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Article

# Testing the Efficacy of Alcohol Labels with Standard Drink Information and National Drinking Guidelines on Consumers' Ability to Estimate Alcohol Consumption

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## Abstract

**Aims:** Despite the introduction of national drinking guidelines in Canada, there is limited public knowledge of them and low understanding of 'standard drinks (SDs)' which limits the likelihood of guidelines affecting drinking behaviour. This study tests the efficacy of alcohol labels with SD information and Canada's Low-Risk Drinking Guidelines (LRDGs) as compared to %ABV labels on consumers' ability to estimate alcohol intake. It also examines the label size and format that best supports adults' ability to make informed drinking choices.

**Methods:** This research consisted of a between-groups experiment ( $n = 2016$ ) in which participants each viewed one of six labels. Using an online survey, participants viewed an alcohol label and were asked to estimate: (a) the amount in a SD; (b) the number of SDs in an alcohol container and (c) the number of SDs to consume to reach the recommended daily limit in Canada's LRDG.

**Results:** Results indicated that labels with SD and LRDG information facilitated more accurate estimates of alcohol consumption and awareness of safer drinking limits across different beverage types (12.6% to 58.9% increase in accuracy), and labels were strongly supported among the majority (66.2%) of participants.

**Conclusion:** Labels with SD and LRDG information constitute a more efficacious means of supporting accurate estimates of alcohol consumption than %ABV labels, and provide evidence to inform potential changes to alcohol labelling regulations. Further research testing labels in real-world settings is needed.

**Short summary:** Results indicate that the introduction of enhanced alcohol labels combining standard drink information and national drinking guidelines may be an effective way to improve drinkers' ability to accurately assess alcohol consumption and monitor intake relative to guidelines. Overall support for enhanced labels suggests probable acceptability of introduction at a population level.

## INTRODUCTION

Globally, alcohol is among the top five risk factors for disease and disability, and 5.9% of deaths worldwide can be attributed to harmful use of alcohol (World Health Organization, 2015). Alcohol consumption is causally linked to more than 200 health conditions, most notably liver cirrhosis, cardiovascular disease and eight different forms of cancer (Parry *et al.*, 2011; World Health Organization, 2015). The risk of developing these conditions is positively associated with the volume and frequency of alcohol consumed (Rehm *et al.*, 2010). In Canada, alcohol consumption increased by 13% since 1996, and now 78% of Canadian adults drink alcohol, with 39% consuming above recommended levels at least monthly (Statistics Canada, 1997, 2012a, 2013; Thomas, 2012). The high prevalence of alcohol use and ensuing health burden to Canadians supports the need to consider *population-level efforts* to reduce the total volume of alcohol consumed and to promote low-risk alcohol drinking patterns among all Canadians.

To inform drinkers of the negative impacts of alcohol on health and to promote a culture of moderation, the Canadian Centre on Substance Abuse (CCSA) led the development of nationally endorsed low-risk drinking guidelines (LRDGs) in 2011 (Butt *et al.*, 2011). Based on evidence regarding the level of drinking that presents a 'net-zero risk' for adverse health outcomes, these guidelines suggest women drink no more than 10 standard drinks (SDs) per week with no more than 2 SDs most days and men drink no more than 15 SDs per week with no more than 3 SDs most days. At least two non-drinking days per week are also recommended. To consistently communicate doses of alcohol, these guidelines are presented in 'SD' measures, which in Canada is defined as 13.45 grams or 17.05 ml of ethanol and is equivalent to: a 341 ml (12 oz.) can of 5% beer or cooler, a 142 ml (5 oz.) glass of 12% wine, and 43 ml (1.5 oz.) of 40% distilled alcohol (Butt *et al.*, 2011). Although efforts have been made across Canada to disseminate more than 750,000 resources promoting the LRDG, the great majority of Canadians are unaware of the LRDG and have limited understanding of SDs (Statistics Canada, 2012a; Osioy *et al.*, 2015). Having the LRDG on alcohol labels has the potential to be a more effective and direct method of information dissemination, occurring at the point of consumption rather than through more passive approaches such as posters or pamphlets.

