elements that may be useful to consumers in the context of alcohol products: (i) a list of ingredients; (ii) nutritional information; (iii) serving size and servings per container; (iv) definition of low-risk intake; and (v) a health warning *(85)*. Thus, the term "alcohol labelling" can refer to some or all of the elements mentioned above.

One of the possible labelling elements – the **health warning** – aims to inform and alert the consumer about the potential risks or dangers associated with product use. Health warnings can be provided through container labels (warning labels), but they can also be used in other contexts, for instance in advertisements. In the case of alcohol, the associated risks extend beyond health to include (for instance) harm to others, so the term "health warning" should be understood in this broader manner.

Health warnings can be further characterized depending on their format and design.

- **Textual warnings** use text to convey the warning message. The text can be factual (describing the effect or risk) or narrative (giving the personal testimony of somebody experiencing the effect). An example of a textual warning is the United States of America alcohol health warning, which contains the following text:

  > GOVERNMENT WARNING: 1. According to the Surgeon General, women should not drink alcoholic beverages during pregnancy because of the risk of birth defects. 2. Consumption of alcoholic beverages impairs your ability to drive a car or operate machinery, and may cause health problems.

- **Pictorial warnings** use images to alert consumers to potential risks of dangers. Based on experience from tobacco *(86–88)*, different types of images can be used:
  - Graphic images of health effects and negative impacts of alcohol use, depicting the physical effects of use on the body (e.g. a diseased liver).
  - Graphic lived-experience images, depicting a person experiencing the consequences of substance use (e.g. a cancer patient).
  - Symbols (pictorials, pictograms, icons) that schematically represent the communicated issue to enhance understanding (e.g. a pregnancy pictogram) or to attract attention (e.g. a safety alert symbol); such symbols can accompany text or be used as standalone warnings *(89)*.

Images in health warnings can have different roles: to attract attention, to visually help convey information so that it is better understood, or to elicit emotions in the viewer (e.g. images of diseased organs eliciting fear).

3. Key objectives and roles of alcohol health warning labels

The *Handbook of warnings (89)*, a comprehensive reference work that provides in-depth analysis and guidance on designing effective warnings and risk communications, outlines several general purposes of warnings (not limited to alcohol). First, warnings are a method of communicating important safety information, with the aim of providing people with adequate information about hazards so that they can make informed decisions on how to avoid getting themselves or others hurt. This aspect is associated with the idea that, even in the absence of demonstrable effectiveness of warnings, people have the right to be informed about safety issues. Second, warnings can be a method of influencing or modifying people's behaviour or its determinants in ways that will remove or reduce any related harm that might arise. This can include warnings that serve as a reminder to people who may already know the relevant information, to remind them of information that might not otherwise be salient in their memory.

This section will consider alcohol health warnings from the perspectives of the two warning purposes outlined above: (i) the consumer protection perspective, focusing on the right to information, specifically in the EU context; and (ii) the public health perspective, focusing on the reduction of alcohol-attributable harm. The section will also consider the unique benefits of including this information on a label, as opposed to other means of information provision, and the importance of adopting a mandatory approach.

3.1 Alcohol labelling from the consumer's perspective: the right to know

At the EU level, consumer protection is recognized in EU law, for example in the Treaty on the Functioning of the European Union (TFEU) and the EU Charter of Fundamental Rights (Article 38) and in secondary legislation, such as the Unfair Commercial Practices Directive and the Food Information to Consumers Regulation *(90–92)*. Articles 9 and 12 TFEU provide general objectives of the EU, with Article 9 requiring a high level of human health protection in all EU policies and activities, and Article 12 requiring consumer protection to be taken into account in all EU policies and activities. Articles 168 and 169 TFEU then define specific EU policies and activities. While Article 168 TFEU empowers the EU to act for public health purposes, Article 169 concerns consumer protection, stating that:

> In order to promote the interests of consumers and to ensure a high level of consumer protection, the Union shall contribute to protecting the health, safety and economic interests of consumers, as well as to promoting their right to information, education and to organise themselves in order to safeguard their interests.

Finally, Article 114 TFEU allows the EU to adopt measures that have as their main objective the establishment and functioning of the internal market, including in the areas of health and consumer protection. Consumer protection is also one of the justifications that can be raised to justify that a national measure constitutes a barrier to the free movement of goods and derogate from the general rule established in Article 34 TFEU, which generally prohibits quantitative restrictions on imports (and all measures having equivalent effect).

While the consumer's right to information is an essential part of consumer protection, this right is currently not fully preserved with regard to alcoholic beverages in the EU. The producers of alcoholic beverages are obliged to provide information on percentage of alcohol by volume (ABV) on the labels of their products if the beverage contains more than 1.2% ABV *(83)*, but other information relevant to consumers, such as ingredients, nutritional values and information on risks associated with the product, is not comprehensively regulated by the EU, and in many instances is left to voluntary initiatives by producers rather than being systematically provided. Beverages with an alcohol content over 1.2% ABV are exempted from the general obligation to provide an ingredients list and a nutrition declaration on the

label (Arts 9(1)(b) and 16(4) of Regulation 1169/2011 on the provision of food information to consumers) *(83)*. From December 2023, wines and aromatized wines must contain a nutrition declaration and list of ingredients; however, both elements can be provided by electronic means, such as a Quick Response (QR) code (Regulation 2021/2117) *(94)*. Another regulation that deals with provision of information on labels is Regulation 1924/2006 on nutrition and health claims, which prohibits alcoholic beverages above 1.2% ABV from bearing any health or nutrition claims except those referring to low alcohol levels, reduction of alcohol content or reduction of energy content *(95)*. There is no EU-wide legislation requiring health warnings on alcohol product labels.

The lack of information provision on risks associated with alcohol stands in contrast to previous actions in which the EU strongly emphasized food safety and proactively banned certain food ingredients, additives and other substances, such as potassium bromate, azodicarbonamide, titanium dioxide, danthron and some artificial colours, after research indicated that they could potentially be carcinogenic or otherwise harmful to human health *(96)*. The EU has also issued clear regulations on placing warning labels on certain food products, such as foods containing caffeine ("Contains caffeine. Not recommended for children or pregnant women") and foods containing certain artificial food colourings ("May have an adverse effect on activity and attention in children") *(97–99)*.

Considering the importance of consumer protection and reliance on information provision in EU law, the key questions are thus not whether the consumer should have information available to make informed decisions also in the context of alcoholic beverages, but rather which information should be prioritized and through which channels such information should be provided. As described in section 2 above, alcohol is associated with numerous risks to the individual, as well as risks of harm to others. In the European context, cancer can be considered one of the key issues to be communicated urgently and as a priority, as it represents the largest proportion of alcohol-attributable deaths as compared to other disease categories, with research currently indicating that knowledge of the alcohol–cancer link is lower compared to other outcomes such as heart disease or liver disease *(100)*.

The second question considers the channels through which information on the risks associated with alcohol should be provided. Providing information on potential risks through labels on product packaging is an established practice in the EU. For example, cosmetic products must carry relevant warnings on containers and packaging if they contain certain chemicals (for instance, "Avoid contact with eyes", "Can cause blindness") *(101)*. The Toy Safety Directive puts in place strict requirements for use of chemicals that are liable to cause cancer, change genetic information, harm fertility or harm an unborn child, unless they are considered safe following a rigorous scientific evaluation *(102)*. It also mandates use of appropriate warning labels to inform users of the risks of harm involved in using toys, as well as ways of avoiding such risks. Finally, the Tobacco Products Directive (2014/40/EU) requires combined picture and text health warnings covering 65% of cigarette/tobacco packaging *(103)*.

The key advantage of providing this information through the product label is accessibility, as the label is physically attached to the product itself, making the information readily available to consumers at the point of purchase (and consumption), without requiring them to look for information elsewhere. Further discussion of the importance of labels compared to other means of information provision in the alcohol context is presented in section 3.3.

Regulations on labelling ethanol already exist at the EU level in the case of ethanol used for industrial or medical purposes. Ethanol as a chemical substance intended for industrial purposes falls under a different regulation from alcoholic beverages and is covered under the Classification, Labelling and Packaging of Hazardous Substances Regulation (Regulation 1272/2008) *(104)*. This regulation classifies ethanol as a dangerous substance and mandates

a label, which, among other information, must contain the danger symbol (covering at least one tenth of the label's surface area), an indication of the danger involved in use of the substance, and a reference to the special risks arising from such dangers *(104)*. According to the harmonized classification and labelling approved by the EU, ethanol is classified as a highly flammable liquid and vapour. Additionally, the classification provided by companies to the European Chemicals Agency in the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation registrations identifies that ethanol is a substance that causes damage to organs, is toxic if swallowed, may cause cancer, is toxic in contact with skin, is toxic if inhaled, causes serious eye damage and causes skin irritation *(105,106)*. Pictograms are then applied to the substance, along with the word "Danger!", as shown in Fig. 7.

Fig. 7. Pictograms used on labels of ethanol to identify it as a chemical substance, in line with the EU REACH regulation

Source: European Chemicals Agency, http://echa.europa.eu/ *(106)*.

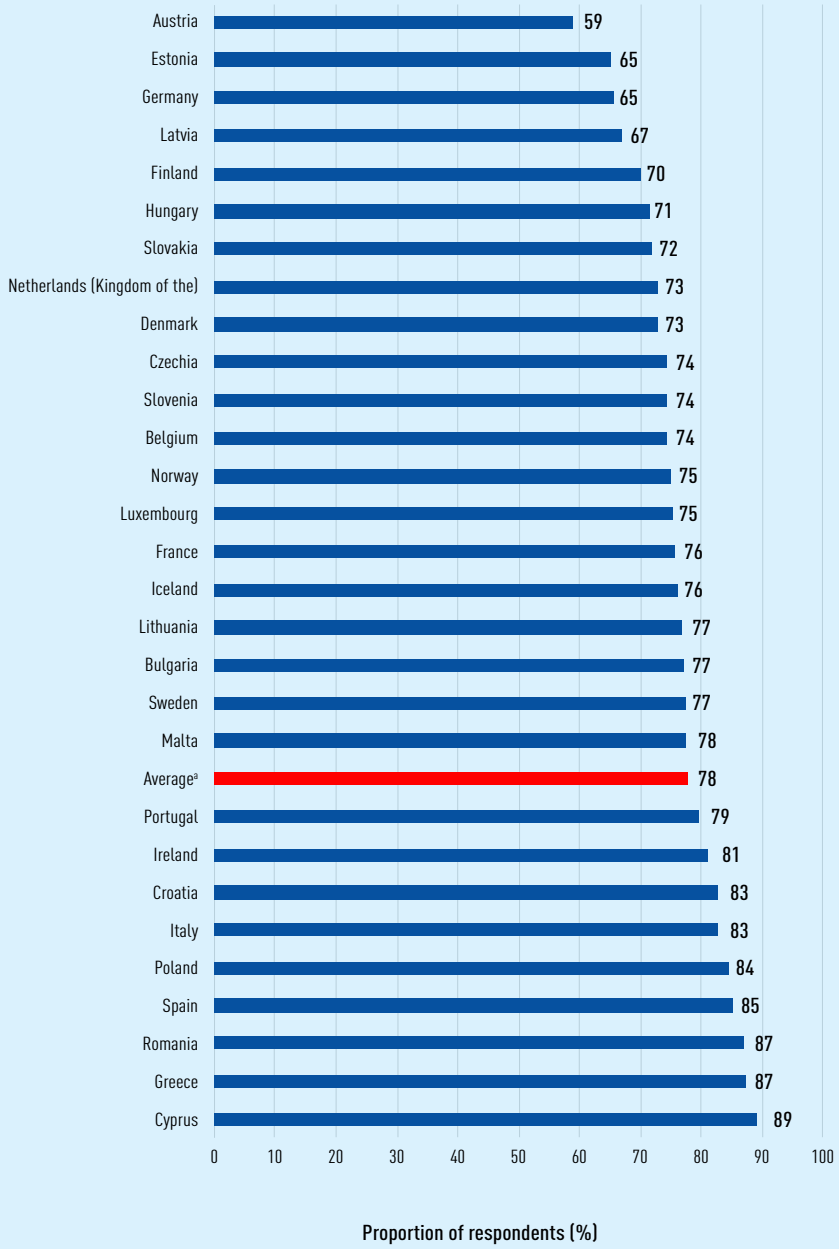
Moreover, the Classification, Labelling and Packaging Regulation also sets clear standards for acetaldehyde levels for ethanol-based products such as disinfectants. Such clear standards do not, however, exist for alcoholic beverages, despite the fact that acetaldehyde associated with consumption of alcoholic beverages has also been classified as a Group 1 carcinogen by IARC, along with ethanol *(35,43)*.

