

## Research Paper

## Beverage-specific consumption trends: A cross-country, cross-sectional comparison

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## ABSTRACT

**Introduction:** The price of alcoholic beverages can vary for a range of reasons, including tax. Risky drinkers purchase more low-cost alcoholic drinks than moderate drinkers, contributing to beverage-specific risks for that category. The study aimed to examine the proportion of total alcohol consumption comprised by each beverage type and their correlates. Australian and New Zealand populations were compared, where drinking cultures are similar, but taxation of alcohol differs.

**Method:** Data was taken from the International Alcohol Control study in Australia (N=1580) and New Zealand (N =1979), a cross national survey that asks questions on beverage specific alcohol consumption at a range of different locations. Tax rates were obtained from previous analyses run on the dataset.

**Results:** Ready to Drink (pre-mixed) beverages are more popular in New Zealand and the proportion of these drinks consumed out of total alcohol consumption by risky drinkers was correspondingly higher there. Conversely, the proportion of wine consumed by risky drinkers was higher in Australia. The consumption of spirits and beer by risky drinkers was similar in both countries.

**Discussion:** Differences found for the proportion of beverages consumed by risky drinkers between the countries are fairly well aligned with differences in the taxation of each drink type. Future adaptations in taxation systems should consider the impact of taxes on preferential beverage choice and associated harms.

## Introduction

The consumption of alcohol has been associated with a range of harms including injury, cancer, and motor-vehicle accidents (Rehm et al., 2003; Taylor et al., 2010). The bulk of these harms arise from heavy or harmful drinking, whether that is in the form of single-occasion heavy drinking, or high daily use (Rehm, 2011). In response to these harms, the World Health Organisation has set a goal to reduce harmful alcohol use 20% worldwide by 2025 (World Health Organisation, 2022). Pricing and taxation measures are some of the most effective policy levers in reducing alcohol related harm, with evidence suggesting that an increase in the price of alcoholic beverages, thereby reducing affordability, leads to a decrease in consumption (Babor et al., 2022).

There are significant variations in taxation methods used by governments, as reported in the 2012 Global Survey on Alcohol and Health (Rehm & Shield, 2017). Taxation methods that are based on ethanol

content, rather than on price or beverage volume, are usually the most appropriate options for imposing taxes on alcohol products from the perspective of public health benefits. Yet, many countries use a combination of taxation methods, with some beverages taxed based on the total volume of the drink, regardless of the alcohol content it contains. This then results in the price of absolute alcohol not always being consistent across different beverage types. These differences in the taxation of beverages may be influencing drinking trends and beverage preferences. It is therefore important to understand the contribution of different beverage types to total alcohol consumption and heavy alcohol use, particularly in countries that do not follow a taxation method based on ethanol content purely, to better inform and tailor alcohol tax policy measures. The current study will therefore examine beverage specific trends in two countries with similar alcohol consumption per capita (World Health Organisation, 2019), but varying taxation policies that impact the affordability of beverages: Australia and New Zealand.

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**Table 1**  
Mean price of purchased alcohol in USD (\$), taken from Wall et al., 2018.

	Beer		Wine		Spirits		RTDs	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Australia	1.39	1.29	1.29	1.19	1.39	1.19	1.99	1.79
New Zealand	1.31	1.21	0.91	1.19	0.91	0.81	1.34	1.21

The taxation system for alcohol in Australia is complex. A volumetric excise tax is levied on spirits and beer, which is based on pure alcohol content. There are also varying tax rates applied to beer depending on the total strength of alcohol and the container size, with the first 1.15% of alcohol content in beer tax free. This tax is further reduced for beer in large barrels intended for on-premise (for example, pubs), on-tap sale. The tax on Ready to Drink spirits (RTDs) in Australia was adjusted in 2008 so that RTDs were taxed on the basis of the spirits they contain, and not on a lower rate as a weaker drink. Finally, an *ad valorem* excise tax is levied on wine based on the wholesale price of the product (Wall et al., 2018). In New Zealand, excise taxes on beer and spirits and fortified wine are taxed by alcohol content, table wine by product volume, and RTDs are taxed by both alcohol content and product volume (Wall et al., 2018). Both countries also have a goods and service tax, with retail alcohol subject to a 10% tax in Australia, and 15% in New Zealand (Point, 2018; Webb, 2009).