The current alcohol label in Canada does not communicate the alcohol content of beverages in a form that is consistent with Canada's LRDG. As explained above, the LRDG are expressed in terms of the number of SDs an adult man and woman can consume at relatively low risk per day and per week, whereas the current alcohol labels in Canada list only %ABV information to communicate alcohol content (Butt *et al.*, 2011). The inconsistency in messaging causes consumer confusion and creates barriers for consumers to comply with the LRDG (Stockwell *et al.*, 1991a, 1991b; Stockwell, 2006; Kerr and Stockwell, 2012; Osioy *et al.*, 2015; Wettlaufer, *accepted*). Results of a recent Canadian study reported that providing SD labels on alcohol containers enabled more accurate estimates of alcohol intake compared with %ABV labels (Osioy *et al.*, 2015). The study also found that after completing the alcohol estimation tasks, 83% of participants preferred SD labels over %ABV labels and 68% indicated the SD labels would help them to better comply with Canada's LRDG.

To support consumers in monitoring their alcohol consumption relative to national drinking guidelines, SD labelling was implemented in Australia in 1995 and New Zealand in 1998 (Stockwell, 2006). The UK has introduced voluntary guidelines for alcohol labels

including the number of SDs per container and the national drinking guidelines (Farke, 2010). Although no evaluations of the UK, Australian and New Zealand labels in real-world settings have been published, experimental evidence from Australia and Canada indicate listing SD information on alcohol labels supports more accurate estimates of alcohol intake as compared to %ABV, especially among younger adults (Stockwell *et al.*, 1991a, 1991b; Osioy *et al.*, 2015). To our knowledge, no published studies have been conducted to examine alcohol labels containing both SD information and national drinking guidelines.

Given the limited research on the effectiveness and acceptability of alternative alcohol labels among drinkers, the primary aim of this study was to experimentally test the efficacy of modified alcohol labels including SD information and national LRDG on adults' ability to estimate alcohol intake. This study also examines the label format and size that best support adults' ability to make informed drinking choices. A more in-depth qualitative exploration of consumer input on content, design and acceptability of enhanced health messaging on alcohol labels can be found in the companion paper by Vallance *et al.* (submitted).

## METHODS

### Sample and recruitment

Data were collected using an online survey over a 3-week period in May 2014. Participants were recruited via email from a consumer panel through the marketing research company, Nielsen ([www.nielsen.com/ca/en.html](http://www.nielsen.com/ca/en.html)), and were provided with limited information about the purpose of the study. The consumer panel included adults residing in Ontario, Canada who were recruited through internet-based advertisements, email, and other methods to participate in online surveys. Study participants included adults aged 19 to 75 who reported drinking at least one alcoholic beverage in the past 12 months; 19 is the legal drinking age in Ontario. Sample targets for this study were created based on Census 2011 information for the province of Ontario for age (median 40.4 years) and gender (51% female) to reflect the adult population in Ontario (Statistics Canada, 2011). These proportions were used to target invitations and monitor accrual in an effort to maintain demographic diversity. Participants were compensated with reward points equivalent to \$3 from the survey firm in appreciation of their participation. Surveys were offered in English only, and participant consent was obtained. The study was reviewed by and received ethics clearance from the Research Ethics Board at Public Health Ontario.

### Study design

A between-groups experimental design was used to test the efficacy of modified formats of alcohol labels on adults' ability to make more informed drinking choices with SD information and national LRDG compared to the current alcohol label in Canada listing %ABV. Participants were randomly assigned to view alcohol containers displaying a label systematically altered according to one of six treatment conditions (Fig. 1). The treatment conditions were based on a 2 × 3 factorial design (Cody and Smith, 1997). Current alcohol label regulations in Canada, including %ABV (control—condition #1) were compared to five alternative labelling formats (treatment conditions) containing labels with the daily and weekly limits recommended in Canada's LRDG for men and women displayed as either a pictogram (condition #2) or in a chart (condition #3), labels listing the



SD: Standard Drinks, LRDG: Low-Risk Drinking Guidelines

Fig. 1. Sample images of label conditions as viewed by study participants: wine.

number of SD per container (condition #4), and both SD information and the LRDG displayed as either a pictogram (condition #5) or in a chart (condition #6). Design of the content and format elements of the labels tested in this study were informed by mandatory SD labels used in Australia and New Zealand, voluntary SD labels with LRDG messages used in the UK, and alcohol control messaging published by non-government organizations in Canada and the US (Farke, 2010; Canadian Centre on Substance Abuse, 2011; New Zealand Health Promotion Agency). Each of the experimental label conditions were stratified to include a small and large version of the label (50% vs 100% of label on back of container) to test the impact of label size given that larger labels have been shown to be more efficacious for health warnings on tobacco packages (Hammond, 2011; Hammond *et al.*, 2013).

