Energy labelling for alcoholic beverages in New Zealand: Impact on consumer purchase and consumption

Phase 2 report: Randomised trial

March 2019

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Conflicts of interest

The authors have no conflicts of interest to declare.

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EXECUTIVE SUMMARY

This research by the National Institute of Health Innovation (NIHI), University of Auckland measures the impact of energy labelling on alcoholic beverages, on consumer purchase or consumption behaviour in a New Zealand population. Energy labelling information on alcoholic beverages is not currently required in New Zealand, unless a nutrient claim is made. The first phase of the project provided qualitative insight into consumers' awareness of and views around energy labelling of alcoholic beverages (available on the Health Promotion Agency's website; Walker, McCormack, Jiang, Lang, & Ni Mhurchu, 2018). This report summarises the second phase of the project, namely quantitative research to determine the likely influence of energy labelling on the purchase or consumption of alcoholic beverages.

There is limited research on how energy labelling affects consumers' purchase and consumption of alcohol. The above qualitative study was the first New Zealand study on the topic. It found that consumers supported energy labelling on alcoholic beverages (Walker et al., 2018). It remains unclear what influence energy labels could have on the purchase and consumption of alcohol in New Zealand, a country with a unique ethnic make-up and alcohol policy environment.

This report summarises a four-arm, parallel-group, randomised controlled trial to determine the impact of three different energy labels, compared to a 'no label' control condition. We hypothesised that energy labels would reduce people's likelihood of purchasing an alcoholic beverage, compared to the control (no label) condition.

People from throughout New Zealand who were aged 18 years or over, could read English and had purchased and consumed at least one alcoholic beverage in the past month were recruited from a nation-wide online market research panel. Eligible participants (N=615) were randomised (at equal allocation ratios, and stratified by ethnicity and level of alcohol use) to view online one of four label conditions:

- a Nutrition Information Panel (NIP)
- a combined label displaying energy content (in kilojoules and calories), standard drinks, and % alcohol content together in one panel

- an interpretive label displaying energy content (in kilojoules and calories) and an orange stopwatch icon illustrating the amount of exercise required to burn off the energy
- a control label displaying only current mandatory information on alcohol labels for New Zealand (i.e. standard drinks and % alcohol content) and no energy content information.

Figure 1: Example of the NIP, combined label, and interpretive label (left to right).

Participants were asked to indicate how likely they were to purchase or consume the displayed beverage. They were also asked to rate how high or low they perceived the energy content of the displayed beverage to be (based on a seven-point scale ranging from "not very much" to "a lot"), then to estimate the energy content of the displayed beverage in kilojoules and calories. Participants reported: the impact of the label on their attitude towards the displayed beverage; their level of support for energy labelling on alcoholic beverages; and their preferred placement of energy labels on alcoholic beverages.

Key findings

Impact of labels on likely purchase of alcoholic beverages

- None of the tested energy labels reduced the reported likelihood of purchase of alcoholic beverages, irrespective of ethnicity or baseline alcohol use. However, compared with the no label control condition:
    - the NIP energy label significantly *increased* the reported likely purchase of alcoholic beverages overall (5.6 versus 4.8, on a scale from 0 to 10; adjusted mean difference: 0.86, 95% confidence interval: 0.04, 1.68); and
    - the NIP and interpretive energy labels significantly *increased* the reported likely purchase of alcoholic beverages by Māori participants (5.8 versus 4.1

[adjusted mean difference: 1.94, 95% confidence interval: 0.44, 3.43] and 5.7 versus 4.1 [adjusted mean difference: 1.53; 95% confidence interval: 0.07, 2.99] respectively, on a scale from 0 to 10).

Impact of labels on likely consumption of alcoholic beverages

- Energy labels had no significant impact on the reported likely consumption of alcoholic beverages, irrespective of ethnicity or baseline alcohol use.

Perceived and estimated energy content of alcoholic beverages

- Energy labels had no impact on the perceived energy content of alcoholic beverages, but did increase participants' confidence in their ability to estimate the energy content of alcoholic beverages.
- Energy labels significantly increased the accuracy of energy content estimates when made in calories (but not kilojoules).

Attitudes towards alcoholic beverages

- Participants perceived alcoholic beverages with the NIP or the interpretive energy labels to be more expensive relative to the control (no label) condition. However, there were no other significant differences between participants who viewed the label conditions and the control in respect to attitudes.

Support for energy labelling of alcoholic beverages

- Just over half of all participants (52%) agreed that energy labels should be displayed on alcoholic beverages. Support for labels was consistent across conditions, ethnicity, and baseline alcohol use.

Preferred placement of energy labels on alcoholic beverages

- Across all four label conditions, the most preferred placement of energy content information was on the back of the bottle, particularly by participants allocated to the control and NIP conditions (55% and 53% respectively).
- Support for front-of-bottle labelling (alone or in combination with back-of-bottle labelling) was higher in those participants who viewed the combined (42%) and interpretive label (43%) conditions, compared to the NIP label (21%) and control conditions (28%).

Implications

Although consumers show support for energy and nutrition labels on alcoholic beverages, the efficacy of such labels has not been established. The displayed energy content labels on alcoholic beverages had no influence on reducing the reported likely purchase or consumption of alcoholic beverages, and the NIP and interpretive label had a negative impact on some consumers by increasing the likelihood of purchase.

Our earlier qualitative study (Walker et al., 2018) suggested that the energy content in alcohol beverages is not well understood by consumers. As such, it may be difficult for consumers to interpret energy information when it is presented in the absence of the broader health/diet context. Therefore, further research is needed to determine whether other types of labelling, such as warning labels, safe drinking guidelines, and nutritional claims (e.g. low sugar), have an impact on purchase and consumption of alcoholic beverages, and what effect energy labelling may have on beverage choices.

BACKGROUND

INTRODUCTION

This research was undertaken by the National Institute of Health Innovation (NIHI), University of Auckland, to provide insight into consumers' awareness of and views around energy labelling of alcoholic beverages. This report summarises the second phase of a two-part research project, namely quantitative research to determine the likely influence of energy labelling on the purchase and consumption of alcoholic beverages. The first phase of the project relates to findings from seven focus-groups conducted in Auckland, New Zealand, to provide insight into the awareness of and views around energy labelling of alcoholic beverages. The results of the qualitative study are reported in a separate document available on the Health Promotion Agency's (HPA) website (Walker, McCormack, Jiang, Lang, & Ni Mhurchu, 2018).

HPA commissioned this research to help fill a gap in research on consumer awareness of the energy content of alcoholic beverages and consumer understanding of energy labelling for alcohol beverages. The research has also been commissioned to inform trans-Tasman policy work on the energy labelling of alcohol beverages. The aim of the trial was to determine the impact of three different energy labels, compared to a 'no label' control condition, on consumers' likely alcohol purchase behaviour.

PREVALENCE OF ALCOHOL CONSUMPTION IN NEW ZEALAND

The 2017/18 New Zealand Health Survey reported that four out of five (79%) New Zealanders aged ≥15 years had consumed alcohol in the previous 12 months (Ministry of Health, 2018). Higher rates of alcohol consumption were observed in men (83% versus 75% in women), young adults aged 18-24 years (84%), and people of non-Māori/non Pacific/non-Asian ethnicity (85% versus 80% for Māori, 54% for Pacific people, and 56% for Asian).

Hazardous drinking can be defined as an established drinking pattern that carries a risk of harming the drinker's physical and psychological health, and/or having a harmful social effect on the drinker, their families and the community (Research New Zealand, 2012). Such behaviour can have a significant impact on an individual's health. For example, in 2013 alcohol use accounted for just under 4% of the total health loss in New Zealand, with half of this health loss due to chronic disease (including mental illness), and the remainder due to injury (Ministry of Health, 2016a). However, this measure of health loss does not take into

account the further social harm caused by excessive alcohol consumption, such as crime, family dysfunction, and domestic violence (Babor et al., 2010).

In New Zealand, one in five adults (aged ≥15 years) in 2017/18 engaged in hazardous drinking (Ministry of Health, 2018), defined as scores of ≥8 on the Alcohol Use Disorders Identification Test (AUDIT; Babor et al., 2001). The prevalence of hazardous drinking was highest in men (27%), young adults aged 18-24 years (32%), Māori adults (32%), and adults living in the most deprived areas of New Zealand (22%) (Ministry of Health, 2018). In order to reduce the population harm caused by excessive alcohol consumption, priority should be given to strategies that diminish or counteract the strong advertising, promotion, supply, labelling, and pricing strategies currently employed by the alcohol industry to sell their products (Stead, Angus, MacDonald, & Bauld, 2014). One potential strategy to reduce population harm is the use of nutrition labelling and energy content information to reduce alcohol purchase and/or consumption behaviour.

CAN ENERGY LABELLING REDUCE ALCOHOL PURCHASE AND CONSUMPTION?

Unlike most packaged food products sold in New Zealand, alcoholic beverages are not generally required to present a statement on the composition of the product (e.g. energy or nutrient content) other than the alcohol content - unless a nutrient claim is made (Australia New Zealand Food Standards – Code 2.7.1 – Labelling of alcoholic beverages and food containing alcohol, Australian Government, 2018). Yet consumers of alcohol, both nationally and internationally (Health Promotion Agency, 2017; Suckling, 2017; Annunziata, Pomaric, Vecchio, & Mariani, 2016; Grunert, 2018;), have expressed a desire for nutritional labelling to be placed on alcoholic beverages. Few studies have examined consumer awareness of the energy content of alcohol and the impact of energy/nutrition labelling on alcohol purchase or consumption (Center for Science in the Public Interest, 2003; Martinez, Dale, Fontana, & Collier, 2015; Maynard et al., 2018; Walker et al., 2018; Wright, Bruhn, Heymann, & Bamforth, 2008). Findings from these studies are summarised below.

Consumer awareness of the energy content of alcoholic beverages

- In a US survey (N=415 participants, aged ≥21 years, visitors at two wineries and one brewery) subjects initially perceived red wine to be more healthy than other alcoholic beverages, including beer and white wine (Wright et al., 2008). However, after viewing nutritional information for alcoholic beverages, red wine was perceived as less healthy while beer was perceived as more healthy. The authors noted that subjects didn't tend to rate their preferred beverage as healthier, indicating that perceived healthiness is unlikely to be the main factor driving beverage choice.

- In a second US survey (N= 550 participants, aged ≥18 years, recruited via a nationally representative telephone poll), only 10% of respondents correctly identified the number of kilojoules in a regular beer (Centre for Science in the Public Interest, 2003).

- In a qualitative study of New Zealand adults (N=35 participants, aged ≥18 years, seven focus groups, split by age and level of alcohol use, one Māori-only group) who had purchased alcohol in the last thirty days, most individuals were unable to correctly identify the energy content in different alcoholic beverages (Walker et al., 2018). Participants consistently underestimated the relative energy content of wine, while overestimating the relative energy content of beer. Participants in the study were generally unaware of the energy density of alcohol, or that alcohol was the main source of energy in alcoholic beverages (and instead focussed on sugar as the main source of energy).

The impact of energy/nutrition labelling on alcohol purchase/consumption

- Three US experimental studies (Study 1: N=95 participants, mean age 19 years, recruited underage college drinkers enrolled in an introductory Psychology paper, between-subjects study; Study 2: N=106 participants, aged ≥21 years, recruited from a community coffee shop, between-subjects study; Study 3: N=203 participants, aged ≥18 years, recruited online through Amazon's Mechanical Turk, cross-over design) explored the effect of nutrition labels (similar to the New Zealand Nutrition Information Panel [NIP]) on participants' intention to consume alcohol in the next 30 days (Martinez et al., 2018). In study 1 and 2, participants were shown beer either with or without a nutrition label, while in the trial participants were shown both options

and asked for their preference. In all three studies, the label condition had no significant effect on participants' intention to drink alcohol.

