

Highly deficient alcohol health warning labels in a high-income country with a voluntary system

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Abstract

Introduction and Aims. To examine the prevalence and design elements of the voluntary health warning labels and related industry initiatives on a purposive sample of alcoholic beverage containers sold in New Zealand (NZ), a country with no mandatory health warning labels. **Design and Methods.** We selected a purposive (e.g. low-cost) sample of 59 local and imported beers, wines and ready-to-drink alcoholic beverage containers available in NZ in 2016–2017. We documented the occurrence, content, size, appearance and position of messages concerning drinking during pregnancy, drink-driving, other health effects and industry-led initiatives that could relate to warnings; and collected data about alcohol content, standard drinks, ingredients and energy information. **Results.** A majority (80%) of the alcoholic beverage containers had a pregnancy-related warning, 73% had industry-led initiatives (e.g. advising ‘responsible’ consumption) and 19% had drink-driving/heavy machinery warnings. Warning labels were small, with the average area of pregnancy-related and drink-driving/heavy machinery pictograms being 45 and 36 mm², respectively (i.e. pea-size). The average heights of pregnancy-related and drink-driving text were 1.6 and 2.2 mm, respectively. Pregnancy-related pictograms occupied between an average of 0.13% (wine) and 0.21% (ready-to-drink) of the available surface area of the alcoholic beverage container (i.e. less than 1/400th of the available space). Drink-driving pictograms occupied an average of 0.12% (imported beer), and 0.13% (NZ beer) of the available surface area. **Discussion and Conclusions.** Voluntary recommendations in NZ appear to have been inadequate for producing health warnings on alcoholic beverage containers that are consistent with evidence-informed recommendations for effective labels. This finding suggests that mandatory standardised labelling outlining alcohol-related risks may be required to ensure adequate consumer information. [Tinawi G, Gray T, Knight T, Glass C, Domanski N, Wilson N, Hoek J, Thomson G. Highly deficient alcohol health warning labels in a high-income country with a voluntary system. *Drug Alcohol Rev* 2018]

Key words: alcohol, warning labels, health information, pregnancy, drink driving.

Introduction

Alcohol-related harm is an important global health issue [1], with the role played by alcohol being well established for multiple harms (injuries, cardiovascular disease, alcohol dependency, liver disease and various cancers) [2–4]. Despite this burden, relatively few studies have examined the presence and design of alcohol health warnings in specific markets [5], with the experience in the USA and England best described [6–10].

As is consistent with other high-income countries, alcohol use in New Zealand is responsible for just under 4% of the total health loss, and is the largest risk

factor for injury [11]. Furthermore, it contributes to health inequalities as Māori (the indigenous peoples of New Zealand) report higher rates of hazardous drinking and are therefore at greater risk of some alcohol-related harm than non-Māori [12,13]. Over 70% of New Zealand women report drinking alcohol during the first trimester prior to being aware of their pregnancy, and over 10% continue to do so beyond the first trimester [13]. New Zealand, like many other countries, does not require health warnings on alcoholic beverage containers, though some companies voluntarily provide warnings. There is little research on the awareness by New Zealanders of the risks from alcohol, but in 2015 less than 15% of a survey sample

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gave an unprompted mention of reducing alcohol use levels as a cancer risk reduction factor [14].

The effectiveness of warning labels

According to the World Health Organization, ‘policy interventions are the most effective strategies available to governments to reduce the burden of disease and injury associated with alcohol use’ [1]. Research in the USA found young people, pregnant women and heavy drinkers to be significantly more aware of alcohol warning labels than the general population [8,15]. A review of the effectiveness of alcohol control policies discusses the increasingly recognised value of warning labels in ‘providing information and education’ [16]. In New Zealand, there is a concerning rate of hazardous drinking amongst New Zealand youth (36% of 18–24-year-olds) [17]. Both these issues highlight the role of alcohol warnings labels as a unique product-based intervention delivered at the time of consumption and/or purchase. As a result, virtually all drinkers are exposed to the intervention, with the most regular and heaviest drinkers, most frequently [6].

