



A free sugars daily value (DV) identifies more “less healthy” prepackaged foods and beverages than a total sugars DV

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ABSTRACT

Regulatory changes in Canada will require food labels to have a benchmark [% Daily Value, %DV] for total sugars, based on 100 g/day, while US labels will require a %DV for added sugars, based on 50 g/day. The objective of this study was to compare two labelling policies, a total sugars DV (100 g/day) and a free sugars DV (50 g/day) on food labels. This cross-sectional analysis of the Food Label Information Program database focussed on top sources of total sugars intake in Canada (n = 6924 foods). Products were categorized as “less healthy” using two sets of criteria: a) free sugars levels exceeding the WHO guidelines ($\geq 10\%$ energy from free sugars); and b) exceeding healthfulness cut-offs of the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (FSANZ-NPSC). The proportion of “less healthy” products with $\geq 15\%$ DV (defined as “a lot” of sugars i.e. high in sugars, based on Health Canada's %DV labelling footnote and educational message for dietary guidance) were compared for each sugar labelling scenario. The free sugars DV showed better alignment with both methods for assessing “healthfulness” than the total sugars DV. The free sugars DV identified a greater proportion of “less healthy” foods with $\geq 15\%$ DV, based on both the FSANZ-NPSC (70% vs. 45%, $p < .0001$) and WHO guidelines (82% vs. 55%, $p < .0001$); particularly in sweet baked goods, sugars and preserves, chocolate bars, confectionery, and frozen desserts categories. Compared to total sugars DV labelling, using a free sugars DV identified more “less healthy” foods. Findings support the adoption of free sugars labelling.

1. Introduction

The World Health Organization (WHO) (World Health Organization, 2015), the Dietary Guidelines for Americans (US Department of Agriculture and US Department of Health and Human Services, 2015) and several other health organizations (Canadian Diabetes Association, 2015; Heart and Stroke Foundation Canada, 2014; Public Health England, 2015) recommend limiting intakes of free and added sugars to a maximum 10% of energy. “Free sugars” are the sugars no longer in their naturally-occurring state (i.e., no longer in whole fruits, vegetables, unsweetened dairy, and some grains) (World Health Organization, 2015). Examples include table sugar, honey, and fruit juice. “Added sugars” are the free sugars that have been added to foods (e.g. honey added to a muffin) (Canadian Food Inspection Agency, 2006; Institute of Medicine, 2010). “Total sugars”, include all free as well as the naturally-occurring sugars found in foods that tend to be part of a balanced diet (i.e. fruits, vegetables, and milk) (Health Canada, 2011; Sigman-Grant and Morita, 2003; US Department of Agriculture and US Department of Health and Human Services, 2015).

As such, limiting total sugars intakes does not align with current dietary advice and a recent systematic review found that added sugars, rather than total sugars, better explains the negative relationship between sugars and diet quality (Louie and Tapsell, 2015). In 2016, Canada and the US changed their nutrition labelling regulations; Canadian Nutrition Facts tables will be required to include a benchmark (% Daily Value, %DV) for total sugars, based on a daily reference amount of 100 g (20% of energy) (Government of Canada, 2016), while American labels will include a declaration for added sugars, with a %DV based on 10% of energy (Food and Drug Administration, 2016). The US changes align well with recent sugars intake recommendations, but to our knowledge, there has been no evaluation of the DV for total sugars or any alternative DV for sugars (i.e. for free or added sugars) in terms of its application to the prepackaged food and beverage supply and its ability to identify less healthy food choices.

The overall purpose of this study was to compare the use of a total sugars DV on food labels to a free sugars DV for correctly identifying “less healthy” foods, which exceed: a) WHO free sugars intake guidelines of $< 10\%$ energy; and b) the Food Standards Australia New

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Zealand Nutrient Profiling Scoring Criterion cut-offs for healthier foods. Specifically, this allowed us to assess the ability of each DV labelling scenario to identify and the oretically discourage the consumption of “less healthy” foods and beverages.

2. Methods

2.1. Food Label Information Program (FLIP) database

This study is a cross-sectional analysis of the University of Toronto's Food Label Information Program (FLIP) 2013 database (n = 15,342), which includes information on nutrient contents, as declared on the Nutrition Facts table, UPC, company, brand, price, ingredients, container size, and sampling date for private-label and national brand prepackaged foods and beverages. Data acquisition occurred between May and September 2013, and was carried out in the Greater Toronto Area and Ottawa, Ontario, and Calgary, Alberta. Data were collected from major outlets of the four largest grocery chains in Canada (Loblaws, Metro, Sobeys, and Safeway), representing 75.4% of the grocery retail market share (Canadian Grocer, 2012). Specific details on FLIP 2013 have been described previously (Bernstein et al., 2016). Foods that were the top sources of total sugars intakes (accounting for 91% of total sugars consumption) among Canadians, based on national nutrition survey data (CCHS 2004), were included in this study (n = 6924) (Health Canada, 2015). Foods were categorized based on the Bureau of Nutritional Sciences food group codes and descriptions (Health Canada, 2004). See Table 1 for details on categories analyzed.

2.2. Sugars DV labelling scenarios

Two DV labelling scenarios were examined in this study. The first involved the application of a **total sugars** %DV, based on 100 g/day (20% of energy), to the nutrition information available for products in FLIP 2013. Total sugars content was obtained from the Nutrition Facts table and the %DV was determined based on the manufacturer's stated

serving size, the value presented to the consumer on Canadian food labels to inform their decision-making (Canadian Food Inspection Agency, 2016). The second labelling scenario was the application of a **free sugars** %DV based on 50 g/day (10% of energy), the same DV the US has regulated for added sugars (Food and Drug Administration, 2016). Free sugars contents are not declared on the Nutrition Facts table and were calculated according to the WHO definition for free sugars (World Health Organization, 2015) using the University of Toronto's free sugars algorithm (Bernstein et al., 2016). The free sugars DV was applied to the nutrition information available for products in FLIP 2013 as described for the total sugars DV.