### Protocol

Participants were randomly assigned to view one of the six labelling conditions. For each label condition, participants viewed three images of an alcohol container: (a) the full container, (b) a close up view of the front label on the alcohol container and (c) a close up view of the back label on the alcohol container. Participants viewed the three images of a particular label condition on a single screen for as long as they wished, with the three outcome questions presented directly below the images. Socio-demographic, drinking behaviour and consumer opinion survey items were asked separately. Container images

used a brand unfamiliar to Canadian drinkers to account for brand preferences. The same protocol was completed for a wine bottle, a spirits bottle, and a 'tallboy' can of beer. A 'tallboy' can of beer (i.e. 473 ml) was included in this study instead of a regular size can of beer (i.e. 341 ml) to test the efficacy of labels on irregular size containers as a regular container of 5% ABV beer is, by definition, exactly one SD. Participants each viewed the one labelling condition they were assigned to and asked to answer the three outcome questions for each of the three alcohol beverage types, wine, spirits and beer.

### Measures

#### Socio-demographics and drinking behaviour

Socio-demographics included age, gender, ethnicity, education level, employment status, and annual household income. Consistent with measures used in the Canadian Community Health Survey (CCHS), drinking behaviours were assessed by asking about the number of alcoholic drinks participants consumed on each of the seven days prior to the survey day (Statistics Canada, 2012b). These amounts were used to determine if participants usually exceeded daily and weekly limits recommended in Canada's LRDG (Butt *et al.*, 2011).

#### Consumer opinions

After presentation of the label conditions, participants were asked about their opinions on labels listing SD information and the LRDG. To assess their opinion on labels including SD information, participants

were asked 'Do you think cans and bottles of alcoholic drinks should be labelled with the number of SDs they contain?' and shown an image of a SD label on a wine bottle. Those who responded 'support labelling' or 'strongly support labelling' were categorized as supporting and those who responded 'unsure', 'oppose labelling' or 'strongly oppose labelling' were categorized as not supporting SD labelling. Similarly, participants were asked, 'To what extent, if at all, would labels with LRDGs on alcohol containers make you think about the number of drinks you consume?' and shown an image of a wine bottle displaying a label with the LRDG. Those who responded 'very much' or 'somewhat' were categorized as supporting LRDG labels and those who responded 'neutral', 'not much' or 'not at all' were categorized as not supporting LRDG labels.

### Outcome variables

The three primary outcomes used open-ended questions to assess participants' ability to: (a) estimate the amount of alcohol in a SD (e.g. for wine: 'If you were drinking this bottle of wine, how many ounces or millilitres of wine are in a "SD"?'), (b) estimate the number of SDs in an alcohol container (e.g. 'How many SDs are in this bottle of wine?') and (c) estimate the number of SDs to consume before reaching the recommended daily limit in Canada's LRDG for men and women (e.g. 'If you were drinking this bottle of wine, how many 5 oz glasses would you need to consume to reach the daily limit in Canada's LRDGs?'). All three outcomes were assessed for wine, spirits, and a tallboy can of beer to determine which label elements were most efficacious for supporting adults' ability to make informed drinking choices compared to the %ABV label.

### Statistical analysis

All analyses were conducted using SAS v. 9.3 software (SAS Institute, Inc., Cary, NC). Chi-square tests ( $\chi^2$  test) comparing socio-demographic characteristics and alcohol consumption patterns across the six label conditions were used to assess the success of randomization. Separate modified Poisson regression models were then used to examine the effect of label content, format, and size on correct responses within 10% absolute error. To test label content and format, the three outcomes were first assessed to identify if there were significant differences between the five enhanced label conditions and the current %ABV label condition (control). Pairwise differences in correct responses were then evaluated across all six label conditions using Tukey's posthoc adjustment. Finally, additional models were run for each of the three outcomes to identify if there were significant differences in outcomes related to label size between the small and large labels within each of the five treatment label conditions. All models were adjusted for age, gender, ethnicity, education, income and drinking frequency.