Labelling regulations apply to ethanol also when used in a medical context. Ethanol is considered an excipient (a constituent of a medicine other than the active substance) and referred to in the European Medicines Agency's *Annex to the European Commission guideline on "Excipients in the labelling and package leaflet of medicinal products for human use" (107)*. This guideline stipulates that the leaflet accompanying the medicine must provide information on how much ethanol is contained in each dosage unit of the product in milligrams and the equivalent of what this dosage would contain in millilitres of beer or wine, unless ethanol is present in the medicine only as a processing agent or extraction solvent and is evaporated off.

The EU highly values consumer protection and has previously taken decisive action to protect its citizens by introducing comprehensive regulations on substances that are harmful or potentially harmful to human health; or it has at least acted to warn consumers of potential health consequences. Unlike tobacco, alcohol is not regulated by a legally binding international treaty in a manner similar to the WHO Framework Convention on Tobacco Control. Nor is there a dedicated EU directive or regulation comprehensively regulating alcohol, as is the case for tobacco with the EU Tobacco Product Directive. Alcohol is also the only substance that is consumed at a large scale and leads to major public health consequences that remains without

mandated health warning labels in many countries, including the majority of EU Member States. And while consumer protection should generally be independent of consumers' preferences, in the case of alcohol labelling the two align: more than three quarters of Europeans support inclusion of printed warnings on alcohol beverage labels (Fig. 8), making it one of the most widely supported alcohol policy measures among the general population *(27)*.

Fig. 8. Weighted percentage of respondents from EU, Iceland and Norway supporting inclusion of printed warnings on alcohol beverage labels



[a] The average consists of EU Member States, Bosnia and Herzegovina, Iceland, Norway, Republic of Moldova, Serbia and the United Kingdom and is survey-weighted.

Source: Kilian et al. (2022) *(27)* based on data from Standard European Alcohol Survey 2 (SEAS-2), funded by the European Union and published with the permission from the Health and Digital Executive Agency of the European Commission.

In summary, the EU tends to rely on an information paradigm when it comes to developing food information rules, taking the view that if consumers have the necessary (sufficient, accurate, non-misleading, clear and easy-to-understand) information, they will be able to protect themselves *(108)*. This reliance on information only is insufficient – other non-information-based measures are necessary to create an environment that facilitates healthier choices *(108)* – but in the case of alcohol, even this first step is missing, and the failure to provide information shows a misalignment with expressed EU principles. Comprehensive labelling provisions for alcoholic beverages, including clear, understandable and accessible information on health risks, would align with the EU's consumer protection principles and contribute to consumers being well informed – which is separate from the issue of how such provisions might ultimately influence their choices.

3.2 Labelling from the public health perspective: reduction of alcohol-related harm

From the consumer protection perspective, consumers should have information on product risks available, irrespective of the choice about the product they may ultimately make. The public health perspective, by contrast, poses the question of how provision of information through labels can contribute to reduction of alcohol-attributable harm. This goes beyond focusing on warnings as a method of influencing people's behaviour in the short term. It is true that alcohol-related harm (to oneself and others) can potentially be reduced by individual behaviour change resulting from exposure to labels; this aspect is explored further in section 3.2.1 below.[6] Health warnings, however, can also have many other functions through which they contribute to reducing alcohol-attributable harm, such as increasing awareness of alcohol risks, increasing support for other alcohol policies, decreasing product appeal, and signalling that alcohol is not an ordinary commodity and that its consumption entails risks.

Overall, alcohol labelling is not considered to be one of the "best buys" that are most cost-effective in reducing alcohol-related harm, and it is not expected to have such an effect in the short term – there are other policies to achieve this goal that should be implemented, such as increasing the price of alcohol and decreasing its availability *(23,81)*. However, despite strong evidence of the impact of such policies on alcohol-related harm *(23,110)*, they are poorly and inconsistently implemented – not least in EU Member States *(19)*. The failure to implement these policies is likely due not to a shortage of evidence but to a lack of political will, alongside various commercial determinants of health and political practices adopted by commercial operators *(111,112)*. One of the factors influencing political will is the extent to which the public supports the policies in question *(113)*, and labelling has been shown to increase support for alcohol policies by increasing knowledge of alcohol-related health harms *(114,115)*.

Thus, individual behaviour change should not be viewed as the sole or primary criterion for judging the impact of warnings on alcohol-related harm reduction, especially over the short term. Alcohol labelling, including health warnings, should instead be seen in a systems perspective *(93,116)*, in which it is recognized that alcohol consumption is influenced by factors at different levels and that interventions targeting acceptability of alcohol contribute

6 This is the direction of a significant portion of existing alcohol health warning research; see Clarke et al. (2020) *(109)* for a systematic review of the impact of health warnings on product selection.

to shifting perceptions and beliefs about alcohol at individual and societal levels. From this perspective, including warnings on alcohol container labels would contribute to diminishing the role of the product itself as a marketing tool (as was the case for tobacco *(117)*) and would have an impact not only by influencing current drinkers but also by changing norms and drinking behaviours among younger generations. Finally, mandatory labelling on the health risks associated with alcohol in the context of a broader suite of alcohol policies would signal a message from governments and public health officials that alcohol should not be treated as an ordinary commodity – an important step in starting to expose the public to a range of clear and uniform messaging.

3.2.1 Labelling to change alcohol consumption behaviour: integrating theory and practice

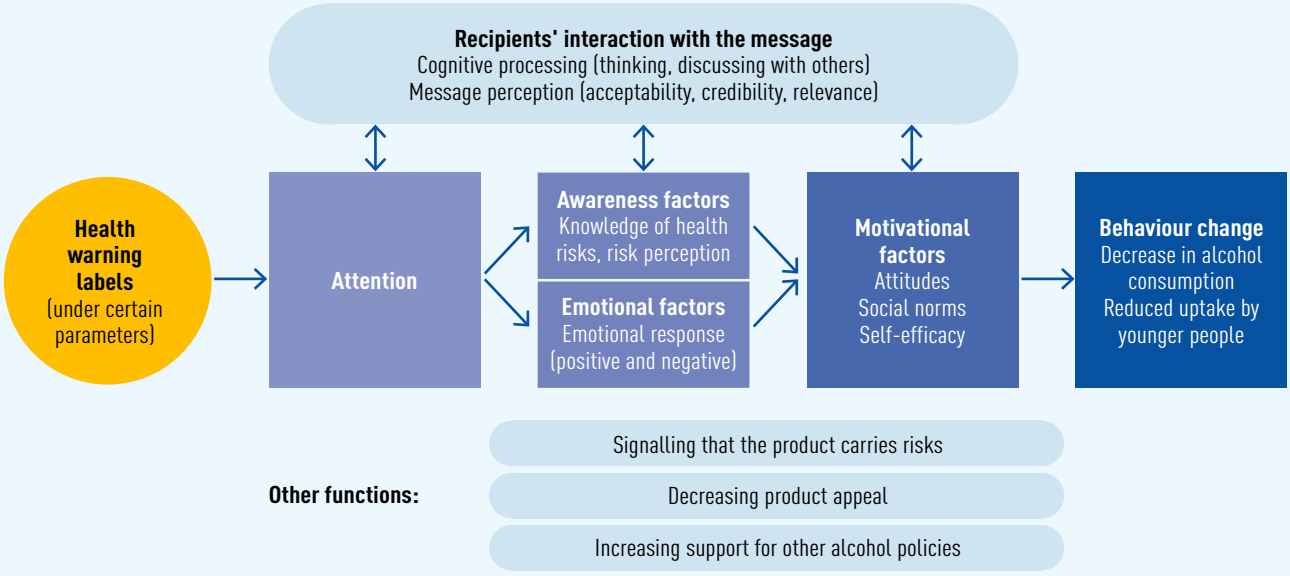
Alcohol consumption behaviour, like any other behaviour, is multi-determined, with many factors (including culture, situational context, personality and habits) influencing it *(118–120)*. The current evidence for the effectiveness of alcohol health warning labels on behaviour change is mixed. However, looking at the studies based on length of exposure to messages, a pattern emerges: studies that involve short exposure to labels show no impact on product selection *(121,122)*, whereas the longer intervention in the Yukon (Canada) study showed decreased self-reported alcohol consumption at follow-up *(114,123)* and decreased sales over the long term *(124)*. This indicates the potential importance of repeated (as opposed to single) exposure to warnings when it comes to changing behaviour.

Before attempting to measure impact on behaviour change, however, most theories would point to a change in precursors/mediating constructs (that is, cognitive factors). In the case of alcohol consumption behaviour, given the lack of public awareness of the link between alcohol consumption and cancer risk *(74,125)*, an important first step in decreasing alcohol consumption is to ensure that the general public is sufficiently informed about the causal impact of alcohol consumption on cancer *(78,126,127)*. Alcohol health warning labels present a unique opportunity – most importantly – to educate the public on the risk of alcohol consumption, but as a secondary outcome, they may serve as a cue for behaviour change at the point of purchase *(128)*. Identifying psychological constructs that should be measured is a key consideration in designing research that will help us to identify the optimal content and format of warnings. For instance, tobacco health warning labels have been shown to draw a significant amount of attention by employing salient, contrasting colours, which appear to increase attention towards, and awareness of, warnings *(129,130)*. From a theoretical perspective, such colours activate the avoidance motivation system (they instil negative affect such as fear and worry) *(131,132)*. However, there may also be other psychological constructs that influence their effectiveness (for instance, self-efficacy, approach motivation, risk perceptions, implicit attitudes and cognitive processing, such as when consumers read labels closely, think about them, and talk to others about the label message *(123,128,131,133–137)*. Similarly, any attempts to conduct research on alcohol warning labels should determine which outcomes it is key to measure.

3.2.2 Theory of change

Fig. 9 presents some possible mediators that can be targeted by alcohol warning labels and which may be important in initiating processes of change in alcohol consumption behaviour. In section 4 below, an overview of current evidence for the impact of alcohol warnings on those variables is presented. The diagram shown in Fig. 9 was adapted to the context of alcohol health warnings based on existing integrated models related to warning processing and health behaviour *(89,138)*; it is partially built upon models previously used in alcohol nutrition labels *(139)* and tobacco warnings *(140)*.