- In a randomised controlled trial undertaken in the UK (N=264 participants, aged ≥18 years, recruited from a university database including students, staff, and the public) the impact of unit and caloric information on *ad libitum* alcohol consumption was assessed in a controlled laboratory environment (Maynard et al., 2018). The study found no difference in the amount of alcohol consumed between the groups provided with alcohol unit and/or caloric information, and those that received no information. In addition, qualitative data (N=153 participants) from this trial suggested that the information provided (particularly alcohol units) may have had the unintended consequence of increasing alcohol consumption, particularly for the undergraduate student population who were motivated to consume alcohol in order to become intoxicated. Findings suggest that unit and calorie information do not influence alcohol consumption, but do influence choice between alcoholic beverages.

- A qualitative study of New Zealand adults (N=35 participants, aged ≥18 years, seven focus groups, split by age and level of alcohol use, one Māori-only group) who had purchased alcohol in the last thirty days explored the influence of four different nutrition/energy labels on likely alcohol purchase or consumption behaviour (Walker et al., 2018). The four labels included: a NIP; a stand-alone energy label/icon (in kilojoules and calories); a stand-alone energy label/icon (in kilojoules and calories) shown with % daily intake (DI); and a combined label with energy, standard drinks, and % alcohol content presented together. Participants reported that none of the presented labels were ideal and none would influence their purchase or consumption of alcoholic beverages. However, if they had to choose one label, participants preferred the combined label. When asked to design their own label, participants included a NIP on the back of the bottle, in addition to front-of-bottle labelling. Of interest was that terms such as kilojoules, calories, % daily intake and standard drinks were not well understood by study participants. The study concluded that alcohol "energy labelling needs to be placed primarily on the front of the bottle, be visually engaging, simple, tangible, require no calculation, should not look like a 'wine award' label, and should enable easy comparison between different types of alcoholic drinks."

STUDY RATIONALE

Despite the need from a public health perspective, and consumer interest in nutrition and energy labelling for alcoholic beverages, there remains very little research on the topic. Information that does exist suggests consumer knowledge of the energy content of alcoholic beverages is low and labelling options tested to date have had no impact on reducing intentions to purchase or consume alcohol. Furthermore, there is emerging evidence that for some segments of the population nutrition and energy labelling for alcoholic beverages may actually increase alcohol consumption. Importantly, there are no quantitative studies conducted in New Zealand to investigate the effects of different labelling options on consumers' alcohol purchase and consumption behaviour.

In an effort to address the limited evidence base on nutrition and energy labelling for alcoholic beverages, we designed a clinical trial to explore the effects of three different energy labels on consumers' alcohol purchase behaviour. The labels chosen for the trial were informed by and based on the labels used in phase one (qualitative) of this research project (Walker et al., 2018). Specifically, the three labels used in the phase two study included: a) a NIP; b) the preferred 'combination' label from phase one; and c) a new label that was created based on interpretive labels often used on food products to highlight nutritional content (e.g. traffic light coding or star ratings).

Research indicates that consumers often rate interpretive labels as more useful than standard NIPs, as they reduce the computational workload for consumers and provide clear indications of health value (Gorton et al., 2008). However, the impact of interpretive labels on actual food purchase is conflicting, for example:

- An analysis of purchase data from a US supermarket chain compared purchases before and after the implementation of an on-shelf label (called the 'Guiding Star') that used a star-rating to indicate the nutritional value of food (no star indicated the lowest nutritional value and three stars indicated the highest). The study found that the percentage of 'no star' foods purchased significantly decreased by 0.5% in the first year and 1.4% two years after implementation of the labelling ($p<0.001$), representing approximately 2.9 million fewer purchases per month of 'no star' foods (Sutherland, Kaley, & Fischer, 2010).

- A New Zealand trial (N=1357) found that 4-weeks use of a smartphone app that allowed users to: 1) scan food items; 2) view the fat, sugar and salt content of the product via a colour-coded traffic light label or a Health Star Rating label; and 3) view a range of healthier options, did not significantly increase the healthiness of the food

purchased by participants at 4-weeks, compared to standard NIP labelling (mean difference: 0.08, 95% confidence interval: -0.38, 0.54, *P*=0.74) (Ni Mhurchu et al., 2017).

Despite this conflicting evidence, the effect of an interpretive energy label on alcohol purchase behaviour has not yet been tested, which is why we included such a label in the trial.

The aim of the trial was to determine the impact of three different energy labels, compared to a 'no label' control condition, on consumers' likely alcohol purchase behaviour. The hypothesis was that the NIP label, the 'combination' label, and the interpretive energy label would significantly reduce the likelihood of consumers purchasing alcohol, compared to a 'no label' control group, irrespective of ethnicity or degree of alcohol consumption.

METHOD

STUDY DESIGN

The study aimed to test the effects of different types of energy labels on the likelihood of purchase and consumption using an online questionnaire completed by members of a survey panel. A four-arm, parallel, randomised controlled trial design was used, with eligible participants randomised to receive one of four different labelling options (outlined below). The trial was registered at ClinicalTrials.gov (NCT03553043).

ELIGIBILITY CRITERIA

Participants were eligible to participate if they met the following criteria: 1) they were aged ≥18 years; 2) they had purchased and consumed at least one alcoholic beverage in the past month; 3) they were able to read English; 4) they resided in New Zealand; and 5) they were members of the Research Now Survey Sampling International (SSI) online panel (or one of their partner panels).

RECRUITMENT

Participants were recruited via a third party (Research Now SSI) from a nationwide online panel that they host. The panel is broadly representative of the New Zealand population across demographic and geographic variables. Research Now SSI's panel members are recruited using multimedia advertising. Panel members were invited to "take a survey" through e-mail invitations. Potential participants accessed the participant information sheet for the trial via a hyperlink on the trial welcome page. Interested participants then provided online consent and completed an online screening tool to assess eligibility. Those who were eligible and still interested then provided online consent to enter the trial, where they completed a baseline questionnaire immediately prior to being randomised.

Participants were compensated for their time in the study: reward points were given by Research Now SSI, which could be redeemed for a range of products and services. Based on a 10 minute survey, participants were credited the point equivalent of up to NZ$1.

RANDOMISATION AND BLINDING

Eligible participants were randomly allocated (1:1:1:1 ratio) using a computer-generated algorithm to one of the four experimental conditions, stratified by ethnicity (Māori, Pacific

people, and non-Māori/non-Pacific people) and alcohol use (based on the AUDIT-C: mild to moderate use vs. heavy use, where scores ≥3 for women and ≥4 for men indicate heavy alcohol use) (Towers et al., 2011). Ethnicity was prioritised by Māori, then Pacific people, then non-Māori/non-Pacific people. The randomisation code was computer generated and prepared by the trial statistician. Random allocation was centrally managed by Research Now SSI, and concealed in a secure database until the point of randomisation. Due to the nature of the intervention, participants were aware of the allocated experimental condition. However, research staff were blinded during the study period.

INTERVENTION

Three different energy labelling options were developed to appear on the alcoholic beverage favoured or preferred by each participant (i.e. beer, wine, or spirit). Labels were developed based on previous research findings, including focus group feedback from phase one of this project (Walker et al., 2018). The three labelling conditions were tested against a control label which displayed an alcoholic beverage without a specific energy label. All labels were compliant with the minimum mandatory labelling requirements under the Food Standards Australia New Zealand Code (Australian Government, 2018), in that % alcohol content and the number of standard drinks were displayed on the front of the bottle. Nutrition information and energy values were obtained from the New Zealand Food Composition Database (Sivakumaran, Huffman, & Sivakumaran, 2017) based on common serving sizes for each beverage (i.e. 330 ml bottle of beer, 125ml of wine and 30ml of spirits). Labels were as follows (see Figure 1 and Appendix 1):

- Condition 1: NIP (Nutritional information panel on the back-of-bottle).
- Condition 2: Combined (energy content, % alcohol content and standard drinks presented in a single label in a front-of-bottle location; energy presented per serve in kilojoules [usually reported as kJ] and calories [usually reported as Cal]).
- Condition 3: Interpretive label (energy content presented in kilojoules and calories with an orange stopwatch icon demonstrating the amount of exercise required to burn-off the shown energy).
- Condition 4: Unlabelled control.

Figure 1: Example of the NIP, combined label, and interpretive label (left to right).

OUTCOME MEASURES

Baseline assessment

Baseline variables collected prior to randomisation included the following (see Appendix 2 for questionnaire):

- **Socio-demographics:** age, gender, ethnicity, highest educational level (as a measure of socio-economic position), and region where they live.
- **Household structure:** number of people per household, the number of minors (aged <18 years) in the household, and the combined household income per annum.
- **Alcohol use and misuse:** assessed using the AUDIT-C, a screening tool that has good reliability and validity across different age groups, genders and ethnicities (Dawson, Grant, & Stinson, 2005). Alcohol use was classified as mild/moderate or heavy use, with scores of ≥3 for women and ≥4 for men indicating heavy alcohol use (Towers et al., 2011).
- **Current alcohol purchasing behaviour:** frequency of buying alcoholic beverages; types of alcoholic beverages usually bought; the usual weekly expenditure on alcoholic beverages; the number of people alcohol is usually bought for; and the places alcohol is usually purchased from (e.g. liquor stores, wine shops, supermarkets, etc.).
- **Use, understanding and perception of nutrition labels on foods and non-alcoholic beverages:** measured using an adapted New Zealand version of the Food Label Questionnaire (Mackinson, Wrieden, & Anderson, 2010).

- **Attitudes towards alcohol:** assessed using the Scale for Measurement of Attitudes Towards Alcohol, a tool used to: 1) assess people's risk profile regarding the use of alcohol; and 2) identify the factors that contribute to determining their attitudes (Francalanci, Chiassai, Ferrara, Ferretti, & Mattei, 2011). Based on predisposing factors for risky drinking, the scale consists of three domains (family, social ease, and unease), each consisting of five items that can be rated on a five-point Likert scale ranging from “absolutely false” to “absolutely true”.

Primary outcome measure

The primary outcome was intention to purchase the displayed product, immediately after viewing the allocated label. Intention to purchase was assessed on an 11-point Juster scale, where 0 represented “no chance or almost no chance of purchase” and 10 represents “certain or practically certain to purchase”. Purchasing behaviour has been shown to be associated with drinking behaviour; those who buy more and cheaper alcoholic beverages tend to have more hazardous drinking patterns (National Research Bureau, 2012).

Secondary outcome measures

The following secondary outcome measures were also collected (Appendix 2):

- **Number of drinks likely to purchase.**

- **Intention to consume the displayed product:** assessed on an 11-point Juster scale, where 0 represented “no chance or almost no chance to consume” and 10 represented “certain or practically certain to consume”.

- **Perceived energy content of the displayed product:** assessed using a seven-point scale ranging from “not very much” to “a lot”(Bui, Burton, Howlett, & Kozup, 2008).

- **Perceived confidence in estimating the energy content of the displayed product:** assessed using a seven-point scale ranging from “not confident at all” to “very confident” (Bui et al., 2008).

- **Estimated energy content of the displayed product:** Measured in Kilojoules and Calories.