## RESULTS

Table 1 presents sample characteristics for the 2016 participants, which included 969 (48.1%) male participants. On average, males and females drank 1.4 (SD =  $\pm 1.4$ ) and 1.0 (SD =  $\pm 1.2$ ) drinks per day, and nearly 34.6% of males and 29.2% of females exceeded the daily, weekly or days-off limits recommended in Canada's LRDG, respectively. There were no significant differences with respect to socio-demographic or drinking-related characteristics across label conditions, indicating successful randomization (data not shown).

Table 1 also presents the proportion of participants who support listing SD information on alcohol labels (males = 59.7%,

**Table 1.** Characteristics of study participants

	Male ( <i>n</i> = 969) % ( <i>n</i> )	Female ( <i>n</i> = 1047) % ( <i>n</i> )
Mean age (standard deviation)	47.0 (14.9)	47.3 (14.4)
Education level		
No college/university degree	23.7 (230)	27.1 (284)
College/university or higher	76.3 (739)	72.9 (763)
Employment*		
Full-time	62.2 (603)	46.2 (484)
Part-time	9.8 (95)	16.5 (173)
Unemployed	25.9 (251)	36.1 (378)
Household income		
<\$45,000	14.9 (144)	22.1 (231)
\$45,000–\$99,999	40.3 (390)	40.3 (422)
\$100,000+	35.7 (346)	24.6 (257)
Don't know/refused	9.2 (89)	13.1 (137)
Race/ethnicity		
White	80.0 (775)	87.2 (913)
Other	20.0 (194)	12.8 (134)
Drinking frequency past week		
Meeting LRDG guidelines**	39.4 (382)	34.0 (356)
Exceeding any guidelines	34.6 (335)	29.2 (306)
Missing	26.0 (252)	36.8 (385)
Support for SD Labels*		
Not supporting labelling	38.9 (377)	27.1 (284)
Support labelling	59.7 (578)	72.3 (757)
LRDG labels will make them think about the number of drinks consumed*		
Neutral/not much/not at all	48.5 (470)	40.2 (421)
Very much/somewhat	50.9 (493)	59.1 (619)

\*Less than 5% of sample reported 'Don't Know' or 'Refused' and were omitted in this table.

\*\*Canada's LRDGs include: (a) drinking no more than 2 drinks per day for women, and 3 drinks per day for men, (b) drinking no more than 10 drinks in a week for women, and 15 drinks in a week for men and (c) abstaining from drinking at least 2 days a week for men and women.

females = 72.3%, total = 66.2%) as well as the proportion of participants who believe providing Canada's LRDG on alcohol labels will make them think about the number of drinks they consume (males = 50.9%, females = 59.1%, total = 55.2%).

### Estimating alcohol intake

Table 2 presents the percentage who underestimated, overestimated or correctly estimated responses within 10% absolute error for each of the six label conditions tested in the study for wine, beer, and spirits. Overall, 15.8% (beer) to 37.3% (spirits) of participants exposed to the %ABV label in the control condition underestimated the amount of alcohol in a SD, and 27.9% (spirits) to 43.1% (beer) underestimated the number of SDs in the applicable alcohol container. Fewer than 20% of participants exposed to the %ABV label were able to accurately estimate the number of SDs that can be consumed to reach the daily limit in the LRDG for all types of beverages. In general, the percentage of correct responses increased for all three outcomes among participants assigned to labelling conditions with SD information and/or the LRDG.