Fig. 9. Possible mechanisms of how health warnings influence behaviour change



Source: created by the authors.

First, health warnings must be implemented under certain parameters to make them more likely to have impact. For instance, they should be designed to attract attention and be engaging, and for this reason, not only the message itself, but also its size, location, colour and separation from the rest of the label, are important *(89)*. Furthermore, labels should be implemented in a way that encourages repeated exposure, as this is more likely to stimulate people to think about the message and discuss it with others *(141)*. Essentially, health warnings must effectively catch and maintain peoples' attention *(89)*, as this is necessary to increase basic levels of awareness of harms, leading to greater knowledge of health risks and more accurate risk perception. Behaviour change comes about for a variety of reasons and can be influenced by motivational and emotional factors, such as attitudes, social norms, self-efficacy and emotional response (increasing negative or decreasing positive response). However, health warnings are not expected to lead to immediate behavioural change after a single exposure to the label. Labels can also help to decrease product attractiveness and thus diminish the potential use of packaging as a marketing tool, as happened in the case of tobacco *(142)*; they can also increase support for other alcohol policies *(115)*, thereby potentially

increasing policy-makers' willingness to implement them. Both of these roles can lead to decreased alcohol consumption over the long term, as a result of both reduced consumption among existing consumers and reduced uptake among potential new consumers (such as young people) and vulnerable groups (such as pregnant women). A label's impact will also be affected by how consumers respond to it, both in terms of message perception (for instance, if they find it relevant, acceptable and credible) and in terms of cognitive processing and interaction with the message (for instance, the extent to which they think about the message or discuss it with others).

In summary, based on the proposed process of change, while behaviour change is theoretically possible, it should not be the primary goal of introducing health warnings. Instead, health warnings should be viewed through a systems perspective, with a focus on optimizing and prioritizing (at least in the short term) factors that attract attention and enhance awareness.

3.3 Labels as an essential tool to communicate information to consumers

Information on alcohol risks can be provided through many different channels. This section looks at why it is so important to provide this information through product labels, considering the added value they bring compared to other channels.

3.3.1 Information on label versus digital means

Producers (including, but not limited to, alcohol producers) increasingly favour digital provision of information, as evidenced by various voluntary commitments and the development of digital labels that are accessible through a QR code on the product itself. In 2023, Regulation (EU) No. 1308/2013 "establishing a common organisation of the markets in agricultural products" and Regulation (EU) No. 251/2014 "on the definition, description, presentation, labelling and the protection of geographical indications of aromatised wine products" were modified (through Regulation 2021/2117) to require a nutrition declaration and a list of ingredients, but it was permitted for this information to be provided through electronic means *(94)*. However, provision of essential information solely through such means can hamper consumers' right to make informed food choices, including in relation "to health, economic, environmental, social and ethical considerations", as proposed in the Food Information to Consumers Regulation 1169/2011 *(83)*. While it is understandable that not all information about a product can be provided by means of a label on the product packaging, essential information allowing consumers to make an informed choice should accompany the product. In the case of alcohol, given the burden of disease that it causes, this should include information on the health risks posed by alcohol. Cancer risk associated with alcohol consumption could be considered an area of priority focus, in view of its great contribution to alcohol-attributable morbidity and mortality and its low level of awareness among the EU population. Providing easy and immediate access to such information on label "with or on a product" could be considered an "essential safeguard of consumer health, rights, and interests" *(143)*. Moving this information online would likely undermine consumer choice by decreasing accessibility to information, making access more time-consuming and introducing more hurdles; at the same time, it would increase inequalities by excluding consumers who lack the means or skills to access this information online *(143)*.

The European Consumer Organisation (Bureau Européen des Unions de Consommateurs) lists a number of arguments for providing information on labels on product packaging, rather than online and accessible through (for instance) QR codes, regardless of the type of product *(143)*:

- Labels enable consumers to easily compare several products in real time; accessing this information via QR codes restricts that possibility.
- Purchasing decisions are usually made very quickly; QR codes are time-consuming and potentially unreliable – people might not have Internet access at the point of sale.
- Consumers of different ages and in different EU countries may have different Internet access and digital skills; providing information only though QR codes could exclude some segments of the population.
- Allowing producers to provide information through websites might increase risks that consumers are exposed to misleading practices, such as providing an excess of information or advertising the product instead of providing essential information in a clear manner.[7]

The European Consumer Organisation also raises concerns over: (i) data protection – allowing traders to collect information on consumers' purchasing behaviour and other personal data through cookies, and using that information to identify users and target them with advertising, in the absence of EU General Data Protection Regulation compliance; and (ii) monitoring – there might be no way to see whether the product site had been updated by companies to reflect any changes.

The European Consumer Organisation therefore recommends that digital labels are used to complement, rather than replace, other means of providing information. This echoes the findings of a review of existing research produced for the European Commission, which looked into sources of information on food (including alcoholic beverages) other than packaging labels available in the marketplace, investigating how consumers use and understand such sources and are influenced by them *(147)*. The authors conclude that:

> Online means seem to be an interesting tool to provide food information that goes beyond elements presented on packaging labels, such as complete list of ingredients or traceability information. Digital means, however, do not seem to be the best option to improve accessibility of food information that enables consumers to make informed food choices.

In the context of alcohol, previous research indicates low consumer use of websites provided on alcohol labels (7% of consumers visited a website of an industry-funded campaign in Australia printed on the label) *(148)*. Off-label information, including information provided online and accessible through QR codes, should not, therefore, replace health warnings on label packaging; rather, it could be used to provide further accurate information for consumers who are interested in finding out more about the topic. If information on the label is complemented with information provided through digital means, it is essential to ensure that the latter is accurate, as producers' websites have been shown to provide evidence that is not aligned with the most recent public health and epidemiology data (see footnote 7). This could be achieved by mandating that the QR code directs the user to a public health website, rather than to a website developed by the producers themselves.

7 Independent of the question of digital labelling, the websites of alcohol producers have previously been found to misrepresent evidence on alcohol and health risks, for instance on cancer *(144)*, cardiovascular disease *(145)*, and fetal alcohol spectrum disorder and the issue of drinking during pregnancy *(146)*. This indicates possible conflicts of interest when producers provide consumers with information on health risks associated with their products, as is further elaborated in this section.

3.3.2 Information on label versus other educational interventions

An argument often made against mandating health information on labels is that the information can be provided to consumers through other information channels. Some options often mentioned in this connection include communication campaigns, warnings on advertisements and education in schools.

While all these measures may play a role in raising awareness if done properly (that is, if they reflect the best available scientific evidence communicated in an appropriate way), providing information on label can be considered superior in terms of reach as the information is accessible to consumers at both point of purchase and point of consumption. Compared to other channels, exposure to labels is also higher among heavier consumers, as the more a person consumes, the higher their exposure to information given on the label.

3.3.2.1 Warnings on labels versus communication campaigns

A 2021 labelling study showed that awareness of cancer risk after exposure to cancer warning labels increased from 36.3% before to 57.0% among German adolescents *(149)*. In a recent Australian study, awareness among adult drinkers increased from 62% in the control group to 68–70% (depending on the experimental condition) after repeated exposure to cancer warnings *(150)*. In the European context, evaluation of a large mass-media communication campaign in Denmark revealed that awareness of the link between alcohol and cancer in the general population rose from 44.8% to 49.7% over a period of six months, while a campaign in the United Kingdom saw awareness rise from 57.9% to 65.6% at the follow-up *(51,151)*. In a recent French communication campaign, knowledge of the cancer–alcohol link did not significantly increase at the follow-up, probably because of the high baseline *(61)*. In the Yukon (Canada) study, cancer warnings were only applied to labels for a month, after which their application had to be stopped as a result of industry threats (this industry action generated a great deal of publicity across the country, which almost amounted to a public health information campaign in its own right) *(114)*. Nevertheless, the authors reported a 10% increase in knowledge in the intervention group two months after the cancer label implementation, compared to the control group.

Both warnings on labels and information provided through communication campaigns have thus been shown to increase awareness of alcohol-attributable harms. However, the population effect of warnings on labels is likely to be greater, as the two approaches differ in reach and level of exposure, with labels likely reaching a larger proportion of the population than communication campaigns. The approaches can work to complement each other, as the impact is likely to be greater if the same message is received from several different sources *(152)*. Communication campaigns could also be used to provide complementary information; for example, they could focus on both why and how to reduce consumption *(61,153)*, while labels focused on why to reduce consumption by providing information on the health risks direct to the key target audience – people who consume alcohol. Finally, compared to (publicly funded) communication campaigns, warning labels incur lower costs for governments.

3.3.2.2 Warnings on labels versus warnings on advertisements

There is scarce literature experimentally evaluating the effectiveness of health warnings on alcohol advertisements *(154–157)*, and in the case of mandatory ones, only those in France have been evaluated *(158,159)*. In comparison to health warnings on labels, exposure to warnings on advertisements is (like communication campaigns) less targeted, as advertisements

are not always present at point of sale and consumption, which lowers their reach. Unlike communication campaigns, however, the costs of implementing the warnings are borne by the producers themselves, rather than (for instance) public health authorities.

From the public health perspective, health warnings on alcohol advertisements could be introduced to tackle the issue of cross-border marketing (marketing coming in from another country, or designed to influence people in the target country, for instance via social media) if stricter regulatory options (such as a ban or restriction) are not possible *(160)*. Warnings on advertisements can follow similar design patterns to warnings on labels in order to maximize understanding and visibility. Another consideration regarding health warnings on advertisements is the content of the advertisement – the warning might be more noticeable and better processed on a regulated advertisement (for instance, one that shows only brand information rather than one aimed at evoking positive emotions) *(161)*. Providing such warnings might also be relevant in the context of online shopping, as product labels (as well as any health warnings on them) are not generally very visible when purchasing alcohol online. A recent study auditing the visibility of health information in samples from New Zealand and the United Kingdom showed low visibility of voluntary health information on both products and webpages *(162)*. Another advantage of this way of communicating risk to consumers is easier logistical implementation of several rotating messages, as is the case with mandatory health warnings in Sweden *(163)*.

3.3.2.3 Receiving information from other sources

Information provided on labels does not have to be the only source of information. Information delivered through educational programmes or through health-care providers can complement and elaborate on information on health risks provided on labels. Screening and brief interventions in primary care are known to be effective and cost-effective for people who consume alcohol, reducing their consumption and proving particularly useful in targeting heavier consumers *(164)*. While education has been shown to be less effective in changing behaviour, it is an important tool in the toolbox when it comes to comprehensive provision of alcohol information. It is important that any educational programmes are based on the most recent public health evidence and remain outside the reach of industry influence, as this has been shown to misrepresent the evidence. However, educational programmes providing information on alcohol health risks tend to focus on specific target audiences, such as young people or heavy drinkers, and as such, they cannot aspire to match the universal reach achieved by product labels to which all consumers are exposed at point of sale and consumption.

3.3.3 Labelling versus other alcohol policies

The alcohol "best buys" that have the greatest and most cost-effective proven impact on reduction of alcohol-attributable harm are well established: pricing, marketing and availability *(23,81)*. Labelling, and specifically health warnings, have a role to play in fulfilling the principle of consumers' right to know, increasing consumer awareness of risks (specifically risk of cancer), and decreasing the potential use of products as marketing tools. However, health warnings on labels have also been shown to boost support for other alcohol policies *(115)*. Thus, as previously emphasized, labelling and health warnings should be seen not as an isolated measure but as part of a broader systems approach to reducing alcohol-related harm, in combination with other policies.