- **Attitudes towards the displayed product:** assessed by asking whether participants believed the displayed alcoholic product was expensive/cheap, unattractive/attractive, low quality/high quality, unhealthy/healthy, uncool/cool and taste bad/good (Bollard, Maubach, Walker, & Ni Mhurchu, 2016). Each outcome was measured on a bi-polar seven-point rating scale.

- **Support for having energy labels on alcoholic beverages:** assessed by level of support for the statement "alcoholic drinks should provide energy (kilojoule (kJ)/calorie) content information on labels", with the outcome measured on a seven-point Likert scale, ranging from "strongly disagree" to "strongly agree".

- **Placement of energy labels on alcoholic drinks:** selection of preferred placement from the options: only on the back of the bottle, only on the front of the bottle, both on the front and back of the bottle, no label, and no opinion.

STATISTICAL CONSIDERATIONS

Sample size

A total sample of 600 people were sought (150 participants in each of the four experimental conditions), with equal numbers of Māori, Pacific people, and non-Māori/non-Pacific participants (200 participants in each group). This sample size provides >90% power at 5% significance level (two-sided) to detect a minimum one-point difference in the primary outcome between any one of the three labelling groups and the control (no label) group, with adjustment for Dunnett multiple comparisons. Recruiting 200 participants for each ethnic group (50 participants per experimental condition) provided >80% power to detect the same minimal group difference in the primary outcome under the same assumptions.

Statistical analyses

Statistical analysis were performed using SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). All statistical tests were two-sided at 5% significance level. Baseline data were summarised descriptively by randomised group (overall, for each ethnic group and by level of alcohol use). Continuous variables were summarised as the numbers observed, mean, standard deviation (SD), median and range. Categorical variables were summarised as frequencies and percentages.

The primary analysis was based on the intention-to-treat population including all randomised participants in the group they were randomly allocated to. Since all participants received the intervention and completed the questionnaire online, no per protocol analyses were conducted. Subgroup analyses were performed for the two stratification factors separately (ethnicity and alcohol use). The consistency of intervention effect between subgroups were tested in the main regression model using an interaction term between the treatment and the subgroup.

The primary outcome and secondary outcomes (measured in Likert scales) were summarised as mean and standard deviation (SD) for each randomised group. Generalised linear regression models were used to estimate the effect of intervention between either one of the three labelling groups and the control (no label group), controlling for participants' age, gender, ethnicity, baseline alcohol use and choice of alcoholic beverage (beer, wine, or spirit), with adjustment for Dunnett multiple comparisons. Continuous outcomes were analysed using linear regression, and reported as the model-adjusted mean difference between the intervention and control groups with associated 95% confidence intervals. Count data were analysed using zero-inflated negative binomial regression to account for over-dispersion, and reported as a model-adjusted rate ratio between two groups, with associated 95% confidence intervals.

The accuracy of energy content estimates were analysed by comparing participant estimates (in either kilojoules or calories) to the correct per serve energy value, as displayed on the beverages in the labelling conditions. The mean deviation from the reference value was calculated for each condition. Estimates were considered accurate if they did not deviate from the reference value by more than 10% (as per Hobin et al., 2018).

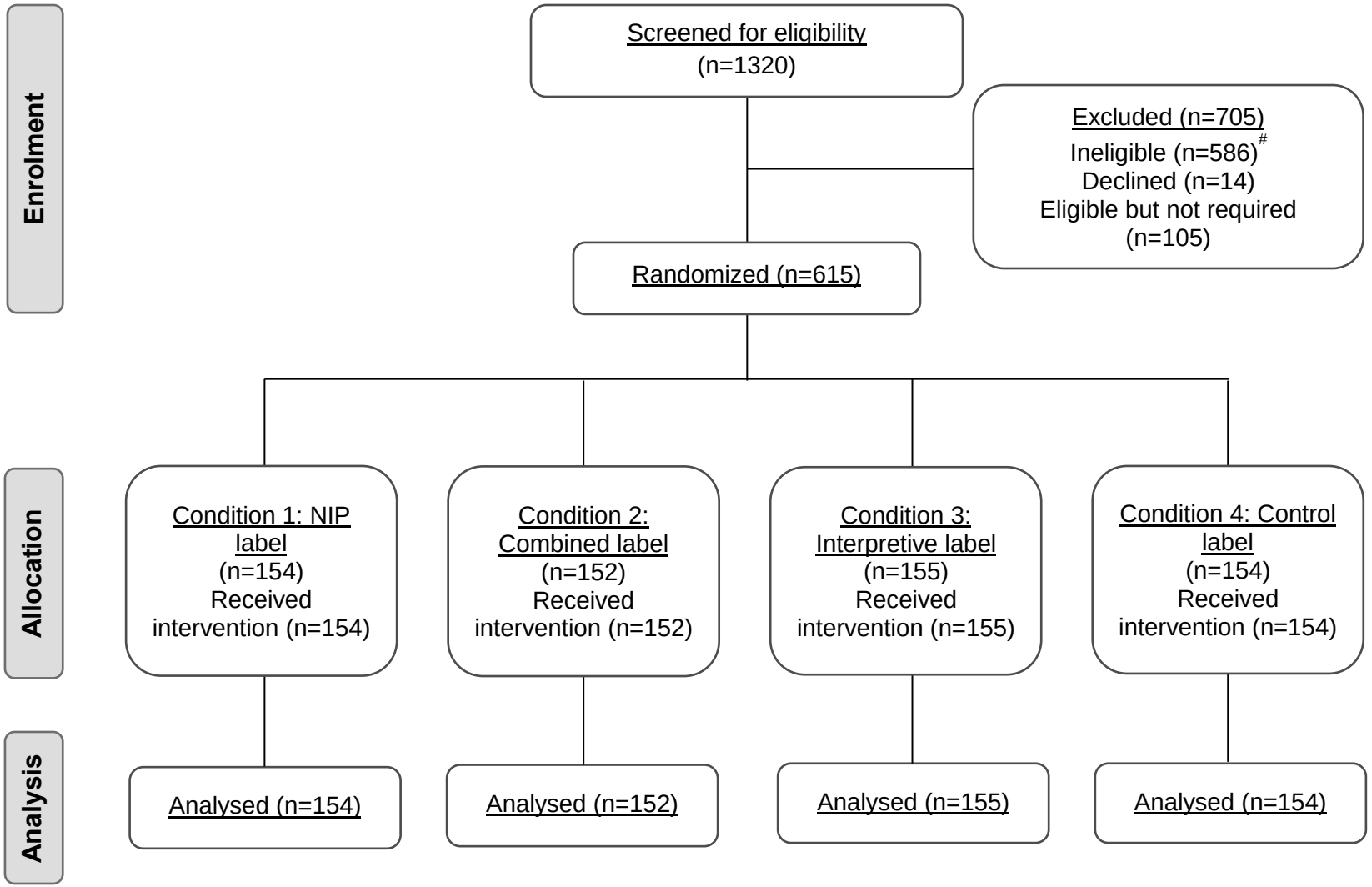
RESULTS

Between 25 July 2018 and 23 August 2018, 1320 panel members responded to the study invitation and answered the screening questions. A total of 586 (45%) people did not meet the eligibility criteria, 14 (1%) declined to participate, and 105 (8%) were eligible but were not needed as the recruitment targets had been achieved. A total of 615 participants (205 Māori, 204 Pacific people, and 206 non-Māori/non-Pacific people) were randomised into one of the four groups, with no loss to follow-up or missing data (Figure 2).

The demographics of study participants are described in Table 1. Overall, 58% of participants were female, and the mean age of participants was 41.2 years (SD 15.1). In the Pacific ethnic group: 51% identified as Samoan; 18% as Cook Island Māori; 15% Fijian; 14% Tongan; 6% Niuean; and 3% Tokelauan. In the non-Māori/non-Pacific ethnic group 77% identified as New Zealand European, and 22% identified as Asian (Chinese, Indian, or Other Asian). The majority (78%) of study participants met the criteria for heavy alcohol use. Thirty-eight percent of participants reported purchasing alcohol more than once a week in the last four weeks. Thirty-five percent of participants selected spirits as their preferred alcoholic beverage, 33% selected beer and 32% selected wine.

The vast majority of participants thought that labels on food and non-alcoholic beverages were important (86%) and useful (78%), but only 42% of participants thought that labels on food and non-alcoholic beverages were easy to understand. Only 29% of participants said they had read nutrition information on packaged food labels ‘often or always’ in the last four weeks, and 23% said they had read energy content information on packaged food labels ‘often or always’ in the last four weeks.

Figure 2: Flowchart of recruitment and retention of participants throughout the trial



Excluded participants: < 18 years (n=27); outside of New Zealand (n=7); did not purchase alcohol in the last four weeks (n=526); did not consume alcohol in the last four weeks (n=477)

Table 1. **Baseline and clinical characteristics for all participants.**

Baseline characteristics	NIP Label^ (N=154)	Combined Label (N=152)	Interpretive Label (N=155)	Control (N=154)
	n (%)	n (%)	n (%)	n (%)
Age (years):				
Mean (SD)[$]	43.2 (16.1)	40.2 (15.1)	41.2 (14.9)	40.3 (14.3)
Gender				
Female	92 (59.7)	90 (59.2)	90 (58.1)	83 (53.9)
Male	62 (40.3)	62 (40.8)	65 (41.9)	71 (46.1)
Ethnicity*				
Māori	51 (33.1)	51 (33.6)	52 (33.5)	51 (33.1)
Pacific people	52 (33.8)	49 (32.2)	52 (33.5)	51 (33.1)
non-Māori/non-Pacific	51 (33.1)	52 (34.2)	51 (32.9)	52 (33.8)
Region				
Auckland	53 (34.4)	65 (42.8)	57 (36.8)	72 (46.8)
Wellington	19 (12.3)	15 (9.9)	24 (15.5)	18 (11.7)
Other North Island	53 (34.4)	44 (28.9)	49 (31.6)	49 (31.8)
Canterbury	18 (11.7)	15 (9.9)	12 (7.7)	10 (6.5)
Other South Island	11 (7.1)	13 (8.6)	13 (8.4)	5 (3.2)
Alcohol Use**				
High	121 (78.6)	120 (78.9)	120 (78.1)	121 (78.6)
AUDIT-C: Mean (SD)	5.6 (2.1)	5.8 (2.0)	5.9 (2.0)	6.1 (2.0)
Mild/Moderate	33 (21.4)	32 (21.1)	35 (21.9)	33 (21.4)
AUDIT-C: Mean (SD)	2.1 (0.7)	2.2 (0.7)	2.0 (0.8)	1.9 (0.7)
Highest qualification				
Secondary school only	59 (38.3)	55 (36.2)	63 (40.6)	72 (46.8)[#]
Tertiary or trade	95 (61.7)	97 (63.8)	92 (59.4)	81 (52.6)[#]
Household size:				
Mean (SD)	3.7 (2.2)	3.5 (2.0)	3.8 (2.1)	3.8 (2.0)
Total household income				
< $40,000	32 (20.8)	30 (19.7)	28 (18.1)	29 (18.8)
$40,001-$80,000	42 (27.3)	51 (33.6)	44 (28.4)	45 (29.2)
> $80,000	64 (41.6)	50 (32.9)	57 (36.8)	52 (33.8)
Unknown	16 (10.4)	21 (13.8)	26 (16.8)	28 (18.2)

[$]SD: standard deviation ^NIP: Nutrition Information Panel

*Ethnicity prioritised by Māori, then Pacific people, then non-Māori/non-Pacific

** Classified according to the AUDIT-C. Scores of <3 for women and <4 for men = mild to moderate alcohol use; Scores of ≥3 for women and ≥4 for men = heavy alcohol use (Towers et al., 2011).