Given these varying taxes on different alcoholic beverages, there is a significant variation in the amount of tax charged for the equivalent amount of pure alcohol purchased in each country. These differences are highlighted in a study investigating tax rates among various countries including New Zealand and Australia (Wall et al., 2018). On average, Australia has a slightly higher tax on beer (based on data collected in 2013) than New Zealand and a lower tax on wine (based on data collected in 2011) according to a comparison of tax rates for each beverage category as a whole. A study investigating tax rates among various countries including New Zealand and Australia found that taxes on spirits were about 50% higher in Australia and the mean tax on RTDs was much higher in Australia, 2.7 times higher than in New Zealand (Wall et al., 2018). Further work in the same study calculated the relative purchasing power parity (which is calculated in US dollars) of each drink type per 15ml of alcohol. Concentrating on alcohol consumed at off licensed premises, where it is most often consumed in both countries, the mean price of purchased alcohol in USD was analysed, and the results can be seen Table 1. The largest difference in price of beverages between countries was for RTDs - which generally make sense in the context of the taxation methods outlined above - for example, RTDs are going to be far more expensive in Australia because of the RTD tax ("Excise Tariff Amendment (2009 Measures No. 1) Bill 2009 [No. 2] Canberra 2009," 2009). While wine was cheaper in New Zealand in this study, due to the Wine Equalisation Tax (WET: *ad-valorem* tax) system in place for wine, Australia has low priced wine, primarily cask wine, that isn't comparable to the prices of wine in the New Zealand market. The WET system means that wine is taxed based on the wholesale product price charge to the retailer instead of alcohol content. While Australians may on average consume higher-priced wine, as highlighted in the average price paid per standard drink in Table 1, they also consume large amounts of exceptionally cheap wine. Cheap cask wine, which can be sold for as little as \$0.35 a standard drink, is often associated with heavy alcohol consumption among Australian consumers due to the low-cost high-alcohol content of the product (Callinan et al., 2015). The cheapest cask wine sold in New Zealand stores is almost double what it can be sold for in Australia (U & Jackson, 2021). Given these differences between beverage prices, it is fair to assume that differential trends could be seen between beverage preference types among risky drinkers in each country.

Previous research has examined whether the proportion of specific types of alcohol beverages consumed is differentially associated with

harmful alcohol use. National studies in the United States have contributed substantially to this body of research, reporting beer and spirits as the beverages comprising the bulk of alcohol consumed by risky drinkers (Naimi et al., 2007; Rogers & Greenfield, 1999). Further work including the United States investigated cross-national differences between five countries, examining the type of alcohol that contributes the most to harmful alcohol consumption, with beer and spirits once again most common (Paschall et al., 2021). However, the distribution of beverages associated with risky drinking behaviour varied for each country. For instance, in China, a greater proportion of table wine was consumed by risky drinkers, which was not replicated in the other four countries. An Australian study investigating specific beverages' contribution to harmful alcohol consumption found that beer and cask wine - the beverages in which alcohol is available at the cheapest cost per unit of ethanol - were the categories with the highest proportions being consumed at levels above the long-term risky drinking guidelines (Callinan et al., 2018). This result varied from the findings, for instance, in the United States studies, raising the question of whether the beverage categories with the greatest concentration of heavy drinking vary between countries with similar drinking cultures, and whether such differences may be explained by national differences in beverage-specific tax levels per unit of alcohol.

Therefore, using data from the Australian and New Zealand arm of the International Alcohol Control (IAC) study, the current study aimed to:

1. Estimate the proportion of total alcohol consumption comprised by each beverage type, categorised by drinker status and country.
2. Identify the correlates of the proportion of total alcohol consumption comprised by each beverage type and country.