### Efficacy of alcohol labels

Tables 3–5 present statistically significant relative ratios at  $P < 0.05$  for the efficacy of label conditions as compared to the %ABV label

**Table 2.** Percentage of participants underestimating, overestimating, and correctly estimating outcomes within 10% absolute error for the six label conditions

	Condition #1 (control—%ABV) <i>n</i> = 183			Condition #2 (LRDG, pictogram) <i>n</i> = 367			Condition #3 (LRDG, chart) <i>n</i> = 365		
	% -	% Correct	% +	% -	% Correct	% +	% -	% Correct	% +
<b>Wine</b>									
Amount in a SD	23.1	12.8	64.1	29.8	12.5	57.8	24.6	16.1	59.4
# of SDs in container	35.5	20.2	44.4	32.7	20.4	46.9	34.9	24.0	41.2
# of SDs to reach LRDG	69.4	19.7	10.9	24.0	64.4	11.8	21.9	70.7	7.4
<b>Beer</b>									
Amount in a SD	15.8	22.8	61.4	20.4	17.3	62.5	13.7	22.3	64.1
# of SDs in container	43.1	29.2	27.7	40.4	24.4	35.3	37.7	24.3	38.0
# of SDs to reach LRDG	72.1	14.8	13.1	41.2	18.3	40.6	41.1	17.3	41.7
<b>Spirits</b>									
Amount in a SD	37.3	14.6	48.1	39.7	14.7	45.7	33.2	15.1	51.8
# of SDs in container	27.9	13.5	58.6	33.2	12.9	54.0	37.9	12.5	49.7
# of SDs to reach LRDG	69.4	17.5	13.1	30.0	57.8	12.3	29.6	62.5	8.0
	Condition #4 (SD) <i>n</i> = 364			Condition #5 (LRDG + SD, pictogram) <i>n</i> = 369			Condition #6 (LRDG + SD, chart) <i>n</i> = 368		
	% -	% Correct	% +	% -	% Correct	% +	% -	% Correct	% +
<b>Wine</b>									
Amount in a SD	1.4	84.7	14.0	3.1	79.5	17.5	3.1	77.2	19.7
# of SDs in container	3.4	94.7	2.0	4.8	92.7	2.6	5.3	93.1	1.7
# of SDs to reach LRDG	70.6	14.3	15.1	16.0	72.4	11.7	11.5	78.0	10.7
<b>Beer</b>									
Amount in a SD	3.1	78.4	18.6	5.3	72.8	6.5	4.8	71.6	23.8
# of SDs in container	6.3	91.7	2.1	4.8	88.9	35.1	3.6	90.6	5.9
# of SDs to reach LRDG	76.4	10.7	12.9	20.9	35.5	43.7	18.0	33.4	48.7
<b>Spirits</b>									
Amount in a SD	3.1	80.7	16.2	5.4	77.6	17.1	6.9	73.7	19.5
# of SDs in container	4.9	93.2	2.0	6.7	90.5	2.8	5.1	93.0	2.0
# of SDs to reach LRDG	72.3	14.8	12.9	16.1	73.5	10.6	13.0	76.6	10.4

-, underestimation; +, overestimation.

in the control condition in modified Poisson regression models, adjusting for age, sex, ethnicity, education, income and drinking frequency for wine, beer and spirits.

As shown in Table 3 (wine) and Table 5 (spirits), participants assigned to label conditions with SD information only (Condition #4) or both SD information plus the LRDG (Conditions #5 and #6) were significantly more likely to correctly estimate the amount of alcohol in a SD and the number of SDs in a container compared with the control label (current %ABV label used in Canada). Participants assigned to label conditions with the LRDG only (Conditions #2 and #3) or both the SD information plus the LRDG (Conditions #5 and #6) were significantly more likely to correctly estimate the number of drinks that can be consumed before reaching the LRDG than those who viewed the control label. For beer (Table 4), participants assigned to label conditions with SD information only (Condition #4) or both SD information plus the LRDG (Conditions #5 and #6) were significantly more likely to correctly estimate the amount of alcohol in a SD and the number of SDs in a container compared with the control label. Participants assigned to label conditions with both the SD information plus the LRDG (Conditions #5 and #6) were significantly more likely to correctly estimate the number of drinks that can be consumed before reaching the LRDG than those who viewed the control label.