3.4 Why should alcohol labelling be mandatory?

While there are several possible approaches to ensuring availability of information on product labels, a mandatory approach is preferred for several reasons, from both the consumer protection and the public health perspective.

From the consumer protection perspective, where the key outcome is that information is made available through product labels, evaluations of previous attempts at self-regulation in the area of labelling and health warnings revealed that self-regulatory approaches did not achieve full implementation, even after several years. In Australia, for example, the alcohol producers introduced a self-regulatory labelling scheme in 2011 through the industry-funded organization DrinkWise *(165)*. After the first review in 2013, which showed a 38% uptake, the industry was given another two years to improve compliance *(166)*. The next review in 2017, six years after the start of the scheme, showed that only 47.8% of all alcohol products on the market in Australia contained warnings *(167)*. In the EU context, the limitations of voluntary commitments can be observed in the way nutritional information on alcohol labels has been provided. The various EU producers' sectors initiated their voluntary commitments (which differed from sector to sector according to their differing needs and preferences) after the publication of a European Commission 2017 report that addressed the question whether alcoholic beverages should in future be covered by the requirement to provide information on energy values *(83,168)*. Monitoring of the presence of nutritional information on labels of alcoholic beverages in 2021 showed that, of the alcoholic beverages audited in stores across the EU, 29.6% included ingredient information, 21.6% energy value, and 2.5% full nutritional information (energy value and six nutrient elements) *(169)*. Evidently, a mandatory approach, supported by enforcement measures and effective monitoring, is more likely to elicit compliance.

Turning to the public health perspective, it has previously been demonstrated that the impact of alcohol health warnings depends on their content and design.[8] However, as noted by O'Brien et al. (2021) *(171)*, the experiences of countries that have self-regulatory arrangements for alcohol health warning labels, such as the United Kingdom and Australia, show that, if producers are given freedom to design and implement their own labels, health warnings are less likely to be designed in a manner that would attract attention (they are typically small and integrated into the label) and more likely to contain ambiguous messaging *(148,172)*. While a mandatory approach does not, on its own, guarantee that health warnings will be appropriately designed, policy-makers at least have the option to develop regulations specifying the content and format of warnings such that they are aligned with the best current public health evidence, thus making them more conspicuous and likely to have an impact.

3.5 Summary

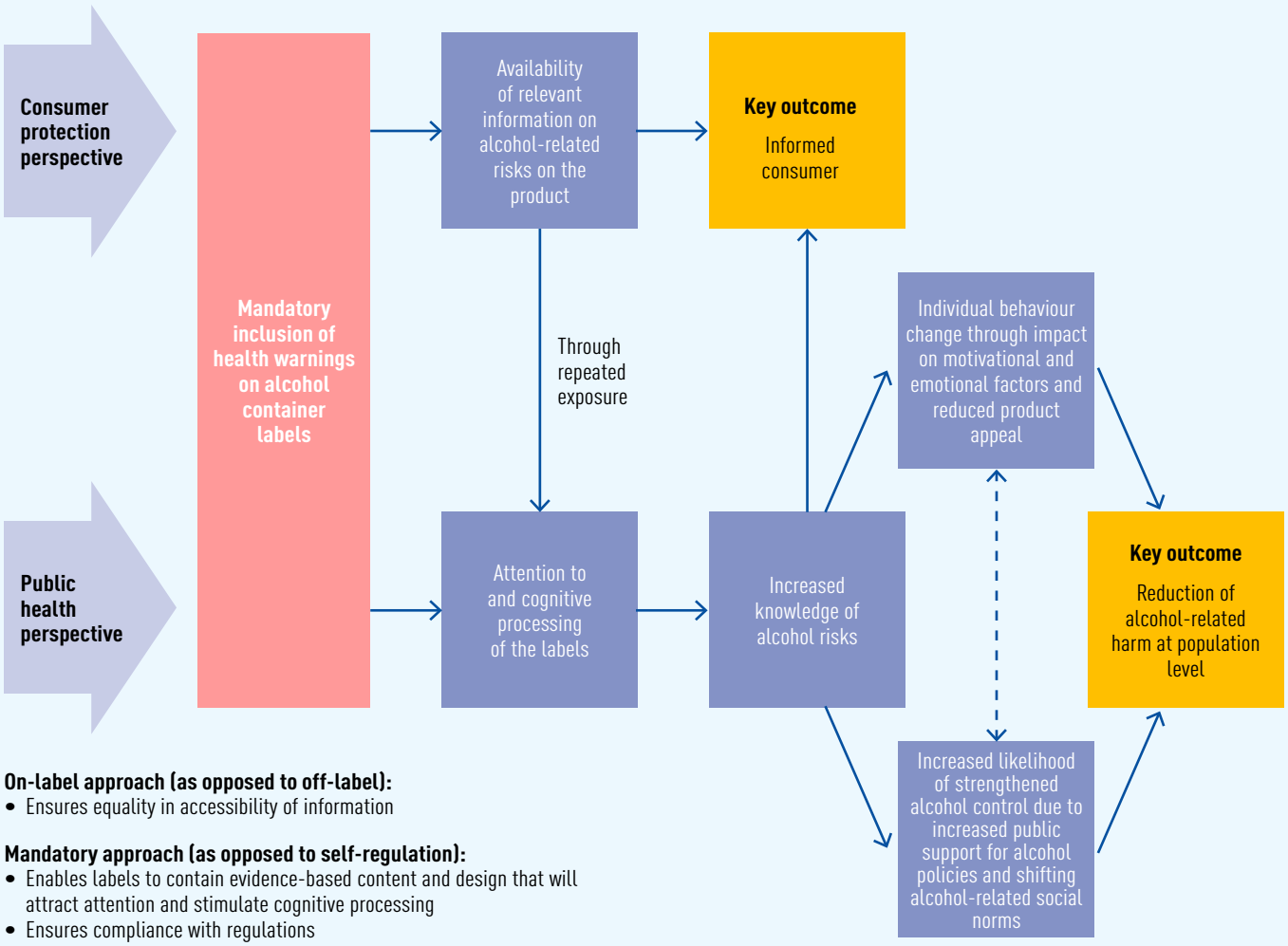
Fig. 10 summarizes the roles of health warnings from both consumer protection and public health perspectives, as described in this section.

From the consumer protection perspective, the availability of information at point of purchase and consumption can help consumers to make informed decisions; and from the public health perspective, health warnings raise awareness of alcohol-related risks and contribute to an

8 See, for example, Kokole, Anderson & Jané-Llopis (2021) for an overview *(170)*.

overall reduction of alcohol-related harm through a multitude of functions that go beyond individual behaviour change, such as increasing support for alcohol policies and decreasing product appeal. To ensure that labels are attended to by consumers and provide evidence-based messages, a mandatory approach is recommended, as it facilitates monitoring and compliance and allows content and design of labels to be specified in such a way that they align with public health evidence. Providing information through product labels can be a complementary measure, working alongside other information channels and other alcohol policies, but labelling is unique in achieving the greatest reach among consumers at point of purchase and consumption. The impact of labelling should be considered from a systems perspective, as part of a broader and more comprehensive alcohol policy approach that signals the message that alcohol is not an ordinary commodity. Finally, the foregoing analysis points to attention, cognitive processing and awareness as key short-term measures to be taken into consideration from both consumer protection and public health perspectives.

Fig. 10. Schematic overview of key health warning influence mechanisms and outcomes from the consumer protection and public health perspectives



Source: created by the authors.

4. Status of knowledge on alcohol health warning labels

4.1 Policy mapping of health warnings on alcohol container labels

4.1.1 Alcohol health warnings in Europe

Currently, there are four EU Member States with legislation on health warnings on labels: France, Germany, Ireland and Lithuania *(93)*. In Ireland mandatory health warnings were included in the 2018 Public Health Alcohol Act and the exact content of the regulation was notified to the European Commission and other Member States in June 2022 *(173)*. In May 2023 this measure was signed by the Irish health minister *(174)*. The regulation (SI No. 246/2023) affords a three-year transition period, indicating that it will come into operation on 22 May 2026, after which all alcohol products sold in Ireland will have to carry a health warning message stating "Drinking alcohol causes liver disease" and "There is a direct link between alcohol and fatal cancers" next to a pregnancy pictogram and website link (Fig. 11) *(175)*.

Fig. 11. Visualization of the Irish label in place on alcohol products

In the European context, Norway has also made progress towards mandatory health warnings on alcohol products. The 2021 alcohol strategy included government plans to introduce requirements for warning labels on alcoholic beverages *(176)*. In 2022 the Norwegian Directorate of Health delivered its recommendation to the Ministry of Health and Care Services for health warnings to be included on labels, including information on alcohol and cancer; and in January 2023 the Directorate of Health was instructed by the Norwegian Minister of Health and Care to assess how health warnings could be accommodated on alcoholic beverages *(177)*.

To date, there has been limited assessment of the impact of mandatory health warnings in Europe. Most evaluation has been done for the French pregnancy pictogram. Evaluation of the French mandated health warning (pregnancy pictogram) showed that warning labels

had been noticed by 66.1% of women and 77.3% of people consuming alcohol five years after their introduction *(178)*, but the warnings were not very visible or noticeable due to their size, location and other competing marketing elements on the packaging or advertisement *(158)*. In another study, 28% of French respondents declared that they had never noticed the labels and 50% did not remember any warning on labels *(179)*.

Health warnings are more common in other Member States of the WHO European Region, 10 of which have mandated health warning messages on labels: Armenia, Belarus, Israel, Kazakhstan, Kyrgyzstan, the Republic of Moldova, the Russian Federation, Türkiye, Turkmenistan and Uzbekistan *(180)*. Mandatory health warnings (either textual or combining text and pictogram) are also present in many other countries around the world: for example, Australia, Chile, Mexico, New Zealand, the Republic of Korea, South Africa and the United States *(181)*.

4.1.2 Cancer warnings in the EU and beyond

Currently, legislated alcohol health warnings on labels in Europe are focused on pregnancy (France, Lithuania) or age (Germany). Ireland is the first country in the EU with a legislated warning focusing on cancer (along with a warning on liver disease, a pregnancy symbol, information on energy value and grams of alcohol contained, and a link to a website with more information). To date, among other EU countries, only Sweden mentions cancer in its health warnings, although these are on advertisements, not labels. In Sweden advertising of alcohol is allowed only for beverages with <15% ABV under certain conditions in printed media, and the advertisements have to contain at least one from a list of 11 statements informing about the adverse effects of alcohol. The legislation also stipulates strict design requirements (horizontal placement, covering at least 20% of the advertisement area, black text on white area with black border, etc.). One of these statements refers to cancer: "Alcohol can cause cerebral haemorrhaging and cancer" (Fig. 12) *(163)*.

Fig. 12. Examples of Swedish warnings on alcohol advertisements[a]

[a] In Swedish - left: "Alcohol can cause cerebral haemorrhaging and cancer"; in Swedish - right: "Alcohol is addictive".
Source: the example designed for the purposes of the report based on the written specifications in the regulations *(163)*.