2.3. Use and Interpretation of %DV labelling to identify “less healthy” foods

Canadian consumers are encouraged to use the %DV as a benchmark along with Health Canada's %DV footnote which states “5% DV or less is a little [of a nutrient, and] 15% DV or more is a lot”, to interpret how much is in a serving of a food and to help guide consumption (Government of Canada, 2016). The inclusion of this message as a required footnote on the Nutrition Facts table was part of the 2016 Canadian nutrition labelling regulatory changes (Government of Canada, 2016). For this study, products with $\geq 15\%$ DV were deemed to have “a lot” of sugars and therefore discouraged according to Health Canada's %DV nutrition label footnote and educational messaging used in dietary guidance.

2.4. Alignment of DV labelling scenarios with assessments of the healthfulness of foods

Products were categorized as “less healthy” by 2 sets of criteria used to define healthier foods. Details on the criteria used are outlined below. An overview of the categorization is visually depicted in Fig. 1a and b.

a) “Less healthy” based on WHO free sugars intake guidelines

Table 1

Top food and beverage categories and examples of products accounting for 90.8% of total sugars intakes of Canadians based on CCHS 2004 data (n = 6924).

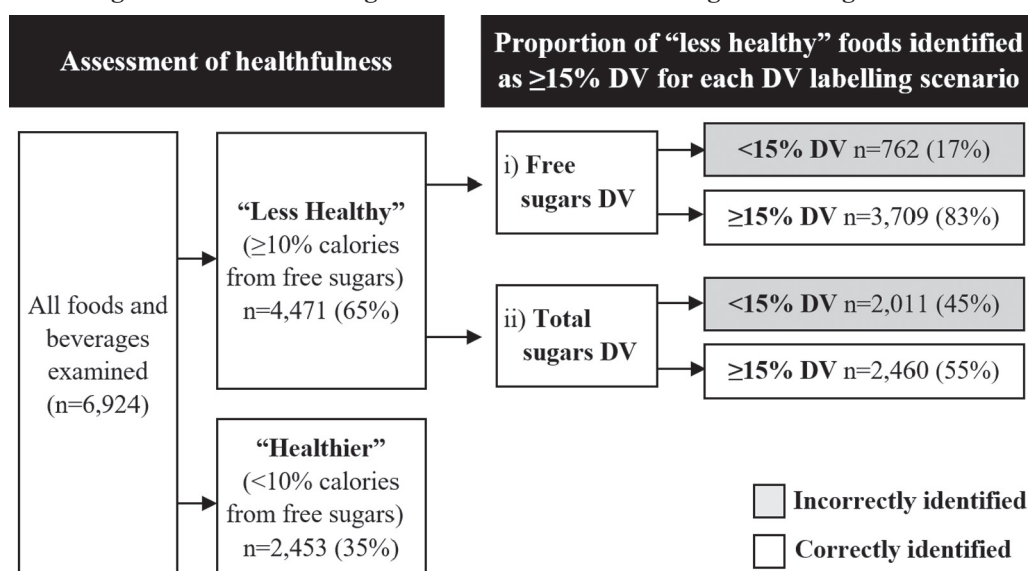
Food categories ^a	% intake ^b	n ^c	Examples from FLIP 2013
Soft drinks, fruit drinks, and others	16.3	517	Soft drinks (diet, calorie-reduced, regular), fruit drinks and combination of fruit drinks and juice, flavoured dairy and alternative beverages, cocoa, hot chocolate. Includes drink mixes.
Fruits	14.0	531	Fruit (frozen, canned, dried), fruit sauces, fruit chips (e.g. apple chips), candied fruits (e.g. maraschino cherries), canned olives, cherry pie filling.
Sweet baked goods	12.2	1165	Brownies, squares, cakes (all types), cookies, doughnuts, muffins, quick breads, pastries (including toaster pastries), sweet buns, pies, tarts, crisps (including shells), baked goods requiring preparation.
Milk, unsweetened	8.8	103	Unsweetened milk, unsweetened plant-based milk alternatives, evaporated milk.
Fruit juices	7.0	385	100% fruit juice (excludes fruit juice with added sweeteners).
Sugar and preserves	6.3	334	Sugar (e.g. white, brown, icing), honey, molasses, bread spreads (e.g. chocolate hazelnut spread), fruit preserves (e.g. jam, jelly), syrups, dessert toppings and spreads (e.g. chocolate sauce).
Coffee, tea, water	5.2	184	Coffee, tea (includes hot and iced tea), flavoured water (includes concentrated flavour enhancers).
Confectionery	3.5	571	Candies (e.g. mints, hard candies, sprinkles, gummies, marshmallow), whipped dessert toppings, custard, pudding, mousse, gelatin, sorbet, popsicles, pie filling (except cherry), cake frosting.
Breakfast cereals	2.9	145	Flakes, puffed, and semi-compact cereals, cream of wheat. Excludes high-fibre, shredded, and other hot cereals (e.g. oatmeal).
Pizza, sandwich, etc.	2.8	214	Frozen and refrigerated pizzas, hot dog dishes, sandwiches, burgers. Excludes individual components sold separately (e.g. bread, buns, burger patties).
Chocolate bars	2.4	286	Chocolate, chocolate bars, chocolate chips.
Vegetable dishes	2.4	388	Salads (e.g. coleslaw, leafy salad), fries, mashed potato, scalloped potato, hash browns, pickles, vegetable-based frozen and refrigerated dishes.
Vegetables	1.8	645	Vegetables (fresh, frozen, canned), vegetable drinks.
Yogurt, sweetened	1.7	238	Sweetened yogurt, sweetened drinkable yogurt.
Pasta, rice dishes	1.3	554	Pasta and rice dishes (shelf-stable, frozen meals, refrigerated meals, pasta salads). Includes ready-to-eat dishes as well as dishes requiring preparation.
Frozen dairy dessert	1.1	563	Ice cream, ice milk, frozen yogurt, cones, bars, sandwiches, sundaes.
Milk, sweetened	1.1	101	Sweetened milk, sweetened plant-based milk alternatives, condensed milk.
Overall	90.8	6924	