[#]One participant declined to answer

IMPACT OF ENERGY LABELLING ON LIKELY PURCHASE OF ALCOHOLIC BEVERAGES

The likelihood of purchase of the displayed product for each of the labelling conditions was compared to the control label, which displayed no energy content information (Table 2). Compared to the control condition, **the NIP label significantly increased the reported likelihood of purchasing the displayed alcoholic beverage** (5.6 on Juster scale versus 4.8, p=0.04). No other comparisons were statistically significant.

Subgroup analysis (Figure 3, Appendix 3) revealed **Māori participants in both the NIP label group and interpretive label group had a significantly increased likelihood of purchase relative to Māori participants in the control group** (NIP: 5.78 versus 4.14, p<0.01; Interpretive: 5.65 versus 4.14, p=0.04). The energy labelling condition had no significant effect on purchase of alcoholic beverages for Pacific people or non-Māori/non-Pacific people, or by level of alcohol use. No significant differences were observed between groups in the number of drinks participants were likely to purchase (Appendix 4).

IMPACT OF ENERGY LABELLING ON LIKELY CONSUMPTION OF ALCOHOLIC BEVERAGES

The likelihood of consumption of the displayed product for each of the labelling conditions was compared to the control label, which displayed no energy content information. None of the labels significantly increased or decreased the reported likelihood of consuming the displayed alcoholic beverage, compared to the control condition (Table 2), irrespective of ethnic group or alcohol use (Figure 3).

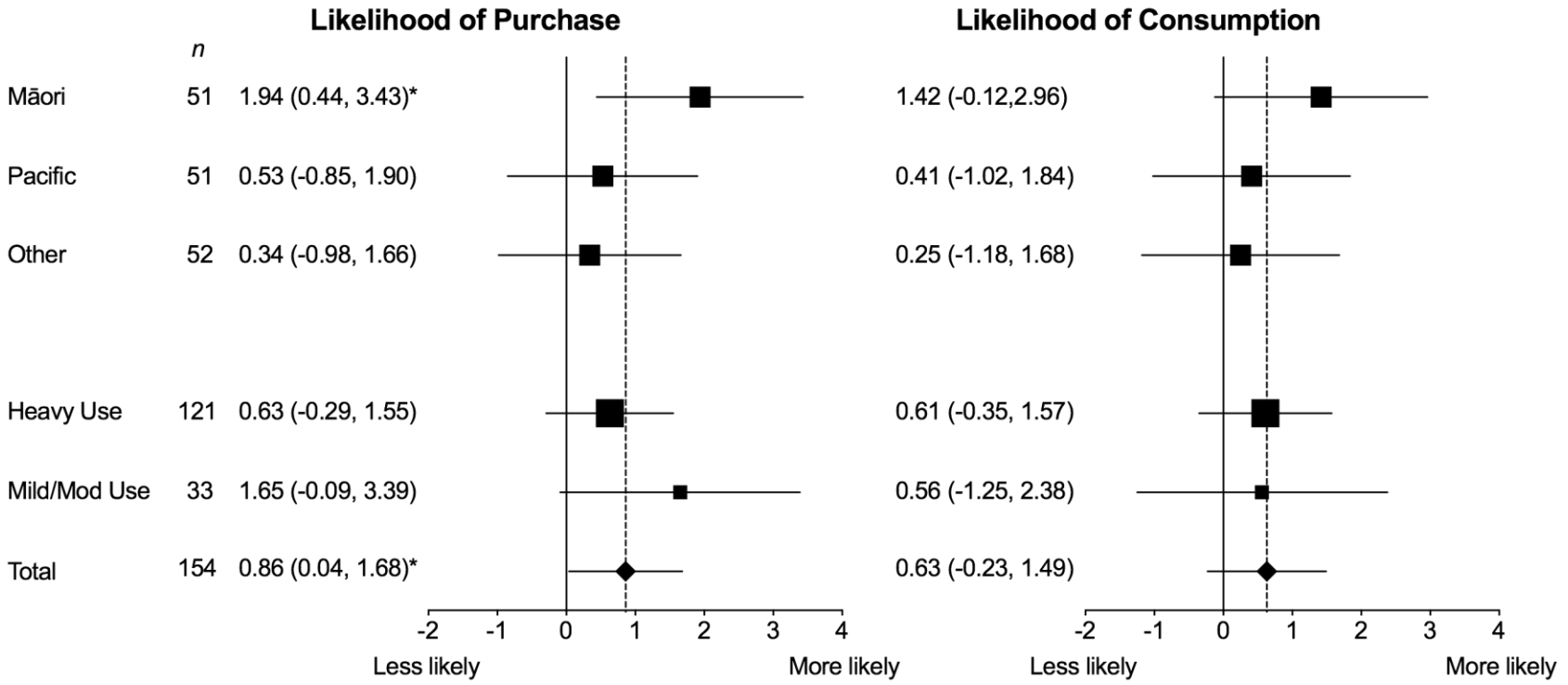
Table 2. **Estimated effect of nutrition and energy labels on likelihood to purchase and consume the displayed product, compared to the control (standard alcohol labelling)**

	Control (N=154)	NIP (N=154) vs. control			Combined label (N=152) vs. control			Interpretive label (N=155) vs. control		
	Mean (SD)	Mean (SD)	Adjusted mean difference (CI)	*p*	Mean (SD)	Adjusted mean difference (CI)	*p*	Mean (SD)	Adjusted mean difference (CI)	*p*
Likelihood of purchase	4.77 (3.09)	5.56 (2.95)	0.86 (0.04, 1.68)	0.04*	5.05 (3.01)	0.27 (-0.55, 1.10)	0.78	5.43 (3.27)	0.68 (-0.14, 1.50)	0.13
Likelihood of consumption	5.44 (3.25)	5.96 (3.18)	0.63 (-0.23, 1.49)	0.20	5.53 (3.23)	0.12 (-0.74, 0.98)	0.98	5.56 (5.56)	0.30 (-0.55, 1.15)	0.74

Note. Higher mean values represent a greater likelihood to purchase or consume the product on a scale from 0 to 10. Mean difference is the model-adjusted mean difference controlling for participants' age, gender, ethnicity, alcohol use and choice of alcoholic beverage, with adjustments for Dunnet multiple comparisons. CI indicates the 95% confidence interval. * indicates the *p*-value is significant ($p<0.05$)

Figure 3: **Forest plots showing mean difference in likelihood of purchase or consumption of products for each comparison, by ethnicity and baseline alcohol use**

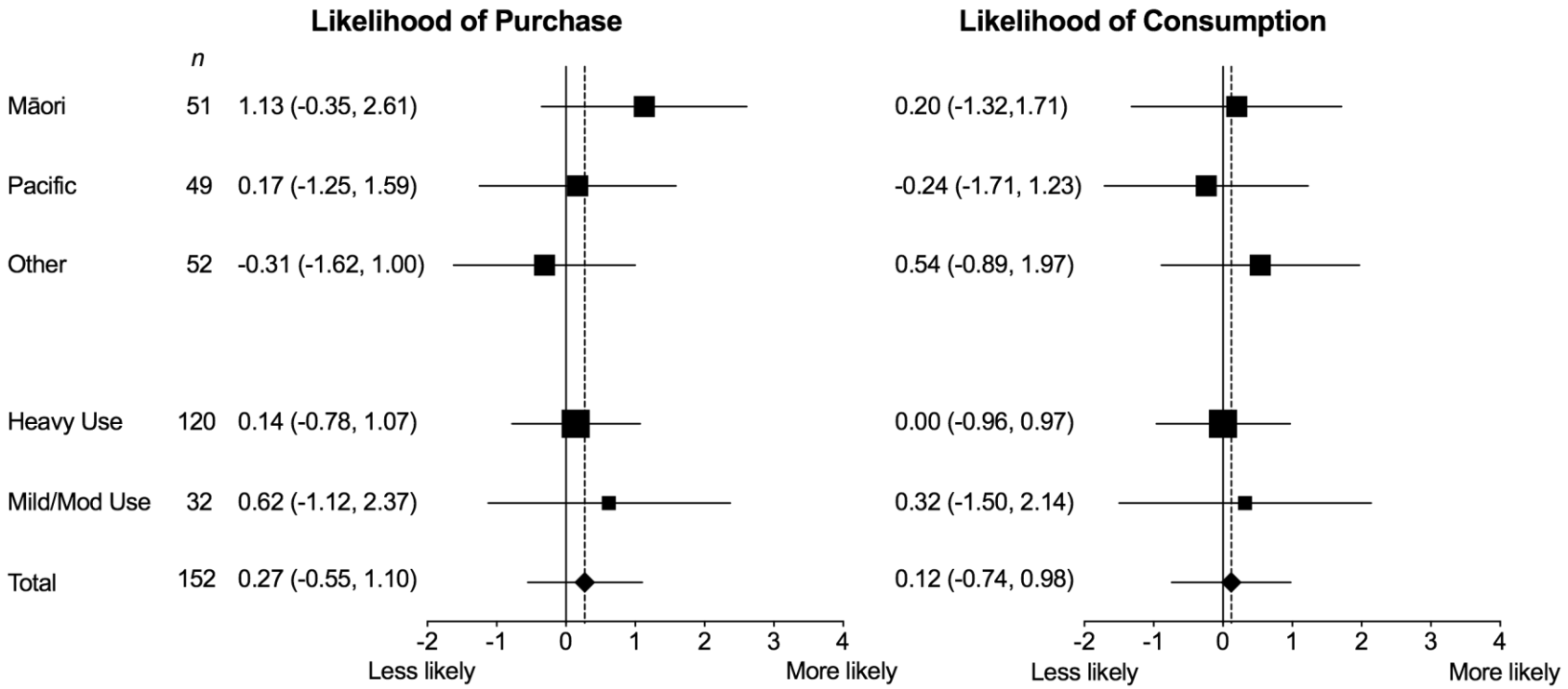
NIP (N=154) vs. control (N=154)