No evaluation of the effectiveness of these warnings has been published to date, although implementation data suggest that advertisers are systematically choosing the least deterrent alternatives from the list of messages: 80% of messages include one of three statements – "Alcohol can harm your health", "Alcohol in connection with work increases the risk of accidents" or "Starting to drink at an early age increases the risk of alcohol problems" – as there is no requirement to use all the statements equally *(182)*. In 2022 a government committee was appointed to evaluate the possibilities of improving the health warnings in advertisements within the scope of strengthening the protection of children and young people *(183)*. The results of the committee inquiry, published in 2024, proposed that the requirements be extended from printed media to other media, including online marketing *(184)*. The committee also proposed removing the three texts mentioned above because they were considered to be too general and less likely to have a deterrent effect.

Two American states have legislation requiring that consumers are informed about alcohol and cancer risk. In California, Proposition 65 requires businesses (both physical and online vendors) to display point-of-sale warnings informing consumers that consuming alcohol may increase cancer risk, using the statement "WARNING: Drinking distilled spirits, beer, coolers, wine and other alcoholic beverages may increase cancer risk, and, during pregnancy, can cause birth defects". As of 2018, the warning must also include a link to the Proposition 65 website *(185,186)*. In Alaska the new Alcohol Beverages and Cancer Act, passed in May 2024, also requires businesses to provide point-of-sale warning informing consumers that alcohol increases the risk of breast and colon cancers *(187,188)*.

The Republic of Korea was, until Ireland's regulation, the only country worldwide with legislation that includes cancer warnings on labels of alcohol containers. In 2016 the country revised the health warnings that are required for any beverages with an ABV above 1%, mandating that alcohol producers choose one of three messages:

- "Drinking during pregnancy increases the risk for congenital anomaly. Alcohol is [a] carcinogen, so excessive drinking causes liver cancer, gastric adenocarcinoma and so on."
- "Drinking during pregnancy, underage drinking, and excessive drinking cause congenital anomaly, brain development disruptions and cancer, respectively."
- "Drinking during pregnancy increases the risk for congenital anomaly. Excessive drinking causes stroke, memory loss and dementia."

The new regulation also requires specific design and placement of the messages to ensure that they are easily seen by consumers *(189)*. However, there are currently no studies that document how well the warnings have been implemented and enforced or that evaluate their impact on consumers. A 2023 study reported that approximately one third of citizens of the Republic of Korea aged 20–69 were aware that alcohol causes cancer *(190)*.

4.2 Summary of the key evidence on alcohol health warning labels

This section provides a summary of recent experimental or quasi-experimental literature on the impact of new or enhanced labels on various key dimensions, as identified in Fig. 9, with a focus on attentional, awareness and behavioural factors: (i) attention; (ii) cognitive processing; (iii) knowledge; (iv) risk perception; (v) emotional response; (vi) product appeal; (vii) intention;

and (8) behaviour. The selection of (quasi-)experimental design keeps the focus on the impact of the label or its characteristics on dependent variables (the key dimensions). The summary is brief, as numerous other reviews exist that have looked at labelling and health warnings more broadly *(109,170,191–194)*; all of these find that the available literature is scarce (although it has grown in recent years) and that evaluations of real-world interventions are lacking. Unless otherwise indicated, the studies described are online (or laboratory) experiments with short-term exposure, which highlights the need for real-world experimental designs and evidence. The selection of studies is based on a 2021 review by Kokole et al. *(170)*, updated with literature published up to June 2024 that fit the same criteria.

4.2.1 Attention

While limited in quantity, existing research on the impact of alcohol health warnings on attention shows the importance of label design characteristics such as size, colour and images. Enhanced colour and size of pregnancy warnings in an Australian study showed that attention was greater when self-reported by participants, but this was not replicated in eye-tracking measurement *(195)*. Large and colourful pregnancy warnings attracted more attention on the part of women in a French eye-tracking study *(196)*. In the United Kingdom context, the image attracted more attention than the text *(197)*, but another study revealed no difference based on the severity of the image (moderately severe or highly severe) *(198)*. Self-reported attention to text warnings accompanied by a symbol was greater than attention to text-only or control warnings in a study from the United States *(199)*. Evaluation of real-world interventions showed that enhanced labels (large and colourful) increased the rate of recognition, as well as prompted and unprompted recall *(114,123)*.

4.2.2 Cognitive processing

Cognitive processing can be seen as the extent to which information is processed or elaborated on – how closely people examine the information source and how seriously they think about the information or discuss it with others. A real-world intervention found that enhanced labelling increased the cognitive processing of the label, which also partially mediated impact on change in alcohol consumption *(114,123,141)*. In online surveys, the findings were mixed in terms of thinking about harms: Hall et al. (2020) found that labels containing image and text (as opposed to text alone) elicited more thinking about harm *(200)*, while Brennan et al. (2022) found no difference between different label formats in thinking about alcohol risks, even after repeated exposure *(150)*. A study of Mexican young adults found that exposure to warning labels with pictograms increased thinking about risks, when compared to no warning *(201)*.

4.2.3 Knowledge

The studies examined generally show the impact on knowledge resulting from providing information on labels, although the results also show topic dependence. For instance, while the impact on cancer knowledge is well demonstrated in both online experiments *(149,150,202)* and a real-world study *(114)*, for topics such as liver damage and heart disease, knowledge tends to already be high, so there is a ceiling effect (see, for example, Brennan et al. (2022)

(150)). There is relatively little research on this topic compared to other outcomes. Greater knowledge of the alcohol–cancer link resulting from information provided on labels has also been associated with support for other alcohol-related policies in real-world studies of labelling *(115)*, and a relationship between knowledge and support for other policies has been established in numerous cross-sectional studies *(51,203,203)*.

4.2.4 Risk perception

Results concerning the impact on risk perception are mixed. Although all the results come from studies with short exposure to labels and with differently framed questions, they are not directly comparable. Studies show increased risk perception resulting from image-and-text health warning labels *(205)*, and from any health warning label compared to no label *(206–208)* – though the latter only in the case of cancer risk perception. Narrative labels have also been found to have potential to increase risk perception *(209)*. However, other studies have shown no impact of labels on risk perception *(207,210,211)*, and no difference between moderately and highly severe images on labels *(198)*.

4.2.5 Emotional response (negative and positive emotions)

The majority of studies examining emotional response looked at negative emotions, comparing different types of warnings, such as text-only versus (graphic) image-and-text, and showing that the latter elicited more negative emotions than both text alone and no label *(122,149,200,205,206)*. The reaction might also be topic-dependent – Pechey et al. (2020) showed that bowel cancer messages and corresponding graphic images elicited more negative emotions than other types of cancer *(212)*. Ma (2022) demonstrated that narrative labels, including lived-experience images, elicited more negative emotions than no labels, while this was not the case for non-narrative labels *(209)*. Only one study to date has focused on the impact of health warnings on positive emotions elicited by the label *(150)*. The study found that health warnings on labels, regardless of format, elicited less positive emotions in comparison to labels carrying no message or a responsibility message. This study also found that health warnings elicited more negative emotions than control or industry messages after repeated exposure. However, there was interaction with the dose – high exposure to control and industry messages was associated with less negative emotions, which the authors interpreted as a possible consequence of the label also being a marketing tool.

4.2.6 Product appeal

A small number of studies have investigated the impact of health warnings on product appeal. Generally, inclusion of (graphic) images contributed to decreasing product appeal *(200,213–215)*. However, Jones et al. (2022) found that both large-text and image-and-text conditions were effective at decreasing product appeal, opening up the possibility that increasing the size of the warning (rather than including graphic images) could reduce product appeal *(216)*. A study of Mexican young adults found that inclusion of warning labels with pictograms decreased product attractiveness *(201)*, as did a Canadian study looking at cancer warnings *(208)*.

4.2.7 Intention

Results concerning the impact on drinking intention were mixed. Some studies showed an impact *(150,202,205,208,217)*, but there were a few studies that found no impact *(209,218)*. In the United Kingdom, enhancing voluntary labels with attention-grabbing design features, such as brightly coloured borders around health information, did not influence drinking intention *(219)*. Another relevant finding is that the impact on intention differs depending on the amount of exposure sources: messages are more impactful if they come from multiple sources than from a single source *(152)*.

4.2.8 Behaviour

The impact of alcohol health warnings on behaviour seemingly differs based on the length of exposure to the label, with mixed results in studies with brief exposure and positive results in a study with repeated exposure. Small laboratory studies found some differences between any label and no label in the speed at which beverages are consumed *(213)*. Larger naturalistic shopping laboratory and online shopping experiments, meanwhile, did not show any impact on beverage selection *(121,122)*. On the other hand, a real-world intervention with cancer warnings, accompanied by low-risk drinking guidelines and standard drink information, showed a reduction in both self-reported drinking *(114,123)* and alcohol sales over the long term, with an almost 7% reduction in per capita consumption relative to two separate control sites *(124)*.

A comprehensive systematic literature review of the impact of alcohol labels on consumption behaviour, published in 2024, evaluated not only the impact but also the quality of the studies and concluded that mixed labels (combining health warnings with standard drink information and/or drinking guidance) may have large effects on reducing alcohol use in the population (with high certainty) and individuals (with moderate certainty) *(220)*. Health warning labels were also found to have moderate to large effects on slowing the rate of alcohol consumption (with low certainty) and not selecting alcoholic drinks (with moderate certainty). Finally, health warnings were assessed to have small effects on reducing alcohol use during pregnancy (with low certainty) and before driving (with moderate certainty).

4.3 Current gaps in the evidence and research agenda

This section presents the key considerations with regard to possible research directions and current research gaps. It has been prepared based on the evaluation of existing literature (summarized in the previous section), in combination with consultations with members of TAG-AL. Health warnings have been implemented and evaluated in fields other than alcohol – for instance, tobacco *(140,221,222)*, nutrition *(223,224)* and cannabis *(225,226)* – which might provide some guidance and lessons for implementation and evaluation. However, in the following discussion of research gaps, the focus is on what is present and lacking in the alcohol field.

4.3.1 Which labels and which of their characteristics should be considered in evaluation?

Existing labels can be evaluated, both mandatory (for example, labels, including cancer warnings, used in the Republic of Korea) and voluntary (for example, the label symbols currently included voluntarily on some products in the EU).

When newly designed (or existing but enhanced) health warnings are evaluated, the following characteristics can be assessed and compared (in addition to the health warning as a whole):

- **Health warning content:** in terms of message topic (for example, cancer message, other types of message – health harm, social harm/harm to others); wording of the label (for example, in terms of signal word, use of causal language, use of narrative language); and label rotation (including exposure to one message versus multiple messages).
- **Health warning design:** in terms of size; positioning on the label (front versus back, horizontal versus other positions); colour; separation from the background; presence and type of image (for example, pictogram).
- **Health warning exposure:** brief versus repeated exposure; forced exposure versus exposure while shopping in online or real-world retail environment.
- **Health warning in context of the rest of the label:** for example, plain packaging; brand marketing on the label; nutritional information; ABV content.

To date, research has typically focused on particular aspects of an alcohol health warning's content (for example, Morgenstern et al. (2021) *(149)*; Pechey et al. (2020) *(212)*) and/or design (for example, Lacoste-Badie (2022) *(196)*; Hobin et al. (2018) *(227)*). However, there are gaps in the evaluation of design characteristics, including evaluation of imagery beyond graphic images (such as symbols and lived-experience images). In terms of exposure, the majority of studies involve brief, one-time exposure followed by immediate reaction to labels; more evidence is needed on the impact of repeated exposure (for an example of an online study with repeated exposure, see Brennan et al. (2022) *(150)*; for an example of a real-world study, see Hobin et al. (2020) *(141)*). Finally, while many studies measure reaction to a health warning in the context of the product label rather than on its own, the conditions are not systematically manipulated to assess the impact of health warnings in the context of different types of information on the label, such as brand marketing or nutritional information/claims (for examples, see Hobin et al. (2024) *(208)* and Al-Hamdani & Smith (2017) *(215)*).