^a Top sources of total sugars by Canadians in 2004; based on results from the Canadian Community Health Survey 2.2 (2004). Data provided by Health Canada (Health Canada, 2015).

^b Percent contribution to Canadian total sugars intake in 2004, by food category and overall (Health Canada, 2015).

^c n = number of unique products per food category in FLIP 2013 database.

a. Alignment of DV labelling scenarios with WHO free sugars intake guidelines



b. Alignment of DV labelling scenarios with FSANZ-NPSC Score

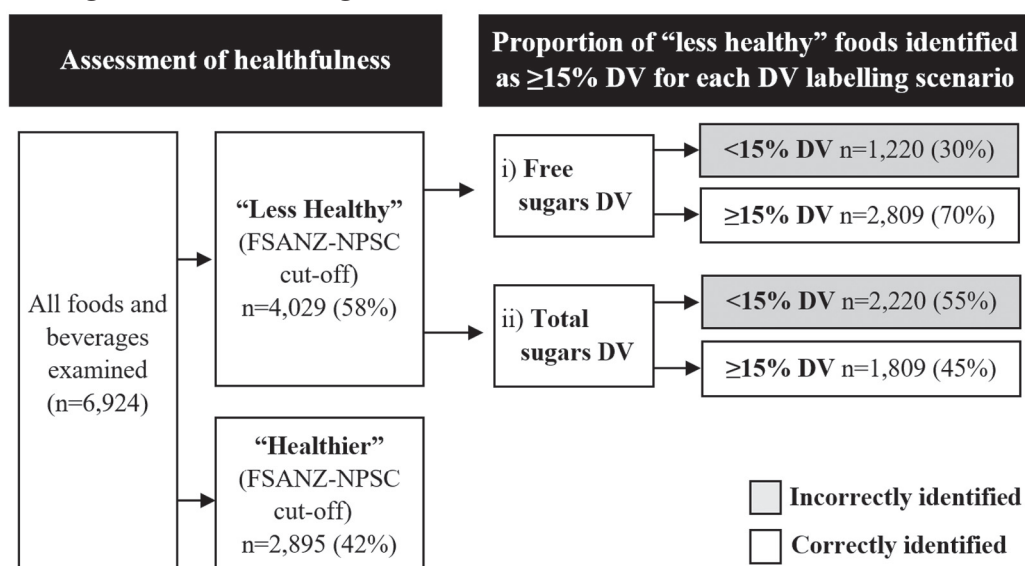


Fig. 1. Comparison of two different sugar labelling scenarios for correctly identifying “less healthy” foods (n = 6924). “Less healthy” products were defined using two sets of cut-offs used to define healthier foods: a) World Health Organization (WHO) free sugars intake guidelines of < 10% of energy; and b) Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (FSANZ-NPSC). Two DV labelling scenarios: i) a total sugars DV (100 g/day); and ii) a free sugars DV (50 g/day), were compared for their alignment with the cut-offs by identifying “less healthy” foods as having ≥15% DV (“a lot”) of sugars, according to Health Canada’s %DV footnote (Government of Canada, 2016). Grey boxes show the products in each DV labelling scenario that were not in alignment.

Based on the WHO free sugars intake guidelines, products with ≥10% of energy coming from free sugars were considered to be “less healthy” and < 10% were considered to be “healthier” (World Health Organization, 2015). Foods and beverages with ≥10% of energy coming from free sugars can contribute to a diet that has a greater proportion of energy from free sugars than recommended (Pan American Health Organization, 2016). The proportion of “less healthy” products defined using WHO free sugars intake guidelines that had ≥15% DV using each DV labelling scenario was determined, overall and by food category (Fig. 1a).

b) “Less healthy” based on the Food Standards Australia New Zealand - Nutrient Profiling Scoring Criterion

A summary score of healthfulness, the Food Standards Australia New Zealand - Nutrient Profiling Scoring Criterion (FSANZ-NPSC) was the second method used to define “healthier” and “less healthy” foods (Food Standards Australia and New Zealand, 2014). The FSANZ-NPSC system assigns points for nutrients to limit (i.e. calories, saturated fat, sodium, and total sugars) and deducts points for nutrients and components to encourage (i.e. dietary fibre, protein, and

fruit, vegetable, nut and legume content) (Food Standards Australia and New Zealand, 2014). A lower FSANZ-NPSC score is indicative of a healthier product and cut-offs are used to identify “healthier” products and “less healthy” products (Food Standards Australia and New Zealand, 2014). Specific details on the application of the FSANZ-NPSC to FLIP 2013 are described elsewhere (Bernstein et al., 2017). The proportion of “less healthy” products according to the FSANZ-NPSC cut-offs that had ≥15% DV using each DV labelling scenario was determined, overall and by food category (Fig. 1b).