## Method

### Sample

The data used in this study was drawn from the New Zealand and Australian national population surveys of the IAC study (Casswell et al., 2012; Jiang et al., 2014). These two countries were selected due to their similar drinking cultures yet differing alcohol policies (Stewart, 1997). Additionally, they had comparable pricing data available (Wall et al., 2018). Both countries recruited participants randomly through computer assisted telephone interviews, with New Zealand's survey running in 2011, and Australia's in 2013. In Australia, a dual frame sample was collected (60% landline, 40% mobile phone). In New Zealand, a nationally stratified landline sample was recruited. In both countries, multiple call-backs of numbers were used, and calls to landlines were followed by random selection of an eligible individual within that household. Both countries recruited both abstainers and drinkers, with Australia oversampling risky drinkers. Response rates were 37% for Australia and 60% for New Zealand. While Australia did not have an upper age limit on participants, respondents aged over 65 were excluded from the current study in order to keep comparability with New Zealand, which implemented this age limit. The Australian oversampling of risky drinkers meant that two-thirds of those who did not drink five or more drinks in an occasion were not asked to participate in this study; this oversample has been compensated for in the current study with weighting. All respondents who reported not consuming alcohol in the past 12 months (11.4% Australia; 22.1% New Zealand) were excluded from the current study. The total number of respondents included, along with some brief demographic descriptors, are displayed in Table 2. Ethical approval for the study was granted by Latrobe University Human Research Ethics Committee (HEC22169).

### Survey and variables

Beverage-specific, location-based loops were used to obtain fuller reports from respondents which collectively would yield a large cover-

**Table 2**

Demographic and consumption descriptive statistics of current drinking respondents from Australia and New Zealand.

	Australia	New Zealand
N	1580	1979
Year of Collection	2013	2011
% Response Rate	37.0	60.0
% Risky Drinkers	45.3	46.0
% Female	48.4	49.9
<30-Year-Olds	29.6	26.3
30–49-Year-Olds	41.2	46.0
50–65-Year-Olds	29.3	27.8
Overall grams per day (g)	27.0	25.0

RR = Response Rate; Average grams per day = average daily volume of pure alcohol consumed.

age of sales data (Casswell et al., 2002). Participants were first asked whether they consumed any alcohol in each of a range of different locations. For every drinking location, they were then asked what types of drinks they consumed on a typical drinking occasion. For the current study, beer, wine, spirits and RTD beverages were analysed, being the most commonly consumed alcohol types (Australia Bureau of Statistics, 2019; Stats NZ Tatauranga Aotearoa, 2021). As New Zealand did not collect data specifically on cask wine, wine was not separated into further categories. They were further asked how often they drank at that location, and what they would drink on a usual occasion, including the container type and usual quantity consumed. Through these questions, it is possible to determine the amount of alcohol consumed as well as being able to further split this total volume by beverage type. Additionally, this form of questioning regarding alcohol consumption results in estimates of consumption that are closer to matching levels of alcohol sales in the population than other forms of surveys (Livingston & Callinan, 2015).

In order to ensure comparability between countries, the main unit of interest in this study are grams of pure alcohol as opposed to standard drinks, which vary between the countries. Risky drinkers were defined as those who consumed at least 60g on a drinking occasion at least once a week.

### Analysis

Stata (14) (StataCorp, 2015) was used for all analyses. All results presented are weighted to rectify disproportionate representation in the sample by age, gender, location and, in Australia, risky drinker status. Descriptive statistics were first run examining the proportion of total consumption comprised by each beverage type, categorised by drinker status. A series of bivariate and multivariate linear regression analyses with interactions were then run, estimating the proportion of total alcohol consumption comprised by each beverage type, with the predictors including interactions between country and risky-drinker status. Where appropriate, estimated marginal means and main effects were run and plotted as a graph, predicting the proportion of total consumption which was of each beverage type (beer, wine, RTDs and spirits).

### Sensitivity analyses

Sensitivity analyses repeating the main multivariable analyses with beta regression models are reported in Supplementary Table 1. As linear regression models are not typically meant for percentages as outcomes, violation of the model assumptions could bias the results, and therefore were checked through these analyses.

### Results

Table 3 displays the proportion of total consumption of each beverage type (beer, wine, RTDs and spirits) comprises by drinker type and

country. Beer and wine in both countries accounted for the largest contribution of total alcohol consumed. RTDs contributed the least to the proportion of total alcohol consumed in both countries. Risky drinkers in Australia had a greater wine intake than those in New Zealand, but the reverse was found for low-risk drinkers. Risky drinkers in New Zealand consumed a greater proportion of their total alcohol intake as RTDs when compared to risky drinkers in Australia.