Supporting evidence for the impact of warning information on health outcomes is suggested by a study of 23 US states and Washington DC, where alcohol retailers are required by law to post alcohol warning signs that warn against the risks of drinking during pregnancy [18]. There is some evidence that these signs are associated with decreases in the odds of very low birth weight and very pre-term birth.

However, commentary on current voluntary labels on alcoholic beverage containers has described them as being ‘text based, indirect, vague, and hardly visible’, thus lacking effectiveness [19]. The response that warning labels elicit—recall, judgement of risk and behavioural compliance—depends on the label appearance, specifically its visual impact, and ease of comprehension [20]. Optimising aspects of label design might be needed in order to increase effectiveness of health warnings as outlined below.

Size, colour, font and position. Size and colour appear to work synergistically to enhance impact of warnings. The traditional use of red typically elicits a stronger response than other colours, while recent research suggests that black text on a yellow background is most effective in gaining consumer attention and communicating danger [21–23]. Studies have repeatedly found a positive relationship between warning label size and its impact [22,24], suggesting that labels attract greater attention when they are larger [19,25–27]. Similarly, larger fonts receive more attention and create a greater sense of urgency [22]. Warnings are most noticeable

when on the front of a container, with as little surrounding clutter as possible, that is, separated from the main product information and branding [28,29]. Up to a certain size, borders appear to increase noticeability of the message they contain [22].

Information content. Signal words, such as ‘danger’, ‘notice’, ‘warning’ and ‘caution’, have historically been utilised to enhance awareness of messages [21]. While research suggests that warning labels should be clear and direct, an effective label should still contain evidence-based information regarding risks to the consumer, in addition to recommendations of how to minimise harm [24,26,27]. New research continues to identify salient factors that warnings could feature, such as the growing evidence linking alcohol use to increased risk of cancer [30,31]. Health warnings that are periodically updated have been shown to have a greater impact [24]. Finally, the inclusion of a help line, the use personal pronouns, and the provision of low risk drinking guidelines have all been suggested as techniques which enhance self-efficacy and subsequently increase the likelihood of behavioural change [24,27].

Images. Pictograms and pictorial warnings appear to induce greater recall than text warnings alone [26,32], but need to be visually prominent [28,33]. Like text, pictograms should be specific and non-abstract, and communicate a consistent message to varied consumer groups [28]. Several studies have indicated that using pictorial warnings on alcohol products, in comparison with either no warning or a text-only warning, can increase consumer perception of health risks and influence intentions to change behaviour [26,27,34]. Studies for warning labels on both tobacco and alcohol products, suggest that graphic warnings are effective because they elicit a memorable emotional response of fear, disgust or anger [24,34]. The evidence from the research on tobacco health warnings is that warnings are most effective in generating behavioural change when they combine a strong emotional element, such as a graphic warning, supported by factual information [35].

Policies on warning labels

While health warning labels on alcoholic beverage containers are required in various nations around the world, including the USA and countries throughout Europe and Asia, they are not mandated in New Zealand [5,6,36]. New Zealand and Australian food law requires beverages that contain more than 0.5% alcohol by volume to be labelled with: (i) alcohol content (either mL/100 g, mL/100 mL or % alcohol; and (ii) the number of standard drinks per container (with one standard

drink = 10 g or pure ethanol measured at 20 °C) [37]. There is no requirement to have an ingredient list on ‘standardised alcoholic beverages’ but ‘non-standardised alcoholic products’ such as ready-to-drink products (RTD) are required to list their ingredients [38]. Nutrition information is not required on the label of alcoholic beverages, unless a claim is made about energy, carbohydrate or gluten content. If a claim is made, then nutrition information, including energy, must be provided on the label [39].

In 2011, an independent review of Australia and New Zealand food labelling law and policy recommended mandatory warnings regarding alcohol intake during pregnancy on alcohol containers and at the point-of-sale, as well as energy content and general nutrition information on labels [40]. The Australia New Zealand Legislative and Government Forum on Food Regulation, in response to this labelling review, gave the alcohol industry a 2-year period, extended in 2014, to voluntarily adopt pregnancy-related warning labels before it considers legislative change [41]. A 2014 self-reporting survey of New Zealand alcohol producers found that approximately 50% of the main producers had adopted labelling and between 90% and 100% of alcohol producers would do so by 2015–2016 [41]. There may also be implications for alcohol warning labels in trade and investment agreements that New Zealand and other countries are considering [42].