2.5. Statistical analyses

Categorical variables (e.g. products with ≤5% DV and ≥15% DV) were presented as proportions (%). For variables with two levels, McNemar tests were used to compare proportions (e.g. “less healthy” products with ≥15% DV for the free sugars vs. total sugars DV labelling scenarios). Exact binomial tests were used when there were no discordant pairs or when a variable only had one level (e.g. when a food category had no products that were categorized as ≥15% DV). Sign

M = -555.5, p < 0.0001

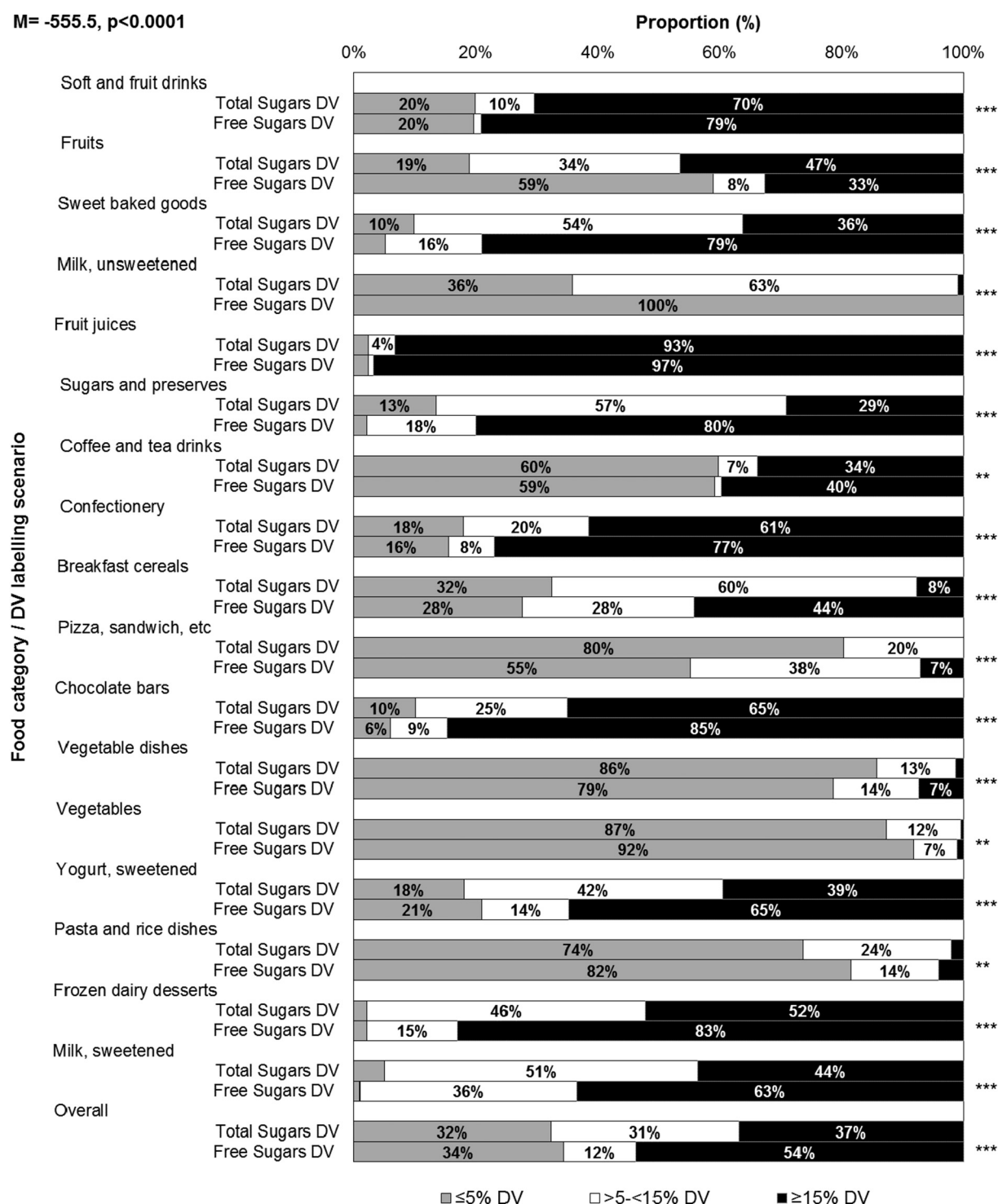


Fig. 2. Proportion of prepackaged food and beverages that have ≤5% Daily Value (DV) (“a little” sugars), > 5%– < 15% DV, and ≥15% DV (“a lot” of sugars), based on Health Canada’s %DV footnote (Government of Canada, 2016), for two DV labelling scenarios: i) total sugars DV (100 g/day); and ii) free sugars DV (50 g/day), overall and by food category (n = 6924). (*) Denotes statistically significant differences between sugars labelling scenarios **p < .01, ***p < .0001 based on results from Sign test analyses.

tests were used to compare proportions when a variable had more than two levels (e.g. proportion of ≤5% DV, > 5% to < 15% DV, or ≥15% DV) because assumption of symmetry required to conduct a Wilcoxon Signed-Rank test was not met. Differences were considered statistically significant at p < .05. All statistical analyses were conducted using SAS version 9.4 (SAS Institute Inc., Cary NC).