Other = non-Māori/non-Pacific ethnicity

Heavy use, mild/mod use = level of alcohol use

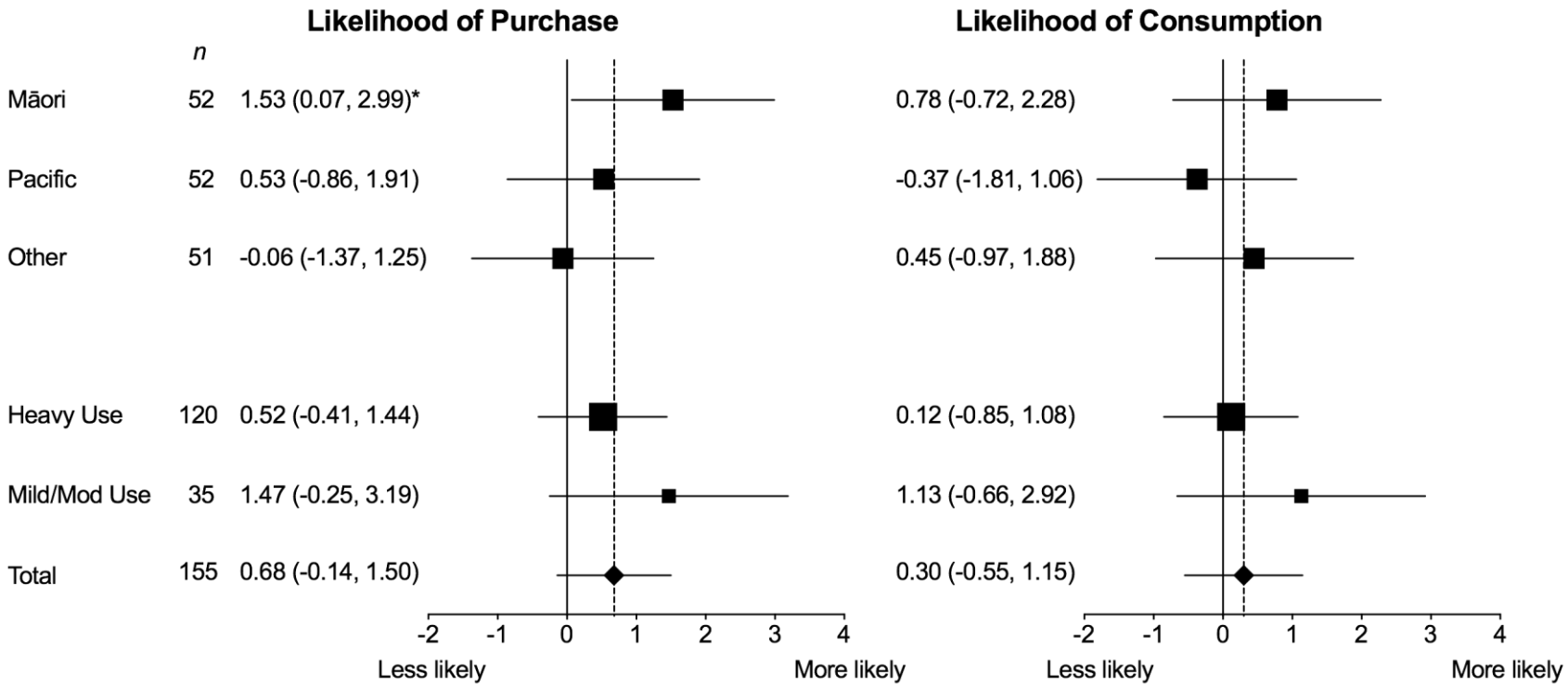
Combined label (N=152) vs. control (N=154)



Other = non-Māori/non-Pacific ethnicity

Heavy use, mild/mod use = level of alcohol use

Interpretive label (N=155) vs. control (N=154)



Other = non-Māori/non-Pacific ethnicity

Heavy use, mild/mod use =level of alcohol use

ESTIMATED ENERGY CONTENT OF ALCOHOLIC BEVERAGES

Participants did not perceive the energy content of the displayed beverages as significantly higher or lower in any of the three labelling conditions, compared to the control condition (Table 3). However, participants did have **significantly more confidence in their ability to estimate the energy content of alcoholic beverages across all three labelling conditions**, compared to the control condition (2.49 on a 7-point Likert scale versus 3.51-3.53, $p<0.01$). Increased confidence in their ability to estimate energy content was also found for Māori participants (2.19 versus 3.36-4.16, $p<0.05$) and heavy drinkers across all three conditions (2.40 versus 3.38-3.54, $p<0.01$), and non-Māori/non-Pacific across the NIP and combined label conditions (2.82 versus 4.04-4.07, $p<0.05$). No differences were observed for Pacific participants or mild/moderate drinkers.

Accuracy of estimated energy content

In terms of calories, significant differences were observed between the energy labelling conditions and the control condition in the accuracy of estimated energy content (Figure 3). The mean deviation from the reference values were calculated for each condition by comparing participant estimates (in either kilojoules or calories) to the correct per serve energy value, as displayed on the beverages in the labelling conditions. The mean deviation from the reference value was largest in the control label condition. Significant differences were observed between the NIP and the control condition (mean deviation from reference value 18.42 versus 112.22 respectively), the combined label and the control condition (mean deviation 4.96 versus 112.22 respectively, $p<0.01$), and the interpretive label and the control condition (mean deviation 8.08 versus 112.22 respectively, $p<0.01$).

Table 3. **Estimated effect of label conditions on secondary outcomes, compared to the control (standard alcohol labelling)**

	Control (N=154)	NIP (N=154) vs. control			Combined label (N=152) vs. control			Interpretive label (N=155) vs. control		
	Mean (SD)	Mean (SD)	Adjusted Mean difference (CI)	*p*	Mean (SD)	Adjusted Mean difference (CI)	*p*	Mean (SD)	Adjusted Mean difference (CI)	*p*
Energy content[#]										
Perceived content (not very much vs. a lot)	4.17 (1.86)	4.52 (1.75)	0.29 (-0.24, 0.82)	0.42	4.28 (1.80)	0.11 (-0.42, 0.65)	0.92	4.44 (1.72)	0.27 (-0.26, 0.80)	0.49
Confidence in estimate (not confident at all vs. very confident)	2.49 (1.89)	3.53 (2.37)	1.12 (0.50, 1.73)	<0.01*	3.51 (2.27)	1.09 (0.47, 1.71)	<0.01*	3.51 (2.34)	10.90 (0.49, 1.70)	<0.01*
Attitudes towards product[#]										
Cheap vs. expensive	3.71 (1.65)	4.14 (1.34)	0.42 (0.03, 0.80)	0.03*	3.83 (1.39)	0.16 (-0.23, 0.54)	0.66	4.15 (1.49)	0.45 (0.07, 0.83)	0.02*
Attractive vs. unattractive	4.16 (1.58)	4.08 (1.65)	-0.10 (-0.51, 0.31)	0.90	4.03 (1.49)	-0.16 (-0.57, 0.25)	0.69	3.98 (1.51)	-0.19 (0.22, 0.57)	0.91
High vs. low quality	4.16 (1.51)	4.16 (1.41)	-0.01 (-0.40, 0.37)	1.0	4.05 (1.45)	-0.12 (-0.51, 0.27)	0.81	4.08 (1.45)	-0.08 (-0.47, 0.30)	0.92

Healthy vs. unhealthy	4.49 (1.73)	4.38 (1.53)	-0.13 (-0.57, 0.30)	0.81	4.21 (1.67)	-0.34 (-0.78, 0.09)	0.16	4.27 (1.69)	-0.24 (-0.67, 0.20)	0.43
Cool vs. uncool	4.08 (1.48)	4.12 (1.49)	0.03 (-0.36, 0.41)	1.0	4.05 (1.37)	-0.05 (-0.43, 0.34)	0.99	4.01 (1.47)	-0.07 (-0.46, 0.31	0.94
Good vs. bad taste	4.16 (1.44)	4.06 (1.28)	-0.10 (-0.47, 0.26)	0.84	3.94 (1.32)	-0.23 (-0.60, 0.13)	0.31	4.08 (1.43)	-0.08 (-0.45, 0.28)	0.91
Support for labels	4.65 (1.82)	4.67 (1.78)	0.05 (-0.41, 0.51)	0.99	4.75 (1.66)	0.09 (-0.38, 0.55)	0.57	4.88 (1.74)	0.11 (-0.35, 0.57)	0.90

[#]Measured on a 7-point Likert-scale

Note. Scales range from 1 to 7, with higher mean values representing more support or tendency towards the latter descriptor. Mean difference is the model-adjusted mean difference controlling for participants' age, gender, ethnicity, alcohol use and choice of alcoholic beverage, with adjustments for Dunnet multiple comparisons. CI indicates the 95% confidence interval. * indicates the *p*-value is significant ($p<0.05$)

In terms of kilojoules, no significant differences were observed between the estimated and actual energy content of the alcoholic beverages, although participants were more accurate in their estimates of the energy content of alcoholic beverages if they had viewed one of the three energy labels (Figure 4). For example, only 3% of participants who viewed the control label were accurate when estimating the energy content of the displayed beverage in kilojoules, and 65% of participants underestimated the energy content. In comparison, 62% of participants who viewed the NIP label, 68% who viewed the combined label, and 74% who viewed the interpretive label were accurate estimating the energy content of the displayed beverage in kilojoules.

ATTITUDES TOWARDS PRODUCTS

Compared to the control condition, viewing the labelling conditions had no clear effect on attitudes towards the displayed product (Table 3), with two exceptions. Participants who viewed the NIP condition perceived displayed products as more expensive than participants in the control condition (4.14 versus 3.71, p=0.03), as did participants viewing the interpretive label (4.15 versus 3.71, p=0.02).

The subgroup analysis detected significant differences for Māori and mild/moderate drinkers on attitudes towards the product. Specifically, Māori participants who viewed the interpretive label perceived the product as more expensive than participants in the control condition (4.08 versus 3.08, p<0.01), while those who viewed the combined label perceived the products as better tasting (3.61 versus 4.41, p=0.02). Participants classified as mild/moderate drinkers who viewed the NIP label perceived the product as more expensive than participants in the control condition (4.24 versus 3.45, p=0.03), as well as more attractive (3.45 versus 4.30, p=0.04) and cooler (3.27 versus 4.03, p=0.05). Mild/moderate drinkers who viewed interpretive label condition also perceived the product as more expensive than participants in the control condition (4.26 versus 3.45, p=0.01). No other differences were noted according to ethnicity or baseline level of alcohol use.

SUPPORT FOR ENERGY LABELLING ON ALCOHOLIC BEVERAGES

Support for energy and nutrition labels on alcoholic beverages was not significantly different between conditions, irrespective of ethnicity (Figure 5). Approximately half of all participants

(51% to 53%) agreed that alcoholic beverages should provide energy content information on labels, while one in five participants disagreed (17% to 22%) (Figure 5).

Figure 4: Accuracy of the estimated energy content of the alcoholic beverages, by label condition: Calorie and kilojoule estimates (± 10%)