Because of their potential as an effective public health initiative, we aimed to examine the prevalence and design elements of the voluntary health warning labels and related industry initiatives on a purposive sample of local and imported alcoholic beverage containers. In particular, we aimed to: (i) document the occurrence, content, size, appearance and position of health warnings and related industry initiatives on a purposive sample of beer, wine and RTD containers sold in New Zealand; and (ii) describe an approach to alcoholic beverage labelling that could be used to fully inform consumers of health implications.

Methods

Purposive samples of alcoholic beverage containers

Because of a lack of published data on sales volume by brand, and the cost of obtaining unpublished data from commercial sources, we used large packaging size or low cost as proxies for sales volume. We used this approach because New Zealand data show that the heaviest overall drinkers and those who drink heavily in a short period (binge) prefer the cheapest alcohol [43]. Heavier drinking young New Zealanders also tend to purchase cheaper alcohol [44]. We did not sample

ciders and liqueurs, due to their relatively smaller sales volumes [45], and we excluded cask wine and spirits to limit the complexity of this unfunded study.

Wines. We identified the five cheapest red wine brands and five cheapest white wine brands in 750 mL bottles listed on a supermarket online store (Table S3, Supporting information).

Ready-to-drink products. We purchased 15 different brands of RTDs by selecting the cheapest four-pack RTDs available online (using the ranking system on the website of a major New Zealand alcohol retail chain, LiquorLand) (Table S4).

Locally produced beers. We purchased the 10 brands of beers produced in New Zealand and available in the largest packaging size (20 or 24 bottles or cans) sold by an online supermarket (Table S1). In this case, we judged that the availability in multiple packages was a better proxy for sales volume than low price.

Imported beers. To facilitate comparisons with the labelling in other jurisdictions, we aimed to include in our sample a single beer brand from each country exporting beer to New Zealand. We purchased the largest available packs of multi-packaged beers from each exporting country. This approach was far preferable to doing online price comparisons as in-shop examination of beverage containers was usually required to identify the country-of-origin. If the beer was not available in multi-packaged containers, we purchased single bottles/cans of the first beer brand identified from each exporting country. Samples of all imported beers in four supermarkets and four liquor stores in the Wellington region were bought during October and November 2016. In addition, the website of a large beer importer (The Beer Cellar) was used to identify additional samples from additional exporting countries, for a total of 24 countries (Table S2).

Data collection

As we were unable to identify any established and published alcohol warning label data collection framework, we devised a coding framework for documenting the occurrence, content, appearance, and position of health warnings displayed on alcohol containers. The coding framework was tested on all 24 imported beers prior to the formal data collection process beginning (since this grouping of beverages contained substantial heterogeneity in label designs).

To minimise inter-observer variation in data collection, two teams (of two people each) independently measured the data items for each alcoholic beverage container. Each group carried out separate data abstraction and entry into two separate databases. Major differences between the results of the two groups were then identified, discussed (with a third independent reviewer), and re-measured, if necessary, to create the final data set. All alcoholic beverage containers and their warning labels were photographed and collated in an online database [46–48]. Further details on the data collection are in the Appendix S1.

Data measures and definitions

We collected information about three different categories of health warnings: pregnancy-related warnings, drink-driving/heavy machinery warnings and those fitting into the ‘other health warnings’ category (e.g. ‘consumption of alcohol is injurious to health’). We also documented the presence of related industry-led initiatives. Pregnancy-related warnings were defined as those that displayed information pertaining to drinking alcohol during pregnancy or the effects of alcohol on a developing fetus. Drink-driving/heavy machinery warnings were defined as those displaying information about drink-driving, vehicular injury, operating heavy machinery or another similar warning. ‘Other health warnings’ were defined as other pictogram or text warnings, not fitting into the above categories, which informed consumers about the effects of alcohol on their health. Industry-led initiatives were defined as messages printed on labels by the alcohol companies advising responsible drinking or referencing an industry-related website. These included Enjoy Responsibly and cheers.co.nz.