Pairwise comparisons of correct responses between label conditions were also tested to further examine label content, format, and

size (Table 3–5). For label content on wine, beer, and spirits containers, inspection of adjusted differences in correct responses by condition show participants exposed to the labels with both SD information and the LRDG with a pictogram (Condition #5) or in a chart (Condition #6) were significantly more likely to correctly estimate all three of the primary outcomes (Table 3–5). In the comparison tests of correct responses between small and large labels within each of the five experimental conditions, results (not shown) indicate participants exposed to larger labels with both SD information and the LRDG (Conditions #5 and Conditions #6) were significantly more likely to correctly respond to all three primary outcomes compared to those exposed to the smaller labels. Significant differences in label size were not detected within the other experimental label conditions. Lastly, the format for presenting the LRDG on the labels (i.e. chart or a pictogram) did not significantly affect participants' ability to estimate the three primary outcomes for wine, beer, and spirits.

## DISCUSSION

To our knowledge, this is the first research in Canada and one of the few internationally to examine the efficacy and consumer acceptability of alcohol labels displaying SD information and national drinking guidelines as compared to labels displaying %ABV only. Overall, the results demonstrate that providing labels which include

**Table 3.** Relative ratios for the efficacy of content and format for experimental conditions compared to the control condition: wine

	RR [95% CI]		
	Condition #1 (control—%ABV) <i>n</i> = 183	Condition #2 (LRDG, pictogram) <i>n</i> = 367	Condition #3 (LRDG, chart) <i>n</i> = 365
Current %ABV label used in Canada			
			
Outcome 1: Amount in a SD	REF <sup>a</sup>	0.9 <sup>a</sup> [0.53–1.49]	1.1 <sup>a</sup> [0.67–1.81]
O2: # of SD in container	REF <sup>a</sup>	1.0 <sup>a</sup> [0.65–1.58]	1.1 <sup>a</sup> [0.73–1.73]
O3: # of drinks to reach LRDG	REF <sup>a</sup>	3.2 <sup>*b</sup> [2.39–4.36]	3.6 <sup>*bc</sup> [2.69–4.87]
	Condition #4 (SD) <i>n</i> = 364	Condition #5 (LRDG + SD, pictogram) <i>n</i> = 369	Condition #6 (LRDG + SD, chart) <i>n</i> = 368
			
O1: Amount in a SD	7.6 <sup>*b</sup> [5.04–11.55]	7.0 <sup>*b</sup> [4.61–10.60]	6.8 <sup>*b</sup> [4.51–10.38]
O2: # of SD in container	6.8 <sup>*b</sup> [4.69–9.72]	6.4 <sup>*b</sup> [4.47–9.28]	6.7 <sup>*b</sup> [4.64–9.61]
O3: # of drinks to reach LRDG	0.7 <sup>a</sup> [0.50–1.07]	3.7 <sup>*b,c</sup> [2.72–4.91]	4.0 <sup>*c</sup> [2.95–5.32]

\*Statistically significant relative ratios for the efficacy of experimental conditions as compared to the control condition in modified Poisson regression models ( $P < 0.05$ ), adjusting for age, sex, ethnicity, education, income and drinking frequency.

Superscript letters denote significant differences for all pairwise comparisons for each outcome ( $P < 0.05$ ), using modified Poisson regression models with Tukey adjustment for multiple comparisons. Labels with the same superscript letter are not significantly different from one another.







both SD information and the LRDG was most efficacious for supporting accurate estimates of consumption across different types of alcoholic beverages. Compared to %ABV labels, participants exposed to labels with SD information and the LRDG were better able to not only accurately estimate the amount of alcohol in a SD but also the number of SDs in an alcohol container. The results also indicate that participants exposed to labels with both SD information and the LRDG were significantly more likely to know how many SDs could be consumed before reaching the daily limits recommended by the national drinking guidelines. Participants exposed to only the standard %ABV labels were more likely to over or underestimate the number of SDs in an alcohol container than to get the correct result. There was a 12.6% to 58.9% improvement in the accuracy of responses across all beverage types and outcomes when participants viewed labels with both SD information and the LRDG. This was not entirely surprising as research has consistently demonstrated that consumers have difficulty ascertaining the amount of alcohol in a drink when provided with %ABV information only (Stockwell *et al.*, 1991a, 1991b; Stockwell, 2006; Osiovy *et al.*, 2015; Wettlaufer, accepted).