3. Results

3.1. Proportion of foods and beverages having “a little” or “a lot” of sugars based on Health Canada’s %DV footnote

About one-third (32%) of products had ≤5% DV (“a little”) and another third (37%) had ≥15% DV (“a lot”) under the total sugars DV labelling scenario, while 34% had ≤5% DV and 54% had ≥15% DV under the free sugars DV scenario (Fig. 2). Overall, there was a

Table 2

Cross-classification of the number and proportion of products with $\leq 5\%$ Daily Value (DV) (“a little” sugars), $> 5\%$ – $< 15\%$ DV, and $\geq 15\%$ DV (“a lot” of sugars)^a, for two DV labelling scenarios: i) total sugars DV (100 g/day); and ii) free sugars DV (50 g/day), overall and by food category (n = 6924).

Free sugars DV ^b	$\leq 5\%$ DV			$> 5\%$ – $< 15\%$ DV			$\geq 15\%$ DV ^c	
	$\leq 5\%$ DV	$> 5\%$ – $< 15\%$ DV	$\geq 15\%$ DV	$\leq 5\%$ DV	$> 5\%$ – $< 15\%$ DV	$\geq 15\%$ DV	$> 5\%$ – $< 15\%$ DV	$\geq 15\%$ DV
Total sugars DV								
Soft and fruit drinks	100 (98%)	2 (2%)	.	3 (50%)	3 (50%)	.	45 (11%)	364 (89%)
Fruits	95 (30%)	136 (45%)	82 (26%)	6 (13%)	29 (64%)	10 (22%)	18 (10%)	155 (90%)
Sweet baked goods	56 (93%)	4 (7%)	.	59 (32%)	126 (68%)	.	499 (54%)	421 (46%)
Milk, unsweetened	37 (36%)	65 (63%)	1 (1%)
Fruit juices	9 (100%)	.	.	.	3 (100%)	.	14 (4%)	359 (96%)
Sugars and preserves	7 (100%)	.	.	38 (63%)	22 (37%)	.	170 (64%)	97 (36%)
Coffee and tea drinks	109 (100%)	.	.	1 (50%)	1 (50%)	.	11 (15%)	62 (85%)
Confectionery	74 (83%)	12 (13%)	3 (3%)	29 (67%)	13 (30%)	1 (2%)	92 (21%)	347 (79%)
Breakfast cereals	40 (100%)	.	.	7 (17%)	34 (83%)	.	53 (83%)	11 (17%)
Pizza, sandwich, etc.	118 (100%)	.	.	54 (67%)	27 (33%)	.	15 (100%)	.
Chocolate bars	17 (100%)	.	.	12 (44%)	15 (56%)	.	56 (23%)	186 (77%)
Vegetable dishes	294 (96%)	11 (4%)	.	39 (71%)	16 (29%)	.	23 (82%)	5 (18%)
Vegetables	551 (93%)	41 (7%)	1 (0%)	13 (29%)	32 (71%)	.	5 (71%)	2 (29%)
Yogurt, sweetened	43 (86%)	7 (14%)	.	.	34 (100%)	.	60 (39%)	94 (61%)
Pasta and rice dishes	392 (87%)	60 (13%)	.	16 (20%)	64 (80%)	.	11 (50%)	11 (50%)
Frozen dairy desserts	10 (83%)	2 (17%)	.	2 (2%)	82 (98%)	.	174 (37%)	293 (63%)
Milk, sweetened	1 (100%)	.	.	4 (11%)	30 (83%)	2 (6%)	22 (34%)	42 (66%)
Overall	1953 (82%)	340 (14%)	87 (4%)	283 (34%)	531 (64%)	13 (2%)	1268 (34%)	2449 (66%)

^a DV categorization is based on Health Canada's %DV footnote of “ $\leq 5\%$ of a DV is a little and $\geq 15\%$ of a DV is a lot” (Government of Canada, 2016).

^b Free sugars DV categories are in the top row, total sugars DV categories for the products within each free sugars DV category are in the second row.

^c No products that were categorized as $\geq 15\%$ DV with the free sugars DV were categorized as $\leq 5\%$ DV by the total sugars DV.

significant difference in the proportions of foods in each DV category between the two DV labelling scenarios (Fig. 2) ($M = -555.5$, $p < .0001$). All categories except for *unsweetened milk* and *fruits* had a greater proportion of products with “a lot” of sugars using the free sugars DV compared to the total sugars DV. A cross-classification of where differences occurred, showed that 1991 (29%) products differed in the DV categorization between the two labelling scenarios (Table 2). There were two sets of misclassifications: 1) products with $\leq 5\%$ DV using the free sugars DV, not identified as such with the total sugars DV (18%, $n = 427$), e.g. *fruits* and *unsweetened milk*; and 2) products with $\geq 15\%$ DV identified using the free sugars DV, but not with the total sugars DV (34%, $n = 1268$), e.g. *sweet baked goods*, *sugars and preserves*, *breakfast cereals*, *pizza*, *sandwiches etc.*, and *sweetened yogurts*.