We recorded the presence and size of pictograms and text, warning borders, and colours (see Appendix S1). We also collected the following general information (if present): volume of container (mL), nutritional data [any statement of energy (kJ) content or % of recommended daily intake, carbohydrate and sugar content if stated], ingredients list, and alcohol content (grams, millilitres, percentage or number of standard drinks). We also estimated the average surface area available for displaying warning labels per beverage type (see Appendix S1).

Statistical analysis

We used the online software OpenEpi to determine whether differences between data collected about the

alcoholic beverage containers were statistically significant. All *P* values presented are mid-*P* exact (two-tailed) unless stated otherwise.

Results

Overall health warning presence and size

Most (85%) of the alcoholic beverage containers had at least one warning label (Table 1). Pregnancy-related warning labels were present on 80% of all containers and industry-led initiatives were present on 73% (Table 1). A minority (19%) of alcoholic beverage containers had drink-driving/heavy machinery warning labels present (Table 1) and 7% of alcoholic beverage containers had a warning defined as ‘other’. The average pictogram warning sizes were 57 mm² (for pregnancy-related warnings on wines) or less, and the maximum height of *any* text warning was 3 mm (Table 2). The largest pictogram, which was on an imported beer (Victoria Bitter), was 100 mm². Pictograms occupied less than 1% of the available surface area of the container across the range of beverages (Table 3).

Pregnancy-related warnings

All New Zealand beers had a pregnancy-related warning label but only 73–80% of RTDs, imported beers and wines did (Table 1). Across all types of drinks, imported beers tended to have a greater proportion of pictograms (72%) compared to New Zealand beers, wines and RTDs. The average area of pregnancy-related pictograms across all alcoholic beverage containers was 45 mm² (Table 2), which is roughly equivalent to the cross-sectional area of a pea. Pregnancy-related pictograms (present across the range of alcoholic beverage containers), occupied on average between 0.13% and 0.21% of the container surface area (Table 3).

Drink-driving warnings

Around a third of beers had a drink-driving/heavy machinery warning present, most of which were displayed as pictograms (Table 1). There were no drink-driving or heavy machinery warnings labels on any of the wines or RTDs. The average area of drink-driving/heavy machinery pictograms was 36 mm² and the average height of warning text (only found on imported beers) was 2.2 mm (Table 2). Drink-driving

Table 1. Presence and type (pictogram/text) of health warning labels across beverage type

Label type/characteristic	NZ beer (n = 10)	Imported beer (n = 24)	Wine (n = 10)	RTD (n = 15)	Total (n = 59)
Any warning label present	10 (100%)	19 (79%)	8 (80%)	13 (87%)	50 (85%)
<i>Pregnancy-related warning</i>	10 (100%)	18 (75%)	8 (80%)	11 (73%)	47 (80%)
Pictogram	5 (50%)	13 (72%)	4 (50%)	5 (33%)	27 (46%)
Text	5 (50%)	5 (28%)	4 (50%)	6 (40%)	20 (34%)
<i>Drink-driving/heavy machinery</i>	3 (30%)	8 (33%)	0 (0%)	0 (0%)	11 (19%)
Pictogram	3 (30%)	6 (25%) ^a	0 (0%)	0 (0%)	8 (14%)
Text	0 (0%)	3 (13%) ^a	0 (0%)	0 (0%)	3 (5%)
<i>Industry-led initiatives^b</i>	10 (100%)	12 (50%)	8 (80%)	13 (87%)	43 (73%)
Pictogram	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Text	10 (100%)	12 (50%)	8 (100%)	13 (87%)	43 (73%)
<i>Other warnings^c</i>	0 (0%)	3 (13%)	0 (0%)	1 (7%)	4 (7%)
Pictogram	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Text	0 (0%)	3 (13%)	0 (0%)	1 (7%)	4 (7%)

^aOne imported beer (Pilsner Urquell) displayed a drink-driving warning as both pictogram and text. ^bExamples include information on 'responsible drinking' for example, at the *Enjoy Responsibly* and *cheers.co.nz* websites. ^cExamples include the UK Chief Medical Health Officer recommendations regarding limits, and 'Consumption of alcohol is injurious to health'. NZ, New Zealand; RTD, ready-to-drink.

