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by Didier Garriguet

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Abstract

Background: Beverage consumption, especially water, is critical to a healthy diet. The 2007 Canada's Food Guide (CFG) makes specific recommendations regarding the intake of water, fruit juice, milk and energy-dense beverages. Earlier comparisons of 2004 and 2015 dietary data show that changing patterns in beverage intake can explain some of the changes in energy and sugar intake observed in the Canadian population. The objective of this study is to describe any changes in beverage consumption between 2004 and 2015, and how these changes relate to existing recommendations in the 2007 CFG.

Data and methods: Data are from the Canadian Community Health Survey – Nutrition for 2004 and 2015. To estimate any change in the proportion of Canadians consuming a beverage the day before and the quantity consumed, 19 beverage categories were derived using the Bureau of Nutritional Science categories. The CFG classification was used to estimate the relative share of juice intake from total servings of vegetables and fruit, and the intake of milk from milk subcategories. The National Cancer Institute method was used to estimate usual intake.

Results: Water intake was higher in 2015 than in 2004. Consumption of milk, fruit juice, and energy-dense beverages such as fruit drinks and soft drinks was lower in 2015. Changes in water, soft drink and fruit drink consumption mostly reflect changes in the proportion of Canadians consuming these specific beverages the day before reporting, while changes in milk and fruit juice mostly reflect a change in the quantity consumed. In 2015, the majority of the population was consuming more whole vegetables and fruit than juice, which is in line with 2007 CFG recommendations.

Interpretation: Beverage consumption patterns in Canada changed between 2004 and 2015. Some of these changes are in line with recommendations from the 2007 CFG, the food guide that was available at the time of the 2015 survey.

Keywords: Canadian Community Health Survey, food, nutrition, dietary intake, water, fruit juice, milk
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Beverage consumption, especially water, is critical to a healthy diet.[1] It not only provides hydration, but can also be an important source of energy, vitamins and minerals—depending on the type of beverage consumed. For the first time in over a decade, food and beverage consumption was measured through a 24-hour recall in the 2015 Canadian Community Health Survey (CCHS) – Nutrition. Earlier comparisons between the 2004 CCHS – Nutrition and the 2015 CCHS – Nutrition show that changes in energy intake[2] and total sugars intake[3] can be partly explained by changing patterns in beverage consumption.

Few beverage consumption recommendations existed when the 2015 survey was conducted. Health Canada's 2011 publication "Eating Well with Canada's Food Guide" (based on the 2007 CFG)[4] provides the following recommendations to all Canadians regarding beverage intake:

- Drink water regularly.
- Have vegetables and fruit more often than juice.
- Drink skim, 1% or 2% milk each day. Have 500 mL of milk every day for adequate vitamin D. Drink fortified soy beverages if you do not drink milk.
- Limit foods and beverages high in calories, fats, sugar or salt (sodium) such as… alcohol, fruit flavoured drinks, soft drinks, sports and energy drinks, and sweetened hot or cold drinks.

These recommendations are mostly in line with the 2019 Canada's Food Guide and Canada's Dietary Guidelines:[5]

- Water should be the beverage of choice.
- Processed or prepared foods and beverages that contribute to excess sodium, free sugars or saturated fat undermine healthy eating and should not be consumed regularly.
- To help reduce the intake of free sugars, the majority of total sugars intake should come from nutritious foods, such as intact or cut fruit and vegetables, and unsweetened milk.

No quantifications are available at this time, and milk has been amalgamated within the protein foods category.

Specific recommendations for alcohol consumption[5,6] are now part of Canada's Dietary Guidelines. Recommendations on caffeine intake[7] also exist but are not part of the CFG.

Although no other nationally representative 24-hour recall nutrition survey was conducted between 2004 and 2015, other data can help explain recent trends in beverage consumption. Food availability data in Canada[8] show a decline in beer, soft drinks, all types of milk, apple juice and orange juice from 2004 to 2015. The Canadian Health Measures Survey (CHMS) collected data on the frequency of consumption for a selected number of beverages. The CHMS shows that between the periods from 2007 to 2009 and 2014 to 2015, the frequency of consumption for soft drinks, juice and milk also declined.[9]

Existing data on trends in beverage consumption are presented on a per capita basis, cover a limited number of beverages, or consider frequency over quantity. Estimates are not compared directly with existing recommendations. A 24-hour recall nutrition survey allows for a more detailed analysis of which beverages were consumed; how frequently and in what quantity they were consumed; and, more importantly, the characteristics of the consumers.

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What is already known on this subject?

- Early comparisons of 2004 and 2015 dietary data show that changing patterns in beverage intake can explain some of the changes in energy and sugar intake observed in the Canadian population.
- Canadian food availability data show a decline in the availability of beer, soft drinks, all types of milk, apple juice and orange juice from 2004 to 2015.

What does this study add?

- Water consumption was higher in 2015, and water contributed more to hydration in the form of moisture in 2015 than in 2004.
- Consumption of skim, 1% or 2% milk was below the recommended intake of 500 mL, or two servings, a day. This was the case in both survey years, but average consumption was lower in 2015, compared with 2004.
- Fruit juice consumption was lower in 2015 than in 2004, and less than 40% of the population consumed more juice than whole fruit.
- Consumption of energy-dense beverages, particularly regular soft drinks and fruit drinks, was lower in 2015 than in 2004, mostly because of a change in the proportion of the population who consumed this type of beverage the day before.

To better understand the overall impact of beverage consumption on observed changes in energy and sugar intake, the objective of this study is to describe in detail any changes in beverage consumption between 2004 and 2015 and how these changes relate to existing recommendations in the 2007 CFG. In addition to the contribution of beverage intake to energy and total sugars, the contribution of beverages to water (moisture) and selected nutrients is also described.

Methods

Data sources

The 2004 CCHS – Nutrition and 2015 CCHS – Nutrition