The impact of displaying larger versus smaller labels and of presenting the LRDG information in two different formats was also tested. The effect of label format for presenting the LRDG in a chart versus as a pictogram was negligible; however, similar to what has

previously been shown in tobacco warning labels by Hammond (2011), larger label size did seem to have a positive impact across outcomes. Similar results were found between labels with the LRDG in a chart or a pictogram, which suggests that either format is suitable for communicating drinking guideline information to consumers. Focus group participants who subsequently viewed a similar label (see Vallance *et al.*, submitted) were able to further refine presentation of the LRDG by suggesting that a combination of both the chart and pictogram formats would help ensure accessibility for different levels of literacy and English comprehension. The results of the consumer acceptability questions suggest that the majority of participants supported listing SD information on alcohol labels and more than half reported that listing the LRDG on labels would make them more likely to think about their alcohol consumption. These findings are also reflected in the companion paper (Vallance *et al.*, submitted) where focus group participants showed strong support for larger labels listing both the SD and LRDG information and felt the labels would cause consumers to reflect on their drinking (Vallance *et al.*, submitted).

The unique contribution of the current study is to show that participants support listing national drinking guidelines on alcohol labels and that providing both SD information and the LRDG on alcohol labels enables consumers to more accurately estimate and potentially track their alcohol consumption in relation to national

**Table 4.** Relative ratios for the efficacy of content and format of experimental conditions compared to the control condition: beer

	RR [95% CI]		
	Condition #1 (control—%ABV) <i>n</i> = 183	Condition #2 (LRDG, pictogram) <i>n</i> = 367	Condition #3 (LRDG, chart) <i>n</i> = 365
Current %ABV label used in Canada			
			
Outcome 1: Amount in a SD	REF <sup>a</sup>	0.8 <sup>a</sup> [0.53–1.13]	1.0 <sup>a</sup> [0.69–1.40]
O2: # of SD in container	REF <sup>a</sup>	0.9 <sup>a</sup> [0.62–1.23]	0.8 <sup>a</sup> [0.59–1.19]
O3: # of drinks to reach LRDG	REF <sup>a,b</sup>	1.3 <sup>a</sup> [0.91–1.97]	1.2 <sup>a,b</sup> [0.80–1.76]
	Condition #4 (SD) <i>n</i> = 364	Condition #5 (LRDG + SD, pictogram) <i>n</i> = 369	Condition #6 (LRDG + SD, chart) <i>n</i> = 368
			
O1: Amount in a SD	3.9 <sup>*b</sup> [2.91–5.23]	3.6 <sup>*b</sup> [2.68–4.84]	3.5 <sup>*b</sup> [2.63–4.76]
O2: # of SD in container	4.0 <sup>*b</sup> [3.07–5.30]	3.9 <sup>*b</sup> [2.97–5.14]	4.0 <sup>*b</sup> [3.08–5.32]
O3: # of drinks to reach LRDG	0.7 <sup>b</sup> [0.48–1.14]	2.4 <sup>*c</sup> [1.67–3.39]	2.3 <sup>*c</sup> [1.59–3.23]

\*Statistically significant relative ratios for the efficacy of experimental conditions as compared to the control condition in modified Poisson regression models ( $P < 0.05$ ), adjusting for age, sex, ethnicity, education, income and drinking frequency.

Superscript letters denote significant differences for all pairwise comparisons for each outcome ( $P < 0.05$ ), using modified Poisson regression models with Tukey adjustment for multiple comparisons. Labels with the same superscript letter are not significantly different from one another.

drinking guidelines. More specifically, participants exposed to labels with both SD information and Canada’s LRDG were better able to accurately estimate the number of drinks that can be consumed before reaching the daily limits recommended in the national drinking guidelines for wine and spirits. This task was made more complicated for beer as the SD amount was not disclosed in the survey item (e.g. If *you* were drinking this tallboy can of beer, how many cans would you need to consume to reach the daily limit for the LRDG?) and a tallboy can of beer is an irregular-sized container. Despite the increased complexity of the survey item and the irregular-sized beer container, labels with both SD information and the LRDG continued to enhance participants’ ability to accurately estimate the number of SDs consumed in relation to national drinking guidelines.