Table 2. Comparison of pictogram area and font height size of health warning labels on the different beverages

Size/area measurements (where present)	NZ beer (n = 10)	Imported beer (n = 24)	Wine (n = 10)	RTDs (n = 15)	Total (n = 59)
<i>Pregnancy-related warnings</i>					
Average area of pregnancy pictogram, mm ²	42	41	57	49	45
Standard deviation, mm ²	15	25	14	22	—
Range, mm ²	25–64	9–100	36–64	16–64	—
Average height of pregnancy text, mm	1.5	2.1	1.4	1.3	1.6
Standard deviation, mm ²	0.5	0.7	0.3	0.4	—
Range, mm ²	1.0–2.0	1.0–3.0	1.0–1.5	1.0–2.0	—
<i>Drink-driving/heavy machinery warnings</i>					
Average area of drink-driving/heavy machinery pictogram, mm ²	37	36	—	—	36
Standard deviation, mm ²	12	22	—	—	—
Range, mm ²	25–49	25–81	—	—	—
Average height of drink-driving/heavy machinery text, mm	—	2.2	—	—	2.2
Standard deviation, mm ²	—	0.3	—	—	—
Range, mm ²	—	2.0–2.5	—	—	—
<i>Industry-led initiatives</i>					
Average height of industry-led initiative text, mm	1.7	1.8	1.4	1.5	1.6
Standard deviation, mm ²	0.4	1.4	0.4	0.7	—
Range, mm ²	1.0–2.0	1.0–6.0	1.0–1.5	1.0–3.0	—
<i>Other warnings^a</i>					
Average height of 'other-warning-label' text, mm	—	1.7	—	—	1.7
Standard deviation, mm ²	—	1.1	—	—	—
Range, mm ²	—	1.0–3.0	—	—	—

^aExamples include the UK Chief Medical Health Officer recommendations regarding limits, and 'Consumption of alcohol is injurious to health'. NZ, New Zealand; RTD, ready-to-drink.

Table 3. Comparison of pictogram sizes relative to estimated available surface area of containers in that category, across beverage type (excluding the top and bottom of the containers, see Appendix S1 for the formulae used)

Characteristic	NZ beer (n = 10)	Imported beer (n = 24)	Wine (n = 10)	RTDs (n = 15)
<i>Pregnancy-related pictogram</i>				
Average area of pregnancy-related pictogram (see Table 2) converted to cm ²	0.42	0.41	0.57	0.49
Average volume of the containers, mL (see Table 4)	414	470	750	303
Average surface area (cm ²) of the outside of a cylinder with volume as above	279	298	434	239
Percentage coverage (%), pictogram area relative to available surface area)	0.15	0.14	0.13	0.21
<i>Drink-driving/heavy machinery pictogram</i>				
Average area of drink-driving pictogram (see Table 2) converted to cm ²	0.37	0.36	—	—
Average volume of the containers, mL (see Table 4)	414	470	—	—
Average surface area (cm ²) of the outside of a cylinder with volume as above	279	298	—	—
Percentage coverage (%), pictogram area relative to available surface area)	0.13	0.12	—	—

NZ, New Zealand; RTD, ready-to-drink.

pictograms occupied on average 0.13% or less of the available container surface area (Table 3).

Industry-led initiatives

All the industry-led initiatives were in text form (Table 2). New Zealand beers cited 'cheers.org.nz' in all cases but for one (90%), with the exception being *Heineken* (EnjoyHeinekenResponsibly.com). Three imported beers had 'cheers.org.nz', six had the Australian 'drinkwise.org.au', while the remaining two displayed the equivalent French and UK websites. On wines the majority of messages were a combination of 'cheers.org.nz' and/or 'drinkwise.org.au'. On RTDs 'cheers.org.nz' or 'drinkwise.org.au' were the main messages used. Four RTDs additionally displayed either 'Drink responsibly', 'Enjoy responsibly', 'Drink intelligently', or 'Is your drinking harming yourselves or others?'. New Zealand beers and RTDs were significantly more likely than imported beers to display industry-led initiatives ($P = 0.0049$, $P = 0.0205$, respectively).