3.2. Alignment of DV labelling scenarios with assessments of the healthfulness of foods

a) “Less healthy” based on WHO free sugars intake guidelines

Sixty-five percent ($n = 4471$) of the products that are major sources of sugars in the Canadian diet, were “less healthy” with free sugars levels exceeding the WHO guidelines ($\geq 10\%$ of energy) (Fig. 1). There were significantly more “less healthy” products with $\geq 15\%$ DV using the free sugars DV scenario than the total sugars DV scenario (83% [$n = 3709$] vs. 55% [$n = 2460$], $S = 1223.53$, $p < .0001$) overall (Fig. 1) and for all categories with statistically significant differences (Fig. 3). Conversely, significantly more “healthier” products ($< 10\%$ energy from free sugars) had $\leq 5\%$ DV using the free sugars DV scenario than the total sugars DV scenario (93% [$n = 2285$] vs. 79% [$n = 1940$], respectively; $S = 168.12$, $p < .0001$).

b) “Less healthy” based on the Food Standards Australia New Zealand - Nutrient Profiling Scoring Criterion

Fifty-eight percent ($n = 4029$) of the food and beverages examined were considered “less healthy” using the FSANZ-NPSC system (Fig. 1). Overall, there were significantly more “less healthy” products with $\geq 15\%$ DV using the free sugars DV scenario than the total sugars DV scenario (70% [$n = 2809$] vs. 45% [$n = 1809$], respectively; $S = 968.99$, $p < .0001$) (Fig. 1). This was also seen for most categories, except for *unsweetened milk* and *fruits*, where there was a greater proportion of “less healthy” foods with $\geq 15\%$ DV

using the total sugars DV scenario than the free sugars DV scenario, and for *vegetables* and *fruit juices*, where there was no difference in the proportions for the two DV labelling scenarios (Fig. 4). Conversely, significantly more “healthier” products had $\leq 5\%$ DV with the free sugars DV scenario than the total sugars DV scenario (57% [$n = 1642$] vs. 47% [$n = 1363$], respectively; $S = 168.12$, $p < .0001$).

The “less healthy” products according to each of the two cut-offs used to define healthfulness were not necessarily the same products. Twenty-seven percent ($n = 1203$) of products defined as “less healthy” according to WHO free sugars intake guidelines, were not defined as “less healthy” according to the FSANZ-NPSC cut-offs and conversely, 31% ($n = 761$) of products defined as “healthier” with the WHO free sugars guidelines were not defined as “healthier” with the FSANZ-NPSC cut-offs.

4. Discussion

This study was conducted to inform nutrition policies and actions related to sugars labelling on prepackaged foods and beverages. To our knowledge, this is the first study to compare a total sugars DV, based on 100 g/day, to a free sugars DV, based on 50 g/day, for their alignment with two different methods to define “healthier” foods; one specific to free sugars (WHO guidelines) and the other used to define “healthier” foods permitted to carry a nutrient or health claim under FSANZ regulations (FSANZ-NPSC). With recent regulatory amendment to alter the presentation of sugars information on nutrition labels, it is imperative that any change should be able to help consumers identify less healthy food choices. Findings from this study have identified limitations of the total sugars DV, compared to the free sugars DV, for identifying less healthy foods to discourage their consumption.

Of the major food sources of Canadian sugars intakes in the pre-packaged food supply, an astounding 65% contained free sugars levels exceeding the WHO guidelines ($\geq 10\%$ of energy), which is concerning given the likelihood of exceeding this recommendations increases with the consumption of products that contain excess free sugars levels (Pan American Health Organization, 2016) and makes a healthy eating pattern harder to achieve (US Department of Agriculture and US Department of Health and Human Services, 2015). The primary