4.3.2 Which outcomes should be evaluated?

For both existing and new health warnings, their impact could be evaluated with the help of the model presented in Fig. 9.

- Studies with short-term exposure to the health warning could primarily focus on more proximal outcomes, such as attention and awareness factors (knowledge of health risks and risk perception). Emotional reactions to warnings can also be assessed, both in terms of positive and negative emotions. Studies evaluating longer-term exposure to health warnings can move beyond proximal factors to focus also on more distal ones, such as motivational and behavioural factors.
- When it comes to evaluating behaviour, overall reduction of alcohol consumption among drinkers is only one of the key measures; replacement of alcohol consumption with available alternatives (such as non-alcoholic drinks) or continued non-uptake of alcohol among non-drinkers (including young people) should also be considered.
- The relationship between outcomes in the proposed chain can be assessed, to elaborate on the theory of how health warnings work; alongside these outcomes, the possible

second-order effects can also be evaluated, such as perception of product appeal and support for other alcohol policies.

- In both short- and long-term exposure studies, participant reactions can be evaluated – for example, understanding and interaction with the message; acceptability or support for the warning; relevance, credibility and believability of the warning; and cognitive processing of the message (thinking about harms or discussing the harms with others).

Currently, many studies focus on evaluating attitudes and beliefs about alcohol consumption, negative emotional response, or behavioural intentions (for an overview, see for example Kokole, Anderson & Jané-Llopis (2021) *(170)*). There are some gaps when it comes to evaluation of attention (especially when it comes to comparison of different designs) and awareness – for example, knowledge of health risks associated with alcohol, with a specific focus on cancer, especially in the EU context. Impact on positive emotional responses to products has also been insufficiently evaluated, especially in the context of repeated exposure (for an example, see Brennan et al. (2022) *(150)*). Choosing the relevant outcomes to be evaluated is key also from the legal perspective, as the alignment between the goals pursued by a law on alcohol labelling and the outcomes that can be achieved by labels will be evaluated by courts when assessing the validity of such laws. Evidence generated of the impact of labelling on these outcomes will thus be crucial in the legislative development.

Finally, in line with the consumer protection perspective, the current availability of health warnings on alcohol labels could be measured as a key outcome, and this could include monitoring of compliance with legislation or voluntary commitments. In the EU context, there is a lack of implementation monitoring of existing warnings (in line with monitoring of other label aspects; see, for example, Sarasa-Renedo et al. (2022) *(169)*): the last study was conducted based on data collected in 2013 *(12)*. In Australia and New Zealand there is an ongoing project to monitor the implementation of legislation by monitoring the presence of pregnancy warnings on labels *(228)*.

4.3.3 Which methodologies can be used to evaluate health warnings on labels?

Overall, controlled experimental design is preferable to establish causal conclusions on impact, as evidence from randomized controlled trials employing an experimental design is often rated highest among primary studies *(229)*. Isolating the impact of an independent variable can be useful in evaluating short-term outcomes and examining variations in response to different label characteristics. However, when attempting to study the impact of interventions in the real world, several issues may arise *(230,231)*:

- It is not necessarily feasible to replicate evidence obtained from a strictly controlled experimental setting in a real-world context. Thus, it may be more appropriate to adopt other approaches in a real-world setting, such as a quasi-experimental design (in which participants are not randomly assigned to experimental groups) or a natural experiment.

- Apart from some short-term outcomes, labelling may work in more complex ways than can be measured with a simple experimental design (as discussed above); it may not be possible to isolate the real-world impact of labelling from the impact of other interventions (if implemented together), with the impact showing up only over the long term.

For this reason, a combination of methodologies could be considered. Some approaches that can be used when evaluating health warnings are the following *(232)*:

- **Qualitative methods** – for example, interviews, focus groups (for instance, to evaluate participant responses to health warnings, either when designing the label or when evaluating a real-world study).
- **Quantitative methods** – for example, surveys, questionnaires (to evaluate impact on key outcomes – awareness or motivational, emotional and behavioural factors), eye-tracking (to evaluate impact on attention).

Existing data can also be used – for example, sales data can serve as an objective counterpart to self-report, and content analysis of existing materials can be conducted. Triangulation and mixed-methods approaches can help to gain better insight into the outcomes obtained. The focus should be on producing a range of different types of evidence, while at the same time recognizing the relative strengths and weaknesses of different types of methodologies and their contribution to the evidence base at different phases. In addition to the above-mentioned methodologies, co-creation approaches can be used when developing health warnings *(233)*, while implementation science *(234)* and complex systems thinking concepts *(235)* can be applied when evaluating them.

4.3.4 Which contextual characteristics should be taken into account when evaluating labels?

Regardless of the type of study, type of label and outcomes studied, studies should always be placed in the context of the wider environment and the population studied. Some characteristics to be taken into account are: (i) the social and cultural context – for example, substance use patterns (including alcohol) or existing alcohol policies in the country; and (ii) population characteristics – level of alcohol consumption at the individual level, demographics (age, gender, socioeconomic status as measured by income or education) and psychographics (personality, values, opinions and beliefs beyond alcohol consumption), including health literacy. Consideration should also be given to the impact on potentially vulnerable groups, such as young people, women (in some cases) and people in recovery from alcohol use disorder. While some aspects (such as individual characteristics) can be taken into account as covariates when analysing the data, others (such as the social and cultural context) can only be included descriptively and engaged with in the interpretation and discussion of results.

To date, a large majority of studies evaluating alcohol health warning labels come from English-speaking countries, including Australia, Canada, the United Kingdom and the United States *(193)*. In the EU some published studies have been conducted in France, Germany, Italy, Luxembourg and Switzerland *(149,158,178,179,196,207,210,218,236–238)*. More (multi-country) studies are needed to fill these research gaps. This is necessary both to facilitate examination of the generalizability of results and to allow countries to rely on their own evidence for the purpose of developing labelling legislation.

4.3.5 Which topics relevant or adjacent to health warning policy should also be monitored and investigated?

There are a number of topics that are related to implementation issues rather than impact:

- Legal and policy-making perspective: legal considerations raised by mandating health warnings on labels; the process in different legislative contexts; the involvement of different stakeholders in policy-making; lessons learned from previous attempts to mandate health warnings.
- Commercial determinants of alcohol labelling policy-making: examining the political practices of economic operators, media coverage, and the counterarguments and counternarratives ranged against health warnings.
- Practical implementation of labelling: practical facilitators of and barriers to the label change process; processes and costs incurred in changing labels.
- The reach and impact of health warnings on labels compared with information shared in other formats (for example, online – accessible through QR codes, through communication campaigns, at point of sale, on alcohol advertisements).

Existing papers taking a legal perspective are pitched predominantly at the global level, focusing on issues such as the human rights perspective, World Trade Organization mechanisms and Codex Alimentarius developments *(111,239–241)*, while more recent literature also focuses on the situation in the EU *(108,242)* or its Member States *(243)*. There is very little information on the costs of labelling apart from early evaluations of the voluntary Australian labelling initiative *(167)*, modelling done for the Australian pregnancy warning label *(244)* and assessment of the potential impact of the Irish warning label *(245)*. There are also no direct comparisons of health warnings on labels and warnings or educational interventions in other formats, nor is there information on consumer preferences and use of online sources accessed through information on the label (such as QR codes and websites).

4.3.6 Summary: what are the key gaps in the evidence to be addressed?

Systematic reviews tend to be ranked highest in the hierarchy of evidence *(246)*. However, the key issue in the field of alcohol health warning is that at present, despite numerous attempts to review the existing evidence, the number of empirical studies is small and limited to a narrow range of English-speaking countries. Based on the assessment of current literature and recommendations from TAG-AL, in the EU context the key research questions to be prioritized are the following:

- In the short term: what is the impact of varying health warnings (in terms of content and format) on respondents' attention and awareness (knowledge and risk perception), and how do EU citizens interact with the information on alcohol risks, including cancer risk, provided through product labels?
- In the long term: what is the impact of repeated exposure to health warnings in the real-world retail environment (physical and online) on awareness and other cognitive and behavioural variables, and how does provision of this information on-label compare in terms of reach and impact to provision of information off-label (accessible through a QR code, etc.)?

5. Alcohol health warnings: empirical findings from EU studies

5.1 Impact of alcohol health warnings on cancer awareness in Europe: evidence from the first EU large-scale online experiment

In response to the lack of research on the impact and perceptions of health warnings on labels within the EU, as described in the previous section, the WHO Regional Office for Europe conducted a multi-country online experiment between November 2022 and May 2023. The study was conducted among alcohol consumers in 14 European countries: Austria, Belgium, Estonia, France, Germany, Ireland, Latvia, Lithuania, Netherlands (Kingdom of the), Norway, Portugal, Slovenia, Spain and Sweden, and resulted in three publications, all published in 2024:

1. Correia D, Tran A, Kokole D, Neufeld M, Olsen A, Likki T et al. Designing and implementing an experimental survey on knowledge and perceptions about alcohol warning labels *(247)*
2. Neufeld M, Kokole D, Correia D, Ferreira-Borges C, Olsen A, Tran A et al. How much do Europeans know about the link between alcohol use and cancer? Results from an online survey in 14 countries *(248)*
3. Correia D, Kokole D, Rehm J, Tran A, Ferreira-Borges C, Galea G et al. Effect of alcohol health warning labels on knowledge related to the ill effects of alcohol on cancer risk and their public perceptions in 14 European countries: an online survey experiment *(249)*.

In this section, we summarize the key findings of the study as published in documents 2 and 3. A detailed description of the methodology used to design and implement the study is given in document 1.

5.1.1 Knowledge about alcohol causing cancer

Based on the baseline data weighted to approximate the population distribution in each of the participating countries *(248)*, when asked which diseases are caused by alcohol, 53% of respondents selected cancer, 68% heart disease and 90% liver disease. Knowledge of specific cancers caused by alcohol was lower: 50% of respondents correctly identified liver cancer, 39% colon cancer, 28% oral cancer and 15% female breast cancer. Overall, females, respondents in the younger age groups (18–34, 35–54) and respondents with tertiary education appeared to have higher knowledge of the different conditions associated with alcohol (Table 3).