'Other' warnings

Three imported beers (12.5%) displayed warnings that we defined as 'other' (Table 1). Two were the UK Chief Medical Officer's recommendations regarding

drinking limits, and one was 'consumption of alcohol is injurious to health'. One of the RTDs displayed a warning that we defined as 'other'. This read 'Not recommended for children, pregnant or lactating women, and individuals sensitive to caffeine'.

Warning borders and position

Approximately 50% of all containers had a border surrounding the health warning(s) (Table 4). Few had a warning label present on the same aspect as the brand logo, that is, on the front of the container (Table 4).

Warning label prominence

In general, warning labels blended with the other elements of the bottle, such as the product description or barcode. In some cases, the pictogram or text was not only the same colour as all other text information, but was printed against either a clear glass background (9.6% of all warnings) or one of a similar colour to the warning text itself (18.3%). For example, the *Corona* text seems especially difficult to read (see Figure S1). Further examples included dark red text against a light red background, dark green text against a light green background, and brown text against an orange background.

Table 4. Comparison of general characteristics across beverage type

Characteristic	NZ beer (n = 10)	Imported beer (n = 24)	Wine (n = 10)	RTDs (n = 15)
Produced (or at least bottled) in NZ	10 (100%)	0 (0%)	7 (70%)	13 (87%)
Average volume of beverage container	414 mL	470 mL	750 mL	303 mL
Standard drinks information present	10 (100%)	21 (88%) ^a	10 (100%)	15 (100%)
Average number of standard drinks per beverage container	1.6	1.7	7.9	1.4
Average price per standard drink (NZ\$)	\$1.43	Not calculated ^b	\$1.04	\$2.35
Range of prices per standard drink (NZ\$)	\$1.20-\$2.00	Not calculated ^b	\$0.77-\$1.17	\$1.47-\$3.61
<i>Nutrients and ingredients displayed</i>				
Nutritional data shown	0 (0%)	1 (4%)	0 (0%)	2 (13%)
Ingredients list	2 (20%)	13 (54%)	0 (0%)	15 (100%)
Ingredients list include caffeine ^c	0 (0%)	0 (0%)	0 (0%)	8 (53%)
<i>Warning label borders and positioning</i>				
Border around the largest health warning	5 (50%)	10 (42%)	5 (50%)	10 (67%)
Any one warning label on front	2 (20%)	1 (4%)	0 (0%)	0 (0%)

^aThree imported beers did not display standard drinks information. One beer (Clausthaler Classic) was a low alcohol beer (<0.5%) and therefore is not required by law to display any information regarding standard drinks. Two imported beers, containing >0.5% alcohol by volume, did not display this information. ^bThe price data on the imported beers was not calculated, as some of these were niche products (e.g. a few involved delivery costs following online purchasing). ^cThree of the RTDs also had 'Guarana' as part of their brand names. Unless it is de-caffeinated, products with guarana will have caffeine. NZ, New Zealand; RTD, ready-to-drink.

General health information

Standard drink labelling. All the wine, RTDs and New Zealand beer displayed the number of standard drinks on the container (Table 4), however this information was incomplete for the imported beers (21 out of 24, 88%, Table 4). Wine was the cheapest per standard drink, at an average of NZ\$1.04 (with the lowest in the range being \$0.77, Table 4).

Nutritional data. Recommended daily intake or calorie information was only present on 4% of imported beers and 13% of RTDs, and not on wines or New Zealand beer (Table 4). All RTDs displayed an ingredients list, which is distinct when compared to New Zealand beer (20%) and imported beer (54%) (Table 4). Around half (53%) of RTDs displayed caffeine as an ingredient (Table 4).