Table 4 shows results from bivariate and multivariate linear regression analyses, predicting the proportion of total consumption of each beverage type (beer, wine, RTDs and spirits). Respondents in New Zealand consumed a greater proportion of their total alcohol consumption as wine and RTDs. Australian respondents consumed a greater proportion of their total alcohol consumption as spirits. Further, risky drinkers were less likely to consume a greater proportion of their total alcohol consumption as wine, instead being more likely to consume a greater proportion of their total alcohol consumption as beer and RTDs. These results indicate that wine tended to be a lower proportion of their total alcohol consumption for risky drinkers than for those drinking less. Multivariable regression models with interactions between country and risky drinker status were further run for each individual beverage type. Two statistically significant interactions were identified for the beverages of RTDs and wine. For ease of interpretation, the estimated marginal means of these interactions are depicted in Fig. 1 and Fig. 2.

The interaction between country and risky drinker status, predicting the proportion of wine consumption contributing to total alcohol intake can be found in Fig. 1. In New Zealand, low-risk drinkers consumed a significantly higher proportion of their alcohol intake as wine compared to risky drinkers. Comparatively, in Australia, the difference between the proportion of wine intake between risky and low-risk drinkers was small. Australian risky drinkers were slightly higher in their consumption of wine compared to New Zealand risky drinkers.

For RTDs (Fig. 2), while the proportion of consumption for low-risk drinkers was similar in both countries, in New Zealand, risky drinkers consumed a significantly higher proportion their alcohol intake as RTDs than their Australian counterparts.

### Discussion

Our study has shown that there is a difference in the distribution of beverage consumption among risky drinkers in Australia and New Zealand. The proportion of RTDs consumed by risky drinkers was higher in New Zealand than it was in Australia. While overall wine consumption was similar between both countries, the difference between the proportion of total alcohol intake wine comprised for low-risk and risky drinkers was more pronounced for New Zealand, with low-risk drinkers consuming far more of their total alcohol as wine. In Australia, the difference between consumption wine rates among risky and low-risk drinkers was less pronounced, with wine consumed in greater proportions by risky drinkers in Australia. Finally, spirit and beer consumption were not found to differ greatly between countries.

The proportion of RTD consumption contributing to total alcohol intake was higher for risky drinkers in New Zealand than it was for risky drinkers in Australia. The difference between the proportion of total alcohol consumption that RTDs comprised was greater in New Zealand than it was in Australia. In Australia, the difference between the consumption of RTDs by risky and low-risk drinkers was not as great. These results could reflect the current taxation systems in both countries, with RTDs taxed at a much higher rate in Australia than in New Zealand (Wall et al., 2018). Following the ‘alcopops’ tax introduced in 2008 in Australia, studies have shown marked decreases in consumption rates of RTDs as the price of the beverage rose (Doran & Digiusto, 2011; Mojica-Perez et al., 2020). It is plausible that a similar change to the way RTDs are taxed in New Zealand could also result in a decrease in levels of risky consumption of the beverage. Evidence is mixed, however, with other research indicating that substitution to a cheaper beverage may take place, therefore reducing the positive public health effects

**Table 3**  
Proportion of total consumption comprised by each beverage type, categorised by drinker status.

Country	Drinker Status	Beer %	Wine %	Spirits %	RTDs %
Australia	Risky Drinker	43.5 (38.7, 48.2)	29.2 (24.0, 34.4)	23.1 (16.2, 30.0)	4.2 (2.6, 5.8)
	Low-Risk Drinker	33.6 (26.6, 40.5)	49.9 (41.2, 58.5)	14.4 (10.0, 19.2)	2.1 (0.1, 4.1)
New Zealand	Risky Drinker	46.6 (40.2, 53.0)	24.3 (21.1, 27.5)	14.4 (11.1, 17.5)	14.8 (11.5, 18.0)
	Low-Risk Drinker	25.3 (21.2, 29.2)	62.8 (57.5, 68.2)	9.1 (6.5, 11.7)	2.8 (1.8, 3.8)

**Table 4**  
Bivariate and multivariable regression models with socio-demographics and risky drinking status predicting the proportion of total alcohol consumption comprised by each beverage type.