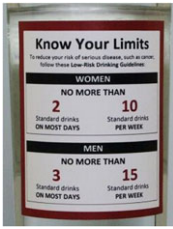



One of the strengths of this study was the use of an experimental design through quota sampling, achieving success in ensuring both randomization of participants to experimental conditions and equal distribution of demographic characteristics across conditions. Furthermore, the application of modified Poisson regression as opposed to logistic regression allowed us to directly estimate relative ratios, thereby producing more accurate estimates than would be obtained from odds ratios. Logistic regression tends to over-estimate the true values of associations when the prevalence of the outcome is common (e.g. above 10%).

However, this study has several limitations. The study did not use probability sampling techniques to select a representative sample of adults from Ontario. As a result, the study sample is likely to be more educated and has a higher socioeconomic profile than the general population. In addition, the study setting in which participants completed a series of functional tasks using label information on alcohol containers does not replicate a real-world experience. Given that regular strength alcohol beverages comprise approximately 80% of alcohol sales in Canada, high and low strength alcohol beverages were not tested in the online survey, however, *Osiowy et al. (2015)* found that labels with SD information made the biggest difference to estimates for unusually high or low beverage strengths (*Government of Canada, 2013; Osiowy et al., 2015*). Future studies are needed to investigate the effectiveness of enhanced alcohol labels in a real-world setting to determine whether label modification would support consumer awareness and understanding of low-risk alcohol consumption and promote behaviour change.

**CONCLUSION**

The introduction of larger enhanced alcohol container labels combining SD information and national drinking guidelines may be an effective way to improve drinkers’ ability to accurately assess their

**Table 5.** Relative ratios for the efficacy of content and format for experimental conditions compared to the control condition: spirits

	RR [95% CI]		
	Condition #1 (control—%ABV) <i>n</i> = 183	Condition #2 (LRDG, pictogram) <i>n</i> = 367	Condition #3 (LRDG, chart) <i>n</i> = 365
Current %ABV label used in Canada			
			
Outcome 1: Amount in a SD	REF <sup>a</sup>	1.0 <sup>a</sup> [0.60–1.52]	0.9 <sup>a</sup> [0.57–1.47]
O2: # of SD in container	REF <sup>a</sup>	1.0 <sup>a</sup> [0.53–1.75]	0.8 <sup>a</sup> [0.45–1.54]
O3: # of drinks to reach LRDG	REF <sup>a</sup>	3.3 <sup>*b</sup> [2.37–4.52]	3.6 <sup>*b</sup> [2.59–4.92]
	Condition #4 (SD) <i>n</i> = 364	Condition #5 (LRDG + SD, pictogram) <i>n</i> = 369	Condition #6 (LRDG + SD, chart) <i>n</i> = 368
			
O1: Amount in a SD	6.3 <sup>*b</sup> [4.32–9.25]	5.9 <sup>*b</sup> [4.03–8.65]	5.7 <sup>*b</sup> [3.86–8.30]
O2: # of SD in container	11.0 <sup>*b</sup> [6.81–17.89]	10.6 <sup>*b</sup> [6.54–17.19]	11.0 <sup>*b</sup> [6.79–17.84]
O3: # of drinks to reach LRDG	0.9 <sup>a</sup> [0.58–1.27]	4.1 <sup>*c</sup> [3.00–5.67]	4.4 <sup>*c</sup> [3.18–5.99]

\*Statistically significant relative ratios for the efficacy of experimental conditions as compared to the control condition in modified Poisson regression models ( $P < 0.05$ ), adjusting for age, gender, ethnicity, education, income and drinking frequency.

Superscript letters denote significant differences for all pairwise comparisons for each outcome ( $P < 0.05$ ), using modified Poisson regression models with Tukey adjustment for multiple comparisons. Labels with the same superscript letter are not significantly different from one another.

alcohol consumption and better monitor their intake relative to Canada's LRDG. Overall support for enhanced health messaging on alcohol labels suggests probable acceptability of their introduction at a population level in Canada.

## CONFLICT OF INTEREST STATEMENT

None declared.

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