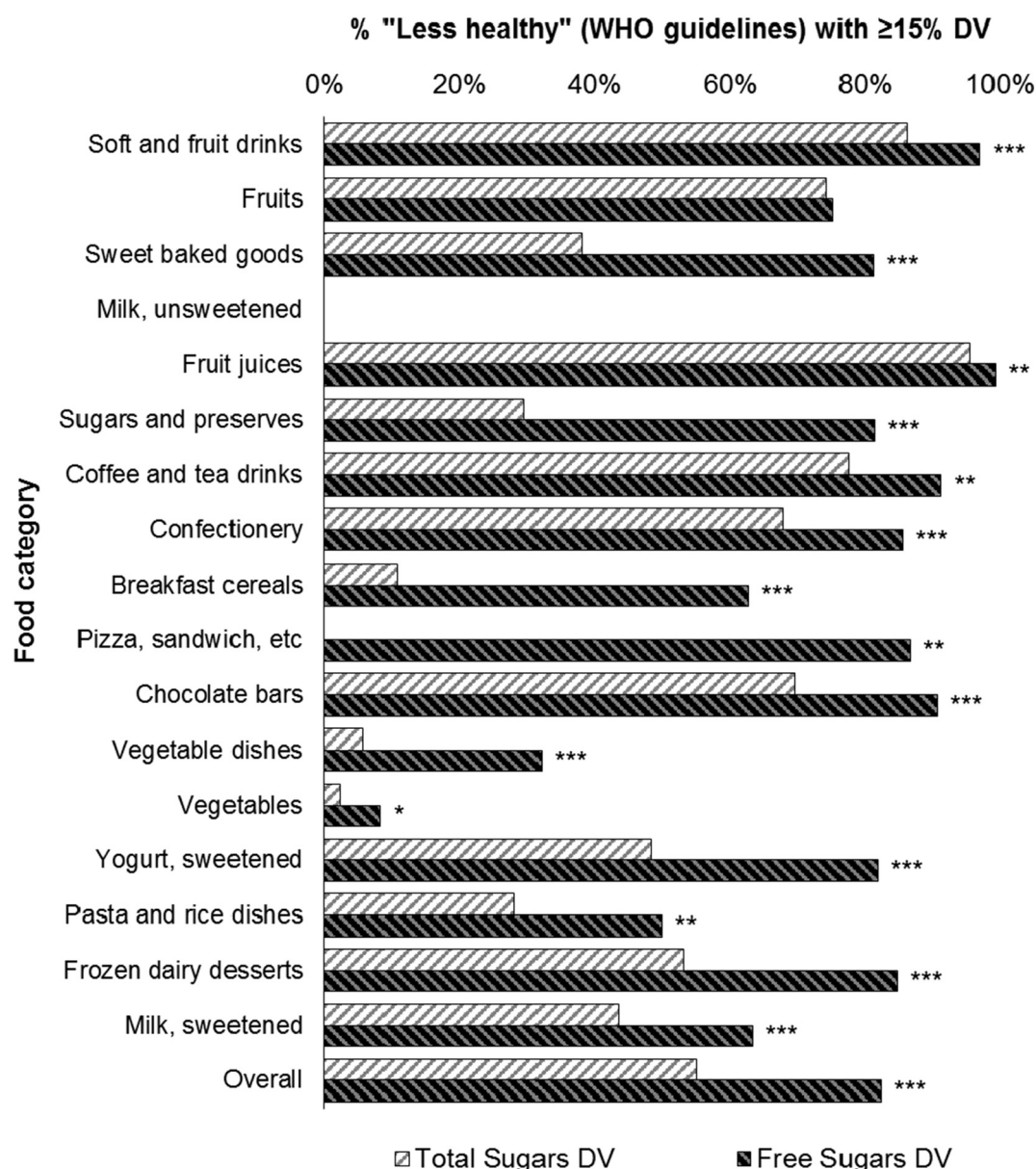
S=1223.53, $p < 0.0001$ 

Fig. 3. Proportion of “less healthy” prepackaged food and beverage products, defined using the World Health Organization (WHO) free sugars intake guidelines of $< 10\%$ of energy ($n = 4471$) that have $\geq 15\%$ Daily Value (DV), for two DV labelling scenarios: i) a total sugars DV (100 g/day); and ii) a free sugars DV (50 g/day), overall and by food category. (*) Denotes statistically significant differences between DV labelling scenarios $*p < .05$, $**p < .01$, $***p < .0001$ based on results from McNemar tests (exact binomial test was used for *pizza, sandwich, etc.*). Test results are unavailable for *unsweetened milk* because there were no “less healthy” *unsweetened milk* products.

purpose of including a %DV for sugars on the Nutrition Facts table is to guide consumers to select foods and beverages lower in sugars. Considering the increased risk of obesity, diabetes, dental caries, and cardiovascular disease associated with excess free sugar consumption (Malik et al., 2010; Moynihan and Kelly, 2013; Te Morenga et al., 2014; Yang et al., 2014), the need for the nutrition label to discourage the selection of products with excess free sugars levels is essential. Findings from this study demonstrate the strength of using free sugars DV labelling in this regard.

The free sugars DV also outperformed the total sugars DV, when assessing the classification of “less healthy” foods using the FSANZ-NPSC summary score for product healthfulness. This finding aligns with results from a systematic review conducted by Louie and colleagues (Louie and Tapsell, 2015) that found high levels of added sugars (similar to free sugars) was a better indicator of lower dietary quality than total sugars.

The weakness of the total sugars DV is particularly noticeable when examining the classification of products into DV categories (i.e., $\leq 5\%$, $> 5\%$ to $< 15\%$ DV, and $\geq 15\%$). Many of the foods that had $\geq 15\%$ DV (“a lot”) with the free sugars DV, had $> 5\%$ to $< 15\%$ DV with the total sugars DV. Thus, for about one-in-three foods evaluated in this study that are major sources of total sugars intakes in Canada (majority of which have high free sugars levels), consumers would be left virtually without guidance under the total sugars DV labelling scenario (Canadian Foundation for Dietetic Research, 2013).

One improvement related to sugars information in the Canadian nutrition labelling changes, that is not included in the US regulations, is the grouping of all sugars-based ingredients in the ingredient list after the common name “sugars” (Government of Canada, 2016). Although this change would not provide consumers with a quantitative amount of free sugars needed to follow dietary intake guidelines (Heart and Stroke