	Beer		Wine		Spirits		RTDs	
	Bivariate	Multivariate	Bivariate	Multivariate	Bivariate	Multivariate	Bivariate	Multivariate
Coefficients with 95% confidence intervals								
Sex								
Country								
Australia	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
New Zealand	-0.01 (-0.05, 0.02)	-0.01 (-0.06, 0.03)	0.05* (0.01, 0.08)	0.07** (0.02, 0.13)	-0.09*** (-0.12, -0.06)	-0.07** (-0.11, -0.02)	0.05*** (0.03, 0.07)	0.01 (-0.02, 0.04)
Risky Drinker Status								
Low-Risk Drinker	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)	0 (Ref)
Risky Drinker	0.13*** (0.10, 0.16)	0.02 (-0.03, 0.07)	-0.21*** (-0.24, -0.18)	-0.02 (-0.08, 0.04)	0.02 (-0.00, 0.05)	0.02 (-0.03, 0.07)	0.06*** (0.04, 0.08)	-0.01 (-0.04, 0.02)
Country x Risky Drinker Status								
New Zealand x Risky Drinker		0.02 (-0.04, 0.08)		-0.09** (-0.15, -0.02)		-0.03 (-0.09, 0.02)		0.10 *** (0.06, 0.14)

\* p<0.05, \*\* p<0.01, \*\*\* p<0.01. NB. Sex and age controlled for in each model.

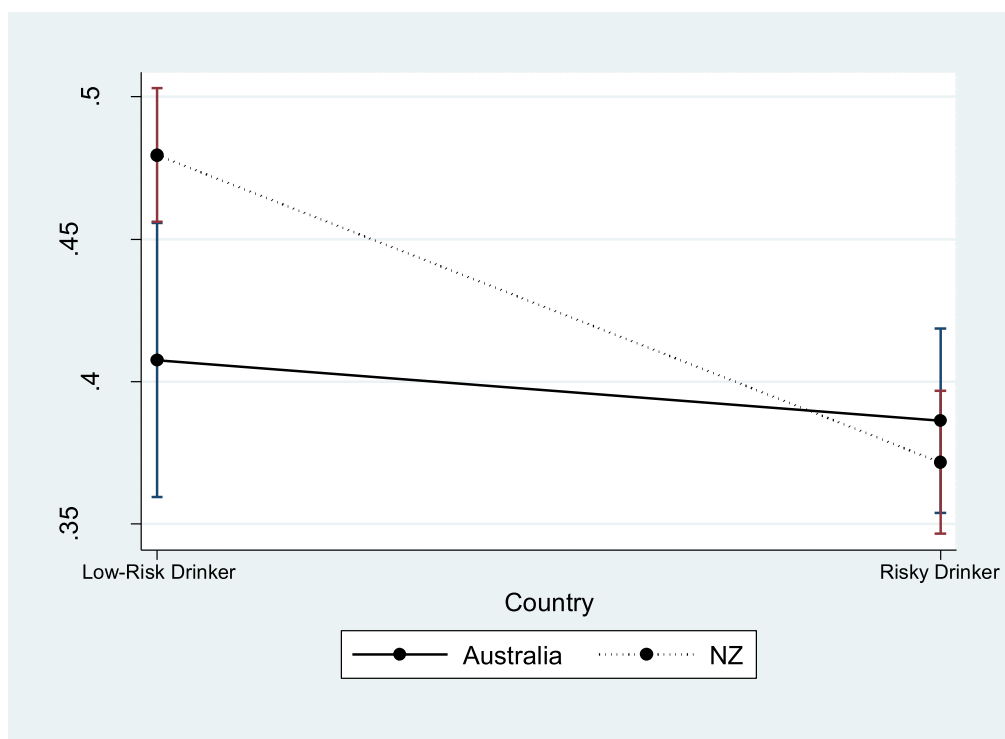


Fig. 1. Interaction between proportion of wine consumed out of total consumption, risky-drinker status, and country with 95% CIs.