Discussion

Main results

Voluntary health warning labels, in our purposive sample, varied and were inconsistent within and across beverage types. When present, warnings were very small compared to promotional elements such as the brand logo. In our opinion, warnings were poorly designed for effectiveness, readability, position and wording. In some cases, warning text was printed against a clear or similar coloured background making

the text difficult to read. This sample showed an incomplete voluntary uptake use of any pregnancy warning by manufacturers. Furthermore, wines and RTDs (which in New Zealand are more likely to drunk by young women than young men) [49] had fewer pregnancy-related warnings than New Zealand beers.

The lack of drink-driving warnings across the majority of alcoholic beverage containers sold in New Zealand is concerning, given the persisting role of alcohol in fatalities and injuries on the road [17].

Two imported beers appeared to be in breach of the current New Zealand law requiring information on the number of standard drinks to be displayed.

From a public health perspective the wording and intention of the industry-led initiatives were ambiguous, as has been found in Australia [50,51]. For example, 'please drink responsibly' includes the words 'please drink', while 'cheers!' brings to mind a group of people celebrating. Our comments are in line with criticisms of industry-led initiatives 'as quite cynical attempts to placate public health advocates without actually hurting sales' [52]. Other research has highlighted the types of ambiguity in alcohol warnings in general [53].

All alcoholic beverage containers, apart from a single imported beer brand from one country, displayed warning information as either pictograms or text, but not both (Table 1). This represents an area for further improvement given it has been suggested that warnings are most effective when displayed as both pictogram and text [27]. The information generally lacked the essential design elements of salience, visibility, and

readability (as they are outlined in the Introduction); and specifically lacked suitable signal words and borders. Text and picture colours were difficult to distinguish against the label background. The text font size, in our opinion, was unsuitable for information intended to be noticed and read, and the vast majority of warnings were neither on the front of the containers nor separated from brand promotional elements. Overall, the formatting used suggested that achieving effective health warning labels is not currently prioritised [28,29].

The *largest* pictogram was 100mm²; less than 1% of the container area. Increasing *average* alcohol pictogram size by a factor of 50 would still only represent 10% of available surface area. In contrast, the 2007 regulations for New Zealand tobacco warnings require 30% of the front and 90% of the back of each packet as health warnings [54].

Nutrition information, such as energy content, was very uncommon, and absent on wine and New Zealand beer. There is currently limited evidence with regards to how nutritional information on alcoholic beverage containers is interpreted (and the effects that this information may have on consumer behaviour) [52]. Further research on the effects of providing nutrition information on all alcoholic beverage containers may help policymakers decide if this is an effective way to support consumer information and deter heavy drinking. If so, it may strengthen incentives to only drink moderately, thus acting in synergy with explicit health warnings.

Possible policy implications

Governments may need to consider mandatory standardised health warnings on alcoholic beverage containers. It seems likely that mandatory warnings, which clearly outline the effects of alcohol on health, would help avoid the inconsistencies that can arise with voluntary approaches, as demonstrated in our sample. Specifying standardised messages and designs could help minimise manipulation attempts by manufacturers to obscure health warnings and other consumer-relevant information.

Governments could specifically consider the elements of health warning labels detailed below, and as in the prototype example in Figure S2. Alcohol warning labels should be easily identifiable on the container, and placed on the container front and be separate from the main body of label information and enclosed by a distinct border [55]. Labels should be clear and non-ambiguous and include: (i) a signal word, picture or symbol; descriptions of a possible

harm and a related instruction [56]; (ii) guidelines regarding maximum alcohol intake, for example, [57]; and (iii) a source of reliable further information about alcohol and health, such as a government website [55]. Possible harms that these labels may address include drink-driving, drinking during pregnancy, injury and chronic health effects. In our opinion, warning labels should not include industry initiatives that could be seen to encourage excessive or hazardous drinking, for example, 'cheers.org.nz'. Complementary product-dependent information such as the number of standard drinks, percentage alcohol, ingredients list, and energy content should also be mandatory on all alcoholic beverage containers [52].