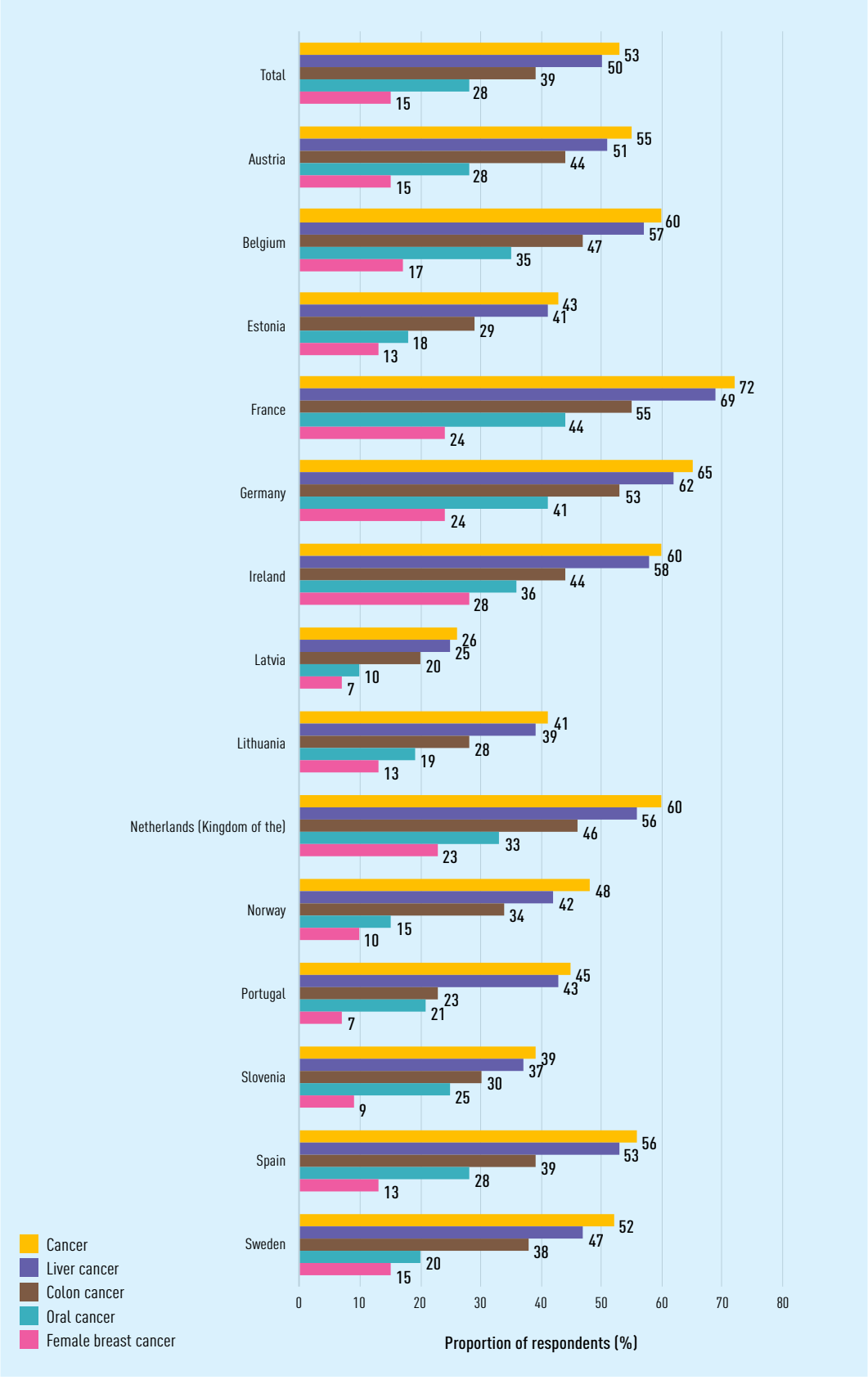
Table 3. Baseline knowledge of alcohol as the cause of various conditions[a]

	Total (%)	Gender (%)		Age (%)			Education (%)	
		Female	Male	18–34	35–54	55+	Secondary or less	Tertiary
Liver disease	**90**	93	86	89	91	89	88	93
Heart disease	**68**	71	64	74	68	61	64	73
Cancer	**53**	57	49	56	53	49	47	62
Liver cancer[b]	**50**	54	46	53	50	47	45	59
Colon cancer[b]	**39**	42	35	38	41	36	33	48
Oral cancer[b]	**28**	31	25	30	29	24	23	36
Female breast cancer[b]	**15**	21	10	15	16	14	10	23

[a] Data are weighted at country level to approximate population distribution by age, gender and education; *n* = 19 601.
[b] Only respondents selecting "cancer" were asked the question about specific cancers; however, the results refer to proportion of all participants.
Source: Neufeld et al. (2024) *(248)*.

In Fig. 13 the findings for knowledge of alcohol as a cause of cancer are presented by country. France, Germany, Netherlands (Kingdom of the), Ireland and Belgium had the highest proportion of respondents selecting cancer as a disease caused by alcohol. Of the specific cancer types asked about, breast cancer was least associated with alcohol, with a low proportion in each country (ranging from 7% to 28%) familiar with the risk. In all countries, there were strong similarities in the percentages of respondents selecting cancer (range 26–72%) and liver cancer (range 25–69%), indicating that when people think about alcohol and cancer, they most commonly associate it with liver cancer. Among the specific types of cancer, the proportions were ranked in the same order in each country: liver cancer, then colon cancer, then oral cancer, then female breast cancer.

Fig. 13. Country-level knowledge of alcohol as a cause of cancer



Source: Neufeld et al. (2024) *(248)*.

5.1.2 Impact of health warning messages on knowledge

The key research aim was to evaluate the impact of health warning messages on knowledge of alcohol-attributable harms *(249)*. The experiment consisted of six conditions that the participants were randomly assigned to at the beginning of the study, with five message conditions and one control condition, as presented in Fig. 14.

- **Responsible drinking message condition:** the message "Please drink responsibly" – a variant of responsibility message that is commonly used on product labels as part of producers' self-regulatory commitments.
- **General health harm message condition:** the message "Alcohol harms your health", designed in the style of older generations of tobacco health harm messages *(250)* and some currently mandated alcohol labels, such as in Turkmenistan *(251)*.
- **Cancer warning conditions:** the message "Alcohol causes cancer, including breast and colon cancer", a cancer warning developed on the basis of previous research and best design practice in alcohol labelling. Adapted from the Yukon study *(114)*, the message specifies that alcohol causes cancer and singles out specific cancers with the greatest burden in the EU (breast and colon cancer) *(41)*; stronger causal language ("causes" rather than "can cause") is used, as this has been shown to increase perceived effectiveness *(252)*. Three variants of the message were tested: (i) text only; (ii) text and warning symbol (an exclamation mark inside a triangle, a symbol commonly associated with warning/danger *(89)*); and (iii) text plus a graphic image depicting a cancer patient that was previously rated as highly severe, realistic and consistent with the topic *(198)*.

Fig. 14. Labels presented in the six experimental conditions

Control
No message

Responsible drinking
"Please drink responsibly"

General health harm
"Alcohol harms your health"

Cancer, text only
"Alcohol causes cancer, including breast and colon cancer"
Warning presented in a red-bordered text box

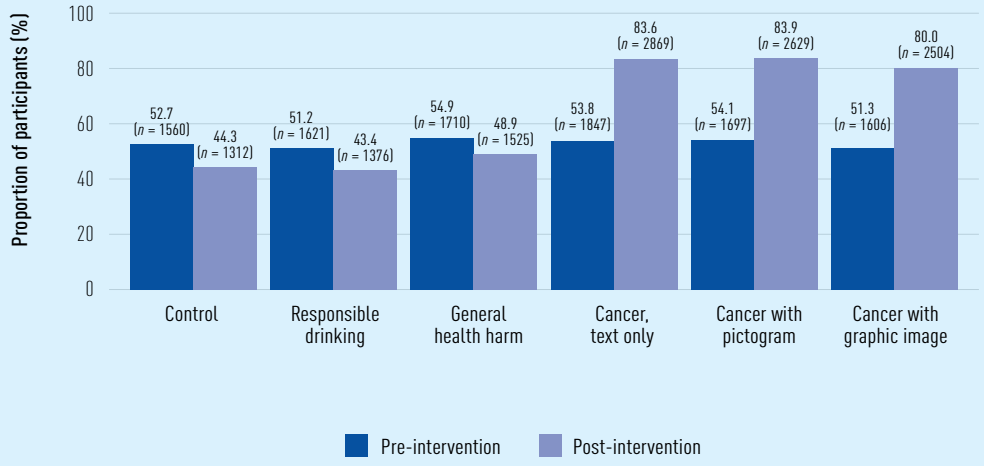
Cancer with pictogram
"Alcohol causes cancer, including breast and colon cancer"
Warning presented in a red-bordered text box displaying a red hazard symbol containing an exclamation mark

Cancer with graphic image
"Alcohol causes cancer, including breast and colon cancer"
Warning presented in a red-bordered text box displaying an image of a cancer patient

Source: Correia et al. (2024) *(249)*.

Outcomes were measured before and after exposure to the six different label conditions. Nearly a third of the participants exposed to the cancer message increased their knowledge of alcohol causing cancer. When exposed to cancer messages, knowledge increased across the whole sample, in all the studied countries and across all demographic groups. Full results by experimental condition for knowledge of alcohol causing cancer are presented in Fig. 15.

Fig. 15. Proportion of participants selecting alcohol as a risk factor for cancer before and after exposure to the labels[a]



[a] Data are weighted at country level to approximate population distribution by age, gender and education.
Source: Correia et al. (2024) *(249)*.

5.1.3 Perceptions of health warning messages

The study also investigated participants' reactions to the different versions of the message content and format presented *(249)*. Fig. 16 presents the distribution of participants' responses to each of seven perception items. The text-only and pictogram cancer warnings were perceived as most relevant, and all three versions of the cancer warning (compared to the general health harm message or responsibility message) were more likely to encourage discussion of alcohol-related risks and deter people from alcohol consumption. However, the inclusion of a graphic image next to the cancer warning led to lower acceptability and higher avoidance in comparison to the text-only cancer message and the message with a warning symbol (as well as the other messages). Overall, all messages apart from cancer with a graphic image were similarly acceptable.

Fig. 16. Distribution of participants' responses to each of seven items evaluating reactions to the label messages

Source: Correia et al. (2024) *(249)*.

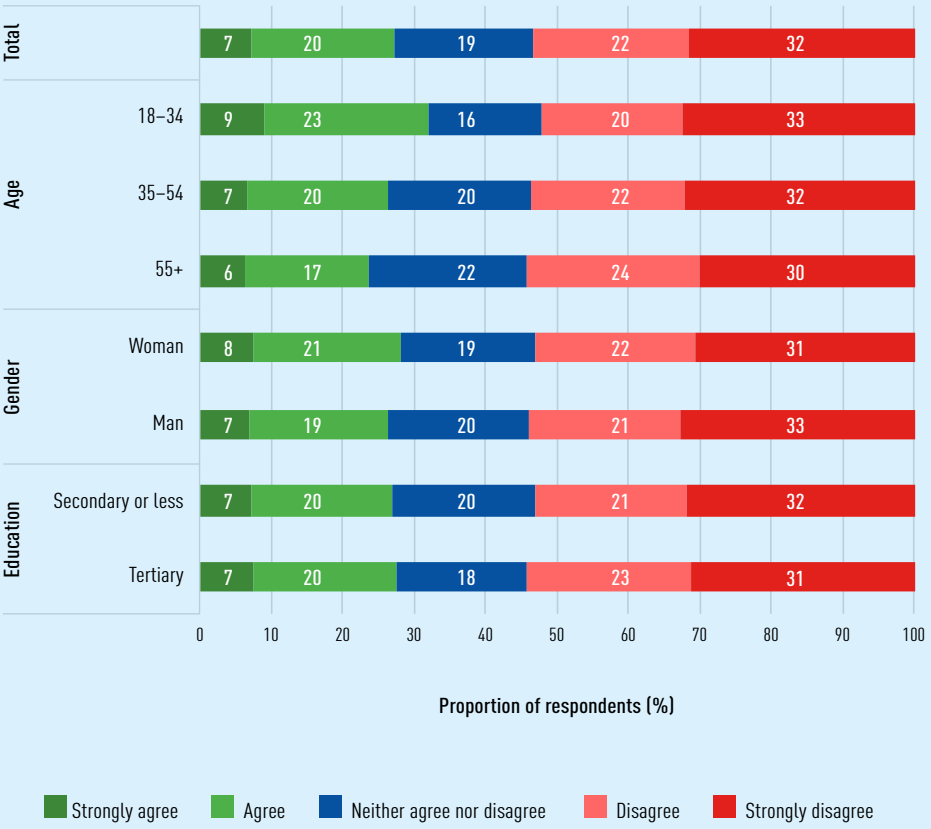
5.2 Consumer preferences and actual use of information provided online

There is scarce existing information on EU consumers' preferences on the provision of information when it comes to alcohol products. A survey from 2014 with a representative sample of six (then) EU countries (Denmark, Germany, Netherlands (Kingdom of the), Poland, Spain and the United Kingdom) commissioned by Brewers of Europe showed that 70% of respondents agreed that the same nutrition information should be provided for alcohol products as for other food and drink products *(253)*. Depending on the source, off-label information (provided through advertising, in-store communication, product/brand-related websites, public health authorities' websites, health and nutrition websites, and offline and online applications) was never or rarely used by 49–66% of respondents. More than half of respondents never or rarely used any of the off-label information sources to access information on nutrition values and ingredients of alcoholic beverages. Trust in different means of accessing information was highest for public health authorities and health and nutrition websites, with 65% and 61% respectively finding them (very) trustworthy, and lower for product brand websites, in-store information, advertising, and online and offline applications.