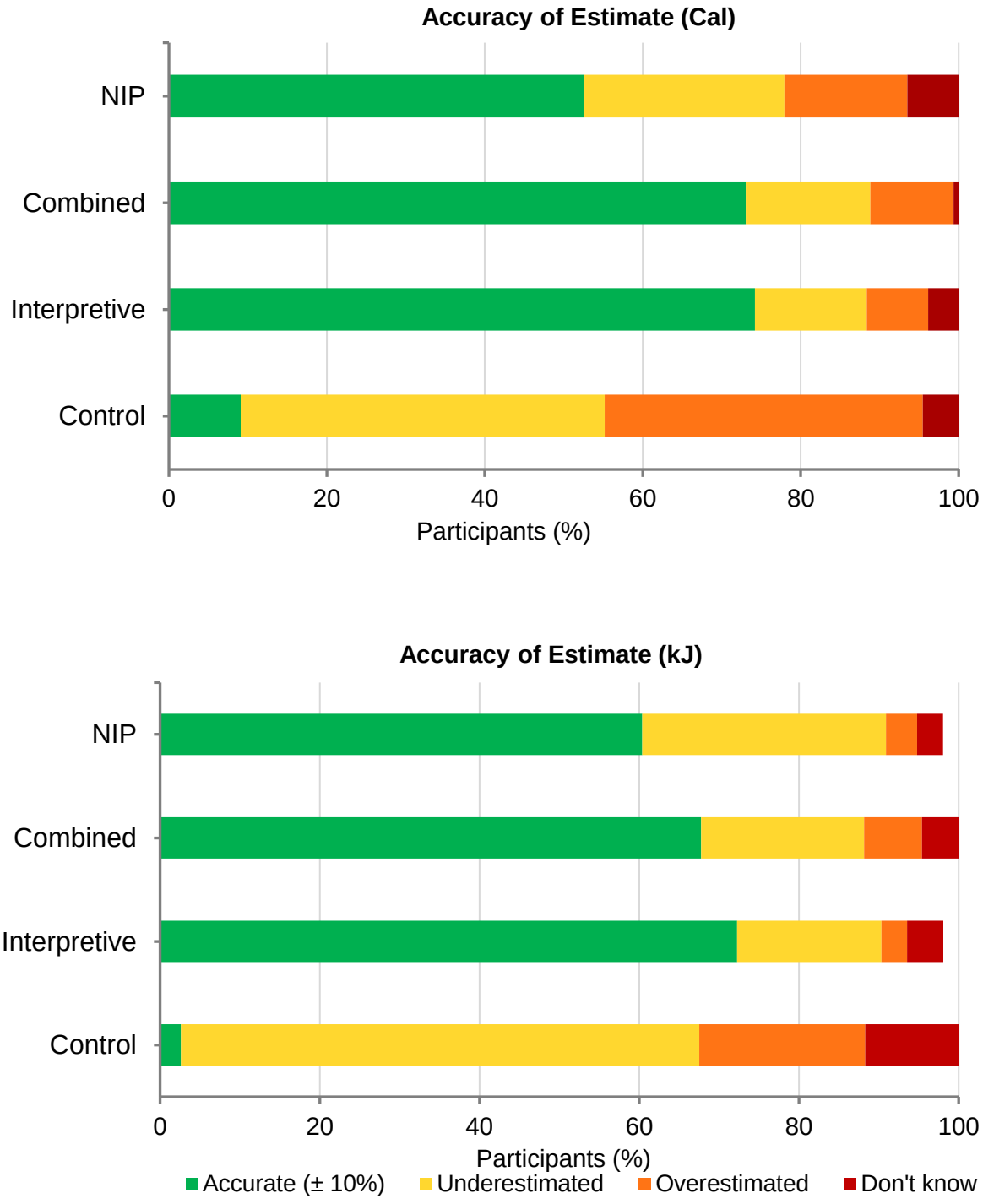
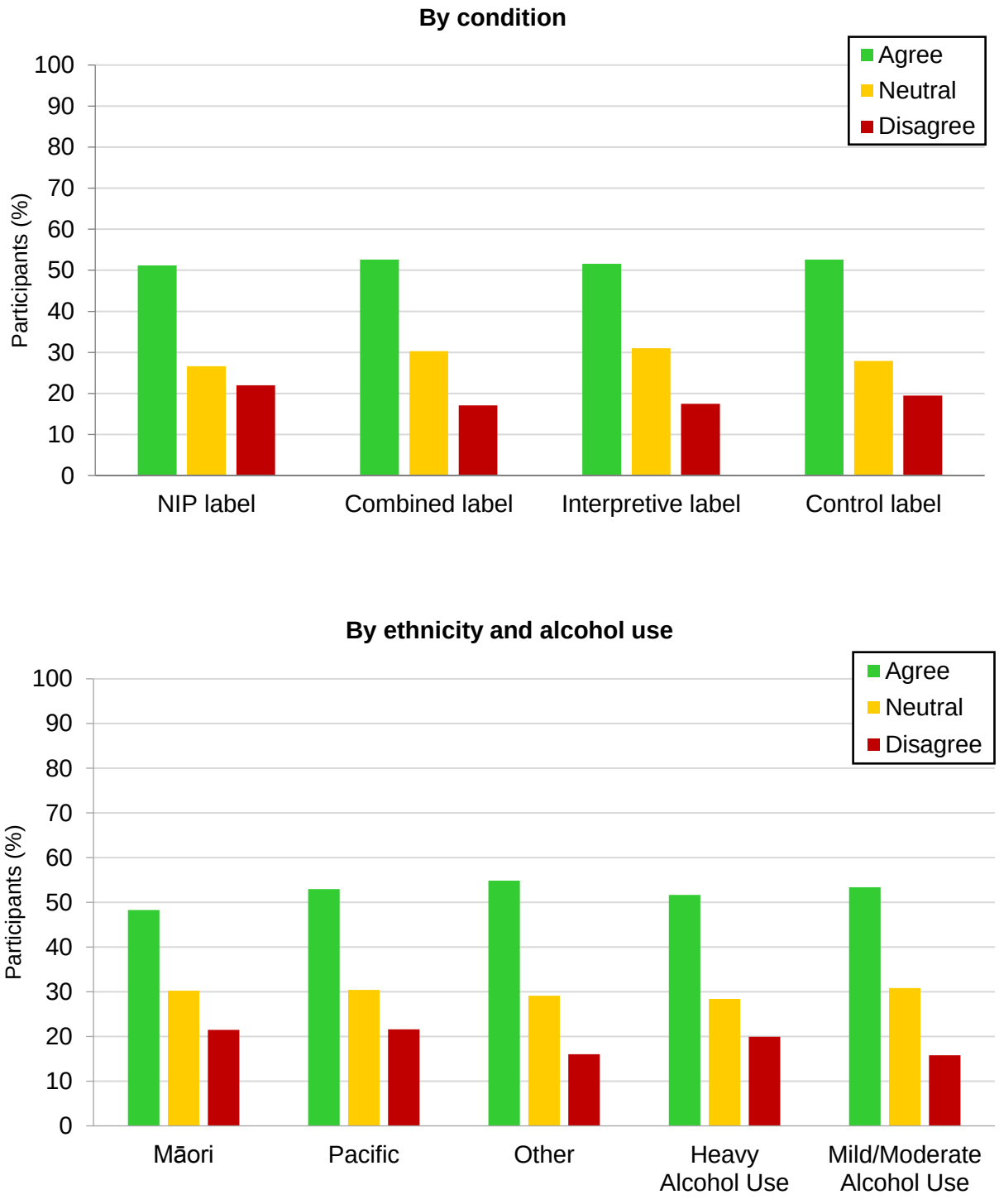


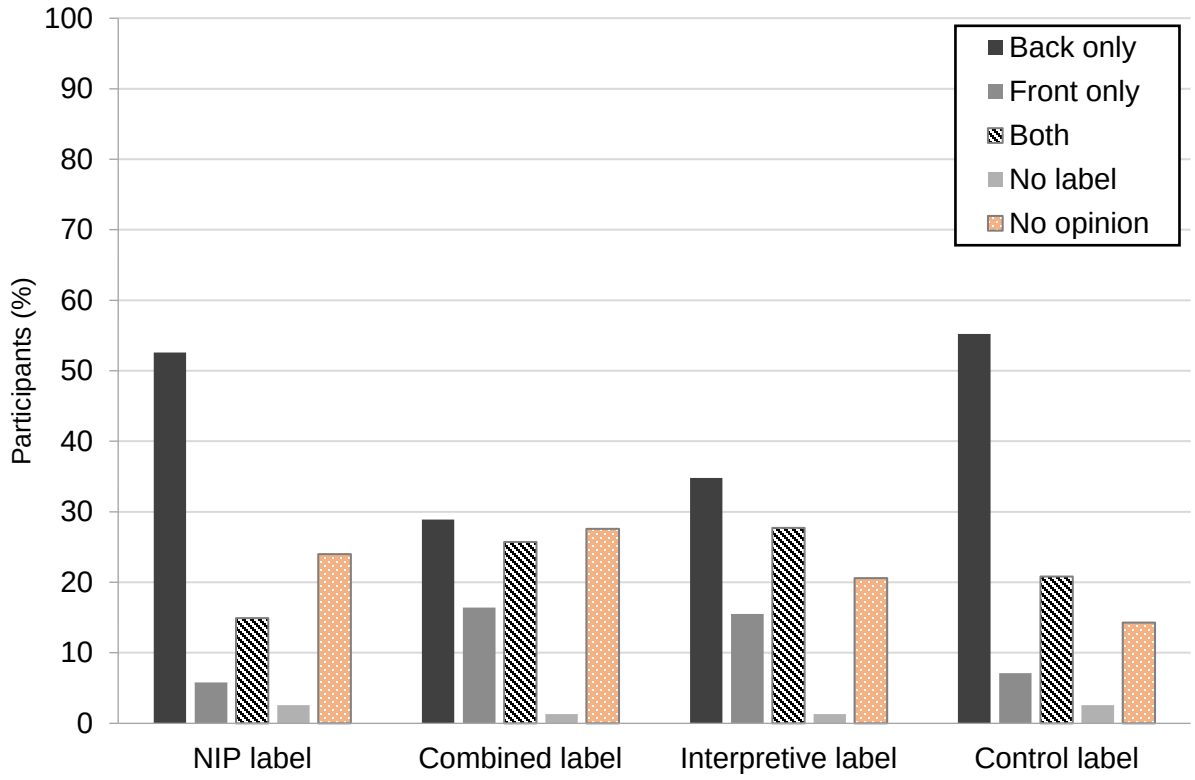
Figure 5: Support for the statement "Alcoholic drinks should provide energy (calorie/kilojoule) content information on labels"



PREFERRED PLACEMENT OF ENERGY INFORMATION

Across all four labelling options, the back of the bottle was the single most preferred place for a label. For both the NIP and the control label conditions, just over half of participants indicated that energy labelling would be best placed on the back of the bottle (53% and 55% respectively), compared to 30% who viewed the combined label condition and 35% who viewed the interpretive label (Figure 5). Support for front-only labelling was highest in those allocated to the combined label and interpretive label conditions (16% in both conditions, compared to 6% for those in the NIP condition and 7% in the control condition, Figure 6). Support for labelling both the front and back of a bottle was also highest in those allocated to view the combined and interpretive label conditions (26% and 28% respectively, compared to 15% for those viewing the NIP condition and 21% in the control condition, Figure 6).

Figure 6: Preferred placement of energy labels on alcoholic beverages



DISCUSSION

This study is one of the largest randomised trials to quantitatively assess the effect of energy labelling on likely purchase and consumption of alcoholic beverages, and the first to investigate effects by ethnicity and level of alcohol use. The trial includes a broadly representative population sample in terms of age, education, income, and geographic spread. In contrast, previous studies have predominately been conducted with university students/staff and are, therefore, not representative of the general population. For this study, we deliberately over-sampled Maori and Pacific people in order to have sufficient power for analyses based on ethnicity.

We found that none of the tested energy labels *decreased* the likely purchase or consumption of alcoholic beverages relative to the control label of no energy content information, and this finding did not differ by ethnicity or alcohol use. However, the NIP energy label significantly *increased* the likely purchase of alcoholic beverages. Furthermore, the NIP and interpretive label conditions significantly *increased* the likely purchase of alcoholic beverage by Māori participants. Participants considered the alcoholic beverages with the NIP or the interpretive energy label as more expensive than the control label which had no energy content information. This may have had the effect of making these beverages more desirable and, therefore, increasing likely purchase of these products by some groups.

The energy labels also had no impact on the perceived energy content of alcoholic beverages, although they did increase participants' confidence in, and accuracy of, estimated energy content. Approximately half of all participants agreed that energy labels should be placed on alcoholic beverages. The preferred placement of the label, across all conditions, was on the back of the bottle. Support for front-of-bottle (alone or in combination with back-of-bottle) labelling was higher among participants who viewed the combined and interpretive label conditions compared to the NIP and control label (although back-of-bottle was still the most preferred). This suggests that exposure to front-of-bottle labelling may increase support for these labels.