Standardised labels should ideally occupy a minimum total area (either as a proportion of available surface area or as an absolute measurement per volume of containers), with a minimum font size for each of the text components. Complementary guidelines, regarding pharmaceutical warning label inserts, recommend a minimum type size of 9 points [58]. If applied to alcohol warning labels, this would result in a significant improvement to the warning labels in our sample which had average font heights ranging between 1.6 and 2.2 mm, corresponding with a type size of 4.5–6.2 points. We recommend that warning labels occupy half the available space of at least one visible aspect of the container. This is in line with research that found 'modest support for increasing the size of graphic warnings beyond 50%', and decreased positive perceptions of alcohol when warnings occupied 50% of the front, as compared with branded alcoholic bottles [19,32]. Again, this would represent a significant improvement to the markedly small warning labels in our sample.

Governments should expect resistance from the alcohol industry to mandatory health warnings, as has been evident in the evolution of tobacco warnings [59]. The alcohol industry has attempted to 'legitimate a role for (itself) as a partner in developing policy responses' to the expanding alcohol-related harms [60]. It has tried to be a 'potential collaborator in reducing alcohol harm', thus potentially delaying government interventions [61], despite obvious 'vested interests'. A striking incompatibility exists between the profit goals that commercial companies, including alcohol manufacturers, must prioritise and their desired role as partners in efforts to reduce alcohol-related harm. Consequently, their involvement in developing warning labelling policy remains 'ethically questionable' [10,62]. Any involvement is likely to see the continuation of suboptimal warning labels that do not meet best practice standards, such as those observed in this New Zealand sample.

Strengths and limitations of this study

While there have been a limited number of similar studies for other countries, for example, [5,9,10] our work is one of few to quantitatively assess and compare the specific warning label characteristics across several alcoholic beverage brands and types available in a high-income country. Because no standard data collection framework existed, we developed a protocol to collect this information in a standardised and objective manner. Inter-observer bias was reduced by using two teams to measure and record the data. Uploading the data to two separate databases allowed comparisons and the identification and resolution of differences.

This study was limited by the sample size and a lack of sales data (since we did not have available research funds to purchase brand-specific sales data). Nevertheless, by sampling the cheapest products (and sampling the multi-packaged containers for NZ beers), we were very likely to capture the types of alcohol typically drunk by young adults and heavy drinkers, who tend to purchase the cheapest alcohol [43,44]. Even so, our findings are not generalisable to other types of beverages, that is, spirits, liqueurs, ciders and cask wines. Furthermore, by examining only the containers, we did not capture what is currently displayed on the exterior packaging (e.g. beer and RTDs sold in boxes), which is potentially seen at the point-of-sale. Future studies could also document initial coding differences of the independent data collecting teams, so as to allow for the quantification of inter-observer variation.

Possible implications for future research

Future studies could use larger samples and market sales data to more accurately sample the most beverages with the highest sales volumes. The studies could also consider the information displayed on external packaging, at point-of-sale, and at licensed premises. While we estimated the surface area of containers (see Appendix S1), measuring the surface area available for labelling, especially given the variation in size and shape of containers would be important in future research, as is gathering more evidence on the most effective font size and style.

Conclusions

In this high-income country, voluntary recommendations appear inadequate for producing health warnings on alcoholic beverage containers that are consistent

with evidence-informed recommendations for effective labels. In our sample, warning labels were small compared to the available container size and were inconsistent within and across beverage types. For appropriate consumer information, mandatory standardised labelling that outlines alcohol-related risks and provides specific guidelines for low risk drinking seems to be required.

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Conflicts of Interest

The authors have no conflicts of interest.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

- Appendix S1.** Further details on the data collection
- Table S1.** Beer containers identified for 10 major brands of beers on the New Zealand (NZ) market*
- Table S2.** Beer containers identified for imported beers on the NZ market*
- Table S3.** Wines (both NZ made and internationally imported) as found on Countdown online store, Wellington Central Location*
- Table S4.** RTDs identified from LiquorLand New Zealand online store, Wellington Central Location*
- Figure S1.** Corona® bottle as an example of relatively difficult-to-read warning label due to text colouring (photograph by the authors).
- Figure S2.** Prototype warning label combining all recommendations.*