In light of this lack of existing information and the ongoing current policy discussions actively examining QR codes as an alternative means of providing information, questions related to QR codes were posed as part of the online experiment described in the previous section *(247–249)*, with the results described below. Furthermore, a pilot study conducted to examine the actual use of QR codes was set up in a supermarket in Barcelona (Spain) *(254)*.

As part of the online experiment, participants were asked to rate their agreement with the statement: "If there was a QR code included on this label as a link to more information, I would scan it with my mobile phone". Fig. 17 presents aggregate results for all respondents regardless of experimental group, as the statement was not related to a specific label; it shows that only about a quarter (27%) of respondents agreed with the statement. The percentage who agreed with this statement was higher among younger respondents (32% of 18–34-year-olds versus 23% of those aged 55 and over).

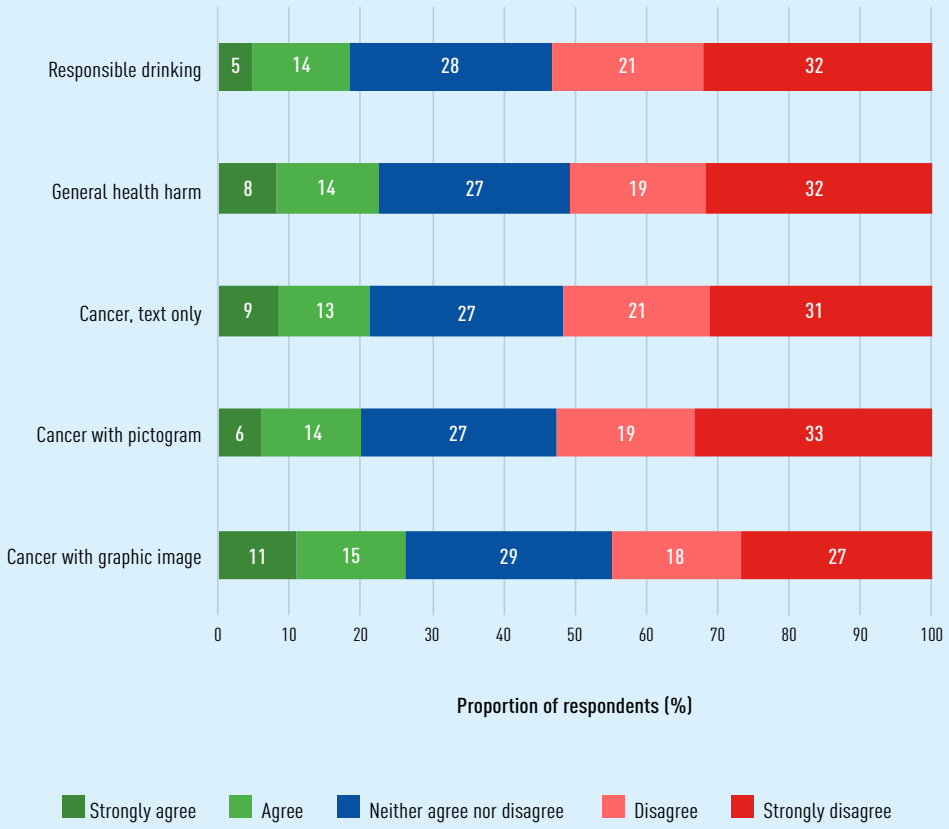
Fig. 17. Responses to the question "If there was a QR code included on this label as a link to more information, I would scan it with my mobile phone", overall and by demographics[a]



[a] Authors' calculations based on data from the online experiment *(249.)* Data are weighted at country level to approximate population distribution by age, gender and education; *n* = 19 465.

Participants were also asked to rate their agreement with the statement "I would prefer to receive the health-related message on this label via QR code" to see whether the responses differed based on the type of health message the participants were exposed to; the results are presented in Fig. 18.

Fig. 18. Responses to the question "I would prefer to receive the health-related message on this label via QR code" by experimental group[a]



[a] Authors' calculations based on data from the online experiment *(249)*. Data are weighted at country level to approximate population distribution by age, gender and education; *n* = 16 361.

To test the actual usage rate of QR codes, a pilot experiment was set up in a supermarket in Barcelona (Spain) over a period of one week, where point-of-sale signs with the message "Alcohol harms your health" and a QR code were placed *(254)*. In total, nine banners with beverage-specific health warnings in large text were displayed in the alcohol section of the supermarket. Each banner provided a large QR code with a link to a government website providing further information on alcohol-attributable harms. To estimate the usage rate of QR codes, a comparison was made between the number of visits to the website and the number of customers in the supermarket (number of unique sales receipts) in a single week. Overall, six out of 7079 customers scanned the QR code during the week, corresponding to a usage rate of 0.085%. Among customers who purchased alcohol, the usage rate was 2.6 per 1000 (0.26%).

The results of this pilot study, when considered alongside survey data on preferences with regard to QR codes, indicate a high probability that survey responses overestimate the likelihood that individuals would actually engage with such means of information provision; in short, in real life QR codes would not be much used. These results are aligned with the conclusion of the review mentioned in section 3.3.1 above, showing that actual use of QR codes to obtain information about food products is low *(147)*. While slightly more than a quarter of respondents answered that they would scan a QR code, actual usage is likely to be much lower. However, further research is needed in other geographical areas to examine the generalizability of the results.

6. Conclusions and the way forward

The present report has presented the most recent data on alcohol consumption and alcohol related-harm in the EU; described the role of labelling and health warnings from consumer protection and public health perspectives; identified key research gaps and considerations for future research; and presented new evidence on the impact and perceptions of alcohol health warnings in the EU, including considerations regarding digital provision of information on alcohol and health.

The EU-27 adult (15+) APC is twice the world average, resulting in a high disease burden, with every 19th adult death and almost every fourth death among 20–40-year-olds attributable to alcohol (2019 data). Alcohol-attributable cancers cause almost a third (three out of 10) of all alcohol-attributable deaths, higher than any other disease category. At the same time, both the review of existing literature (section 4.2) and data collected as part of the WHO Regional Office for Europe's online experiment (section 5.1) show that Europeans in many countries are not aware of the link between alcohol and cancer, and even when they are, they tend to associate alcohol-attributable harm with liver cancer, rather than other common cancers such as breast, oral and colon cancer.

Providing information on alcohol-attributable risks through product labels can serve a multitude of functions: empowering consumers to make informed decisions; increasing awareness of alcohol-attributable risks; helping to increase support for alcohol policies; and decreasing product appeal. However, information on health risks should be considered as part of a broader informational approach in which product labels also help to ensure that consumers are informed about ingredients and nutritional values and prevented from being exposed to misleading claims.

The results of the WHO Regional Office for Europe's online experiment show that a message referring to specific types of cancer that are associated with alcohol is effective in a way that is not replicated when themes of general health harm and responsible drinking are used, and including such a message on labels can lead to large increases in knowledge in all demographic groups. Cancer-related messages are also more likely to encourage discussion of the topic with family and friends, and for a portion of the population such a message may also influence their decision to consume alcohol in certain situations. Overall, in the European context, a cancer message designed not to scare or elicit negative emotions but to inform and attract attention – for instance, a panel separated from the rest of the label and including red colouring and a warning symbol – is likely to be most favourably received.

This report also explains why it is essential to have information on alcohol-attributable risks on labels, as this approach has the broadest possible reach and is unique in providing information at the point of sale and consumption. Results of the WHO Regional Office for Europe's online experiment showed that 27% of respondents claimed that they would scan a QR code on the label, with a higher percentage among younger respondents. However, a pilot study conducted in a supermarket (section 5.2) revealed that a much smaller proportion of people actually did so. Having the information available only through a QR code on the label is likely to lead to the message having low and unequally distributed reach.

The results presented in this report provide the first indication that a significant proportion of Europeans support the inclusion of warnings of alcohol-attributable harms on product labels; they also reveal that, in order to achieve the greatest impact in increasing awareness, the focus of these messages should be on providing information on the link between alcohol and cancers. As outlined in the report, however, labels can serve multiple functions, such as

conveying a number of risks associated with a product, so consideration should be given in the future to producing a longer list of warning messages, akin to the list of rotating messages indicated in the EU's Tobacco Products Directive.

While the results of the online experiment are not without limitations, including a restricted selection of label topics, formats and evaluated outcomes, the current findings, in combination with best design practices, offer substantial guidance to aid development of effective labels. To maximize the public health impact, more evidence could be produced on the effect of different designs and the impact on label effectiveness and acceptability of repeated real-world exposure to labels; further information could also be produced on the reach of the digital provision of information. More investigation could be carried out on the impact of specific label designs in terms of size, location, colours, and implications for attention, cognition, motivation and behaviour; particularly salient is consideration of what is sufficient to attract attention and encourage cognitive processing by the widest range of Europeans. Real-world studies of the impact of labels or similar interventions in EU countries could be developed, replicating or approximating the study conducted in Yukon, Canada; these should be tailored, however, to what is feasible in the local context, comparing the reach and impact of labels to that of other means, including digital, by which health-related information can be provided. Evaluations of existing legislative measures, such as the regulation recently enacted in Ireland, should also be carried out.

However, the need for further research to optimize the design of labels to achieve the greatest impact should be balanced against consumers' rights to have information on health risks available in short order. The EU or its Member States should aim to achieve the greatest possible reach into the population by mandating the inclusion of this information on product labels, and to this end, the EU or its Member States should be free to implement labelling legislation based on existing evidence, their own market research and best design practices. The impact of the legislation thus implemented should then be evaluated.

With the alcohol-related provisions of Europe's Beating Cancer Plan, the European Commission has set ambitious objectives to diminish alcohol-related harm in a region that suffers from a high alcohol-related burden of disease. The initiative opens up an opportunity not only to introduce alcohol labelling regulation but also to position the EU at the forefront of global alcohol policy developments. The present report represents one of the many steps that must be taken in this journey towards better informing the European population about the harms associated with alcohol consumption.

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