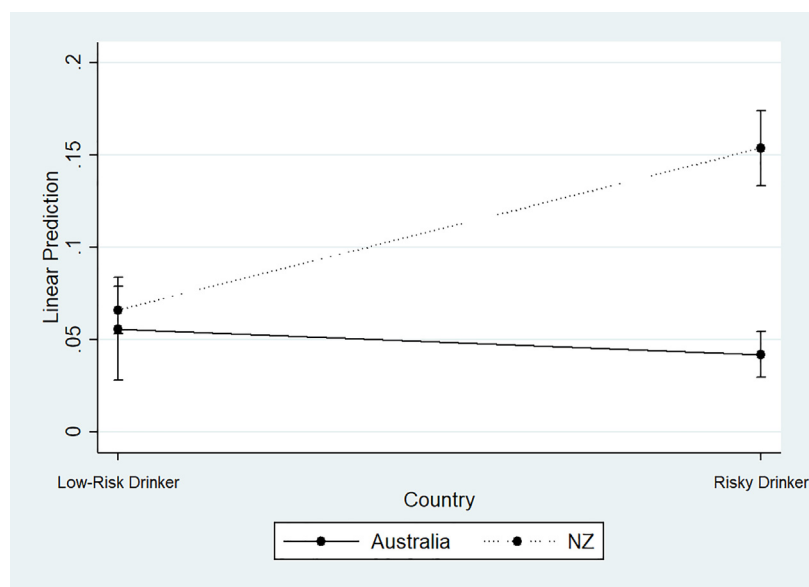


Fig. 2. Interaction between proportion of RTDs consumed out of total consumption, risky-drinker status, and country with 95% CIs.

(Gehrsitz et al., 2021). One potential option to deal with the substitution effect is to raise the tax rate on each beverage equally, which may reduce overall alcohol consumption (Gehrsitz et al., 2021).

The difference between wine consumption among risky and low-risk drinkers was higher in New Zealand than in Australia. Specifically, low-risk drinkers in New Zealand consumed a greater proportion of wine compared to low-risk drinkers in Australia. The results reflected in New Zealand are what we would expect to see, given that the consumption of wine is often more strongly associated with low-risk alcohol intake compared to other beverages, and is less associated with risky drinking behaviour in many wine-drinking locations such as in Europe (Dey et al., 2014). The tax system in Australia may not be fostering this same kind of drinking behaviour, whereby wine is taxed by value instead of alcohol volume (Taylor et al., 2021) and producers are incentivised for their production of cheap, low-quality grapes for wine through large tax rebates (Richardson & Denniss, 2011). Generally, this indicates that Australia may benefit in terms of health from changes to the current tax system in place for wine products, to a higher tax rate such as that reflected in New Zealand.

Spirits and beer consumption by risky drinkers did not greatly differ between countries. Instead of indicating risky drinkers not consuming these beverages, it's more likely due to risky drinkers consuming them at high, and similar levels in both countries. This may reflect that policies and taxes in each country for the beverages are relatively similar (Wall et al., 2018). These findings reflect previous results of studies examining the contribution of alcohol beverage types to total consumption and heavy drinking across multiple countries, where beer and spirits were found to be contributing largely to overall consumption and risky drinking in the majority of countries studied, but specific beverages varied in terms of popularity (Room et al., 2011).

The findings of this study should be considered in light of several limitations. Firstly, the self-report style of the surveys could lead to biases such as under-reporting of alcohol consumption due to social desirability, however studies have shown that self-report data can be just as accurate, or more accurate than, data that has been collected through other means (e.g., bio-chemical tests) (Babor et al., 2000). Secondly, both Australia and New Zealand had low and moderate survey response rates respectively, as is often common in computer-assisted telephone interviewing studies (O'Toole et al., 2008), and the impact of this on the results is unmeasured. Additionally, as the survey asked respondents about their drinking on a "typical" drinking occasion, the amount of alcohol drunk on unusually heavy or light drinking occasions likely not

being included, however the high concurrence of sales estimates with the IAC survey suggests that this was not a major issue in the current study (Livingston & Callinan, 2015). Further, this study relies on using taxation data from Australia and New Zealand in a descriptive and contextual manner. While we cannot directly attribute our findings to differences in taxation between the countries, our findings are fairly well aligned and highlight that further research would be appropriate. Finally, it should be noted that the absolute levels of alcohol and drinking patterns are the main determinants for disease burden, and changes in taxation may reduce the total level of consumption if substitution is accounted for. However, research on the introduction of a minimum price introduced in the Northern Territory, Australia, found little effect of substitution to other beverages not targeted by a minimum unit price (Anderson et al., 2021).

## Conclusions

Overall, both countries demonstrated a similar pattern of alcohol consumption per beverage type. There were some key differences found for the proportion of beverages consumed by risky drinkers; wine is consumed in greater proportions by risky drinkers in Australia when compared to New Zealand, and the same is true for RTDs in New Zealand. These differences are fairly well aligned with differences in the taxation of each drink type between the countries. These findings highlight the importance of tailoring policies and prevention efforts targeting beverage specific consumption to the country or region where they are to be implemented.

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## Declarations of Interest

None.

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## Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.drugpo.2023.104047](https://doi.org/10.1016/j.drugpo.2023.104047).

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