Findings from this trial confirm results from previous studies on energy labelling of alcoholic beverages, in that, although support for nutritional information on alcoholic beverages is high (Annunziata, Pomaric, Vecchio, & Mariani, 2016; Grunert, 2018; Health Promotion Agency,

2017; Suckling, 2017) nutritional information has no effect on intention to drink (Martinez et al. 2015, Maynard et al. 2018) and some labels can have the unintended consequence of increasing alcohol use in certain populations (Maynard et al. 2018). Previous research has suggested that the inclusion of favourable nutritional information (such as low sugar or fat content) and front-of-pack labelling may produce a 'health halo', in which consumers perceive the product as healthier and are, therefore, more likely to purchase it (Wagner, Howland, & Mann, 2015; Fernan, Schuldt, & Niederdeppe, 2018). A 'health halo' effect is unlikely to explain the observed increase in likely purchase of alcoholic beverage by Māori participants when they viewed the NIP and interpretive label, as we did not observe any differences in the perceived healthiness or unhealthiness of alcoholic beverage presented in the NIP or interpretive label conditions as compared to the control label. One possible explanation for the observed increase in likely alcohol purchase is an increased desirability due to increased price perception of these products.

STUDY LIMITATIONS

Several limitations of this study should be acknowledged. First, findings may not be generalisable to people who are using alcohol at a low to moderate level, given the small number of mild/moderate alcohol users recruited to the study. Second, whilst recruiting participants via a national online survey panel has many advantages (such as low cost, speed of recruitment, and no missing data), panel members are recruited in a 'non-probabilistic' manner (i.e. whilst the sampling frame included people from throughout New Zealand, not everyone in New Zealand had the same chance of being selected). The statistical validity and generalisability of the trial findings may, therefore, be impacted by the 'non-probabilistic' sampling method used. Access to national, 'probability sampling' online panels in New Zealand is not yet possible, although a panel is being established by the COMPASS Research Centre, The University of Auckland. It is, therefore, important to replicate this trial using the new panel when it becomes available.

Finally, we only tested informative labels, i.e. energy content information rather than labels that contained warning messages about energy content. Our earlier qualitative study (Walker et al., 2018) suggested that the energy content in alcohol beverages is not well understood by consumers. As such, it may be difficult for consumers to interpret energy information when it is presented in the absence of the broader health/diet context. Results may have been different if

labels carried explicit messaging about energy content and health. For example, messaging that alcohol is energy dense but low in nutritional value, or links between alcohol consumption and obesity. Blackwell, Drax, Attwood, Munafo, and Maynard (2018) demonstrated that motivation to drink could be impacted by health-based labelling, depending on the framing of the information. Further research is needed to examine the impact of specific labelling policies on purchase and consumption of alcoholic beverages. Given that the energy content of alcoholic beverages is largely based on the alcohol content, it may also be worth examining the impact of energy information on choice between beverages in future research.

CONCLUSION

Although consumers support the addition of energy and nutrition information labels on alcoholic beverages, the efficacy of the tested labels to reduce the likely purchase and consumption of such products has not been established. Importantly, displaying energy information (without context) on alcoholic beverages may in fact have a negative impact by increasing the likelihood of purchase by some people.

Future research to reduce alcohol-related harm should, therefore, focus on: 1) identifying new types of energy labels that resonate with people; 2) establishing the impact of these labels on choice between alcoholic beverages, not just on purchase or consumption; and 3) determining the impact of other policy options (such as health warnings and guidelines) and label-based marketing used by the alcohol industry (such as nutritional claims and low-alcohol products) on purchase and consumption of alcoholic beverages.

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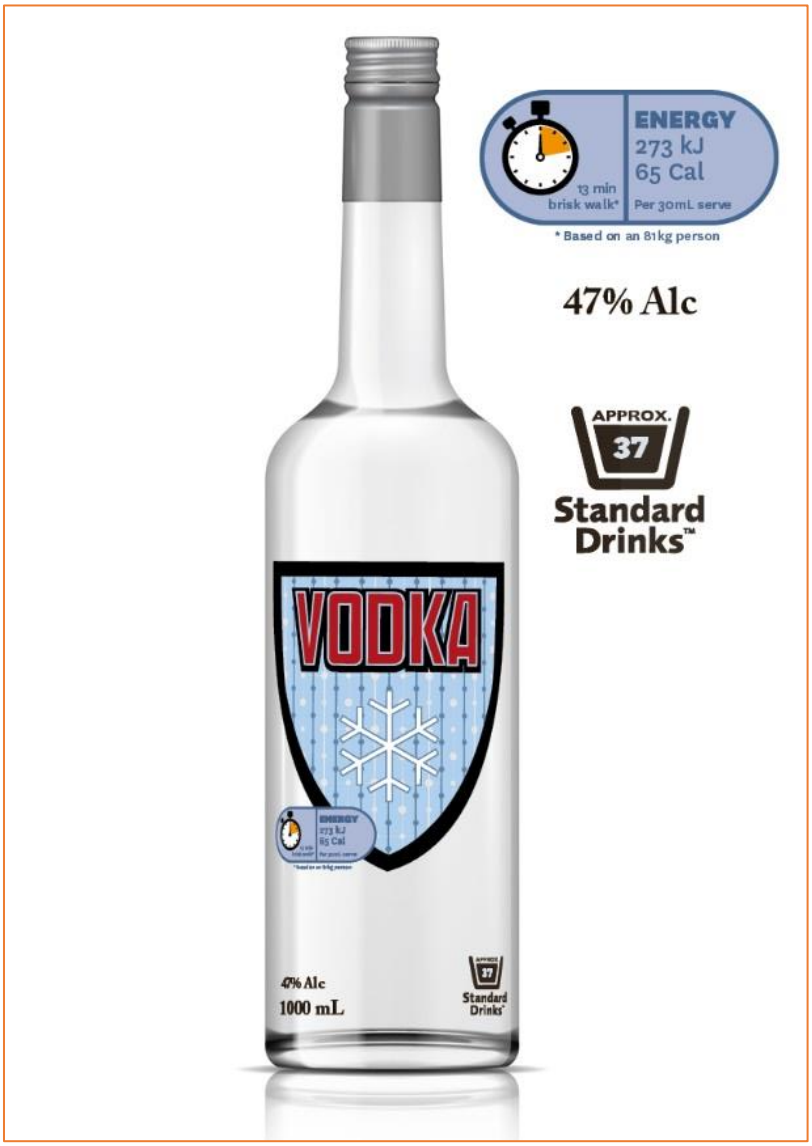
APPENDIX 1: ENERGY LABELS

Condition 1: NIP

Condition 2: Combined label

Condition 3: Interpretive label



Condition 4: Control label

APPENDIX 2: BASELINE AND INTERVENTION QUESTIONNAIRE

BASELINE SURVEY

LABEL Study

Energy Labelling for Alcoholic Drinks in New Zealand: Consumers Perceptions and Impacts on Purchase Behaviour

1: Are you aged 18 years or older?

- Yes
- No

2: Do you live in New Zealand?

- Yes
- No

3: In the last four weeks, have you <u>purchased</u> any alcohol?

- Yes
- No

4: In the last four weeks, have you <u>consumed</u> any alcohol?

- Yes
- No

<u>Part 1: ABOUT YOU</u>

1: Date:

2: What is your date of birth?

_____ (day) _____ month) _____ (year)

3: What is your gender? (please tick one)

- Female
- Male

4: Which of the following groups best describe your ethnicity? (please tick all that apply)

4a New Zealand European
4b. Māori
4c. Samoan
4d. Cook Island Māori
4e. Tongan
4f. Niuean
4g. Tokelauan

4h. Fijian
4i. Chinese
4j. Indian
4k. Other (please specify):_____

5: What is your highest completed educational qualification? (please tick one)

- Secondary school qualification
- Undergraduate qualification
- Postgraduate qualification
- Trade qualification
- Other (please specify):_____

6: How many people usually live in your household (including yourself)?

_____ people

7: Are there children aged under 18 who usually live in your household?

- Yes
- No

8: What is your combined household income per annum (e.g. from all those sharing a household)? (please tick one)

- Less than $20,000
- $20,001–$40,000
- $40,001 -$60,000
- $60,001–$80,000
- $80,001–$100,000
- $100,001 or more
- Don't know
- Prefer not to say

<u>Region:</u> Which of the following regions best describes where you live?

- Northland
- Auckland
- Waikato
- Bay of Plenty
- Poverty Bay/East Coast
- Hawke's Bay
- Taranaki
- Manawatu/Whanganui
- Wairarapa
- Wellington
- Nelson
- Marlborough
- West Coast
- Canterbury
- Otago
- Southland

PART 2: ABOUT YOUR CURRENT ALCOHOL USE

9: How often do you have a drink containing alcohol?

- ☐ Monthly or less
- ☐ 2-4 times a month
- ☐ 2-3 times a week
- ☐ 4 or more times a week

10: How many drinks containing alcohol do you have on a typical day on a typical day when you are drinking?

- ☐ 1 or 2
- ☐ 3 or 4
- ☐ 5 or 6
- ☐ 7 to 9
- ☐ 10 or more

11: How often do you have six or more drinks on one occasion?

- ☐ Never
- ☐ Less than monthly
- ☐ Monthly
- ☐ Weekly
- ☐ Daily or almost daily

12: Attitudes towards drinking: Social

12a: Drinking helps me feel at ease

12b: I drink to ease relations with the opposite sex

12c: I drink to be more talkative

12d: I drink to feel more self-confident

12e: Drinking alcohol helps me overcome my shyness

13: Attitudes towards drinking: Unease

13a. I drink alcohol when I need to relax

13b: I drink alcohol to deal with feelings of despair

13c I sometimes drink when I am angry

13d: I drink alcohol to escape from everyday problems

13e: I drink when I'm sad

14: Attitudes towards drinking: Economic

14a: When alcohol is free it's 'stupid not to take advantage'

14b: I consume less when I have to pay for every drink

14c: Never turn down a free drink

14d: When I am offered a free drink I accept even if I don't feel like it

14e: When I am offered several free drinks in one evening I drink more than usual

PART 3: ABOUT PURCHASING ALCOHOLIC BEVERAGES

15: In the last four weeks, how often have you yourself bought alcoholic drinks (these include purchases from supermarkets or liquor stores, as well as those you bought in a bar or restaurant)?

- Never (Go to question 20)
- Once a month
- 2-3 times a week
- 4 or more times a week

16: How much did you spend on alcohol in the last four weeks?

$_____

17: Which types of alcoholic drinks did you buy? (please tick all that apply)

- Wine
- Beer
- Cider
- Spirits and liquors
- Ready-to-drink spirits (RTDs) or premixed cocktails
- Other (please specify):_____

18: How many people did you buy alcohol for?

- Only for myself
- Only for others
- For myself and others

18a. If buying for others, how many of those people live in your household?____

19: In the last four weeks, where did you purchased your alcohol from (please tick all that apply):

- Supermarket
- Dairy/convenience store
- Hotel
- Bottle store
- Bar/Nightclub
- Restaurant/Café
- Liquor store
- A vineyard
- Speciality store
- Sports club
- RSA/Workingman's/Cosmopolitan Club

- □ Duty Free
- □ Boutique brewery
- □ Online
- □ Mail order
- □ Anywhere else (please specify):_____

PART 4: USE, UNDERSTANDING AND PERCEPTION OF FOOD AND NON-ALCOHOLIC BEVERAGE LABELS

20: In the last four weeks, have you read the following information on packaged food labels at any time?