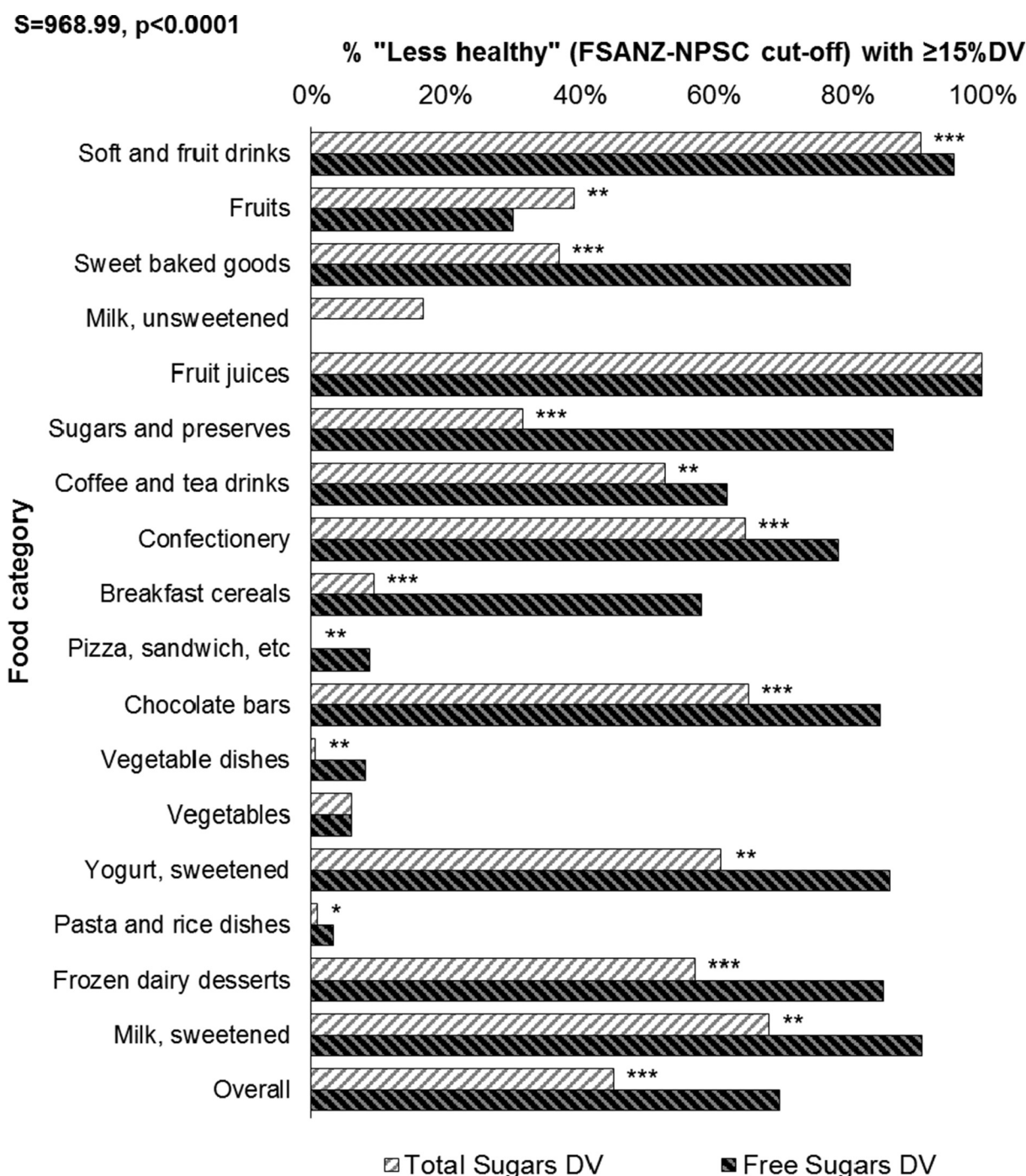


Fig. 4. Proportion of “less healthy” prepackaged food and beverage products, defined using the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (FSANZ-NPSC) cut-offs (n = 4029) that have ≥15% Daily Value (DV), for two DV labelling scenarios: i) a total sugars DV (100 g/day); and ii) a free sugars DV (50 g/day), overall and by food category. (*) Denotes statistically significant differences between DV labelling scenarios *p < .05, **p < .01, ***p < .0001 based on results from McNemar tests (exact binomial test was used for unsweetened milk, fruit juice, pizza, sandwich, etc., and vegetables).

Foundation Canada, 2014; Johnson et al., 2009; US Department of Agriculture and US Department of Health and Human Services, 2015; World Health Organization, 2015), it does highlight the presence of a number of sugars-based ingredients added to foods, that consumers may not recognize as sugars.

Strengths of this study include the use of the *Food Standards Australia/New Zealand Nutrient Profiling Scoring Criterion* to classify the healthfulness of foods and beverages. Nutrients aren't consumed in isolation which makes the interpretation of nutrient-based information and translation into the selection of foods and beverages difficult. Using the FSANZ-NPSC approach, which defines healthfulness based on both

nutrients to limit and components to encourage, accounts for this complexity.

Limitations of this study include the algorithm used to calculate free sugars, the use of nutrient information as declared on the Nutrition Facts table, as discussed elsewhere (Bernstein et al., 2016), and the use of declared sugars contents from the Nutrition Facts table, rather than laboratory analyses. Nutrition Facts table declarations are subject to the Canadian Food Inspection Agency's rounding rules and can vary up to 20% from the actual analyzed value (Canadian Food Inspection Agency, 2014). However, a study evaluating the accuracy of the declared nutrient contents of 1000 Canadian foods found only 13% declared

unsatisfactory values (> 20% difference from analyzed) for sugars contents (Fitzpatrick et al., 2014). As there are no chemical analyses available to differentiate free or added sugars from total sugars contents, the calculation of free sugars contents was based on an algorithm, similar to that developed by Louie and colleagues, which has shown good reliability. That algorithm has been shown to have high levels of inter-researcher repeatability based on a study in which two independent researchers calculated added sugars contents for over 5000 products and had < 1 g mean difference in the results (Louie et al., 2014).

In summary, these data provide the first assessment of two different labelling approaches to sugars. A %DV for total sugars, based on 100 g/day, showed poorer ability to identify “less healthy” foods, defined using free sugars levels and the FSANZ-NPSC summary scores, than a %DV for free sugars, based on 50 g/day. Including a %DV for free (or added) sugars based on 10% of energy aligns with recent sugars intake guidelines and is a superior labelling option for policy-makers to consider. Limiting sugars consumption, specifically free or added sugars, is an important component of overall population health, therefore labelling efforts need to provide clear and comprehensive information on the Nutrition Facts table to enable consumer decision-making related to free and added sugars.

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Authors' contributions

JTB and MRL conceived and designed the overall research plan. AS coordinated data collection. JTB, BFA and MEL, calculated NPSC scores. JTB conducted research, analyzed data and wrote first draft of the manuscript. All authors were responsible for final content.

Conflict of interest

Prior coming to the University of Toronto, Beatriz Franco-Arellano was a PepsiCo employee (2009–2015). The company had no connection with, nor provided funding for the research. The rest of the authors have no conflicts of interest associated with this manuscript.

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