	Always	Often	Occasionally	Rarely	Never
20a: Name of food	□	□	□	□	□
20b: Nutrition content claims (e.g. 'low fat', 'sugar-free')	□	□	□	□	□
20c: Nutrition information panel	□	□	□	□	□
20d: Energy content information (e.g. kilojoules/kJ)	□	□	□	□	□
20e: Allergen information (e.g. 'nut free')	□	□	□	□	□
20f: Information on ingredients (e.g. ingredient list)	□	□	□	□	□
20g: Ethical information (e.g. animal welfare, fair trade)	□	□	□	□	□
20h: Other (please specify): _____	□	□	□	□	□

21: Do you think food labels are:

- □ Very important
- □ Important
- □ Not important, neither unimportant
- □ Unimportant
- □ Don't know

22: Do you think nutrition information on food labels is:

- □ Very easy to understand
- □ Quite easy to understand
- □ Neither easy nor difficult to understand
- □ Quite difficult to understand
- □ Very difficult to understand
- □ Don't know

23: Do you think nutrition information on food labels is:

- Very useful
- Quite useful
- Neither useful nor useless
- Quite useless
- Very useless
- Don't know

INTERVENTION SURVEY

Q1intro: **Choose your favourite/preferred type of alcoholic beverage.**

1. Wine 2. Beer 3. Spirit

Please take a look at the image of this alcoholic drink. Depending on the version of the survey you are completing, this image may look familiar or it may look different from what you are used to seeing in shops. The questions below relate to this image.

1: Imagine you are buying this alcoholic drinks from a supermarket or liquor store. If this was one of the drinks available, how likely or unlikely would you be to *buy* it?

- Certain, practically certain (99 in 100 chance)
- Almost sure (9 in 10 chance)
- Very probable (8 in 10 chance)
- Probable (7 in 10 chance)
- Good possibility (6 in 10 chance)
- Fairly good possibility (5 in 10 chance)
- Fair possibility (4 in 10 chance)
- Some possibility (3 in 10 chance)
- Slight possibility (2 in 10 chance)
- Very slight possibility (1 in 10 chance)
- No chance, almost no chance (1 in 100 chance)

2: How *many* of these alcoholic drinks would you buy from a supermarket or liquor store each week?

_____bottles

3: How likely or unlikely would you be to *consume* this alcoholic drink?

- Certain, practically certain (99 in 100 chance)
- Almost sure (9 in 10 chance)
- Very probable (8 in 10 chance)
- Probable (7 in 10 chance)
- Good possibility (6 in 10 chance)
- Fairly good possibility (5 in 10 chance)
- Fair possibility (4 in 10 chance)
- Some possibility (3 in 10 chance)
- Slight possibility (2 in 10 chance)
- Very slight possibility (1 in 10 chance)
- No chance, almost no chance (1 in 100 chance)

4: On a scale ranging from 1 (not confident at all) to 7 (very confident), how confident are you that you can estimate the energy (kilojoule (kJ)/calorie) content of the displayed alcoholic drink?

- (1) Not confident at all
- (2)
- (3)
- (4)
- (5)
- (6)
- (7) Very confident
- Don't know

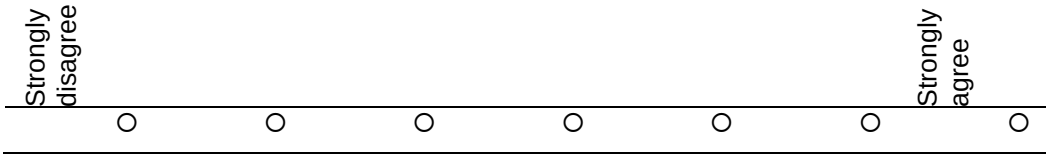
5: On a scale ranging from 1 (not very much) to 7 (a lot), do you think this energy (kilojoule (kJ)/calorie) content is:

- (1) Not very much
- (2)
- (3)
- (4)
- (5)
- (6)
- (7) A lot
- Don't know

6: What is the energy (kilojoules (kJ) or calories) content per serve for this drink?

- _____ kJ
- _____ Cal

7: How much do you agree or disagree that alcoholic drinks should provide energy (kilojoule (kJ)/calorie) content information on labels?



8: Where should information about the energy (kilojoule (kJ)/calorie) content of alcoholic drinks be best placed?

- Only on the back of the alcohol product
- Only on the front of the alcohol product
- Both on the front and back of the alcohol product
- No label
- I don't have an opinion / don't care

9. Do you think the displayed product is:

	(1)						(7)	
9a: Cheap								Expensive
9b: Attractive								Unattractive
9c: Tastes good								Tastes bad
9d: High quality								Low quality
9e: Cool								Uncool
9f: Healthy								Unhealthy

Thank you for participating in this study.

APPENDIX 3: SUBGROUP ANALYSIS

Table 4. **Estimated effect of nutrition and energy labels on likelihood to purchase and consume the displayed product, compared to the control (standard alcohol labelling), by ethnicity and baseline level of alcohol use**

	Control (N=154)	NIP (N=154) vs. control			Combined label (N=152) vs. control			Interpretive label (N=155) vs. control		
	Mean (SD)	Mean (SD)	Adjusted mean difference (CI)	*p*	Mean (SD)	Adjusted mean difference (CI)	*p*	Mean (SD)	Adjusted mean difference (CI)	*p*
Likelihood of purchase	**4.77 (3.09)**	**5.56 (2.95)**	**0.86 (0.04, 1.68)**	**0.04***	**5.05 (3.01)**	**0.27 (-0.55, 1.10)**	**0.78**	**5.43 (3.27)**	**0.68 (-0.14, 1.50)**	**0.13**
Māori	4.14 (3.31)	5.78 (2.82)	1.94 (0.44, 3.43)	<0.01*	5.24 (3.23)	1.13 (-0.35, 2.61)	0.18	5.65 (3.65)	1.53 (0.07, 2.99)	0.04*
Pacific	5.02 (3.07)	5.50 (3.12)	0.53 (-0.85, 1.90)	0.69	5.16 (2.93)	0.17 (-1.25, 1.59)	0.98	5.54 (3.03)	0.53 (-0.86, 1.91)	0.70
Other	5.15 (2.84)	5.39 (2.94)	0.34 (-0.98, 1.66)	0.88	4.77 (2.88)	-0.31 (-1.62, 1.00)	0.90	5.08 (3.12)	-0.06 (-1.37, 1.25)	1.00
Heavy[@]	4.96 (3.01)	5.53 (2.93)	0.63 (-0.29, 1.55)	0.26	5.14 (3.02)	0.14 (-0.78, 1.07)	0.97	5.42 (3.38)	0.52 (-0.41, 1.44)	0.41
Mild/Mod[@^]	4.09 (3.34)	5.67 (3.06)	1.65 (-0.09, 3.39)	0.07	4.72 (2.95)	0.62 (-1.12, 2.37)	0.74	5.46 (2.88)	1.47 (-0.25, 3.19)	0.11
Likelihood of consumption	**5.44 (3.25)**	**5.96 (3.18)**	**0.63 (-0.23, 1.49)**	**0.20**	**5.53 (3.23)**	**0.12 (-0.74, 0.98)**	**0.98**	**5.56 (5.56)**	**0.30 (-0.55, 1.15)**	**0.74**

Māori	5.06 (3.33)	6.22 (2.96)	1.42 (-0.12,2.96)	0.08	5.18 (3.52)	0.20 (-1.32,1.71)	0.98	5.83 (3.56)	0.78 (-0.72, 2.28)	0.47
Pacific	5.96 (3.30)	6.29 (3.25)	0.41 (-1.02, 1.84)	0.84	5.69 (3.12)	-0.24 (-1.71, 1.23)	0.96	5.54 (3.25)	-0.37 (-1.81, 1.06)	0.87
Other	5.29 (3.13)	5.37 (3.42)	0.25 (-1.18, 1.68)	0.96	5.73 (3.07)	0.54 (-0.89, 1.97)	0.70	5.67 (3.38)	0.45 (-0.97, 1.88)	0.80
Heavy[@]	5.77 (3.21)	6.29 (3.00)	0.61 (-0.35, 1.57)	0.31	5.78 (3.17)	0.00 (-0.96, 0.97)	1.0	5.81 (3.53)	0.12 (-0.85, 1.08)	0.99
Mild/Mod[@^]	4.21 (3.15)	4.76 (3.57)	0.56 (-1.25, 2.38)	0.81	4.59 (3.34)	0.32 (-1.50, 2.14)	0.96	5.23 (2.81)	1.13 (-0.66, 2.92)	0.32

[@] Baseline alcohol use; ^Small cell-size (*n*=32-35); Refer to baseline table for n. Note. Mean difference is the model-adjusted mean difference controlling for participants' age, gender, ethnicity, alcohol use and alcohol type, with adjustments for Dunnet multiple comparisons. CI indicates the 95% confidence interval. * Indicates the *p*-value is significant ($p<0.05$). Other = non-Māori/non-Pacific

APPENDIX 4: NUMBER OF DRINKS PURCHASED

Table5. **Estimated effect of nutrition and energy labels on likely number of drinks purchased of displayed product as compared to the control (standard alcohol labelling), by ethnicity and baseline level of alcohol use**

Likely number of drinks purchased	Control (N=154)	NIP (N=154) vs. control			Combined label (N=152) vs. control			Interpretive label (N=155) vs. control		
	Median (Range)	Mean (SD)	Rate Ratio (CI)	*P*	Mean (SD)	Rate Ratio (CI)	*P*	Mean (SD)	Rate Ratio (CI)	*P*
Total	**1 (0, 50)**	**1 (0, 60)**	**1.09 (0.83, 1.44)**	**0.80**	**1 (0, 24)**	**0.86 (0.64, 1.14)**	**0.44**	**1 (0, 48)**	**0.99 (0.75, 1.32)**	**>0.99**
Māori	1 (0, 30)	2 (0, 40)	0.98 (0.63, 1.52)	>0.99	1 (0, 24)	0.74 (0.46, 1.19)	0.31	1 (0, 48)	1.01 (0.66,1.54)	>0.99
Pacific	1 (0, 50)	1 (0, 30)	1.02 (0.62, 1.69)	>0.99	1 (0, 24)	0.69 (0.41, 1.17)	0.24	1 (0, 12)	0.66 (0.40, 1.10)	0.14
Other	1 (0, 20)	1 (0, 60)	1.30 (0.78,2.16)	0.48	1 (0, 24)	1.18 (0.72, 1.95)	0.76	1 (0, 36)	1.43 (0.87, 2.34)	0.21
Heavy[@]	2 (0, 50)	1 (0, 60)	1.03 (0.76, 1.41)	0.99	1 (0, 24)	0.84 (0.61, 1.16)	0.46	1 (0, 48)	0.91 (0.67, 1.25)	0.84
Mild/Mod[@^]	1 (0, 12)	1 (0, 12)	1.60 (0.89, 2.89)	0.15	1 (0, 6)	0.94 (0.49, 1.78)	0.99	1 (0, 12)	1.74 (0.97, 3.10)	0.07

[@] Baseline alcohol use; ^Small cell-size (*n*=32-35); See baseline table for subgroup numbers. Other = non-Māori/non-Pacific

Note. CI indicates the 95% Confidence Interval. SD = Standard Deviation * Indicates the *p*-value is significant ($p<0.05$)
Due to the skewed distribution, the median and range is reported rather than mean and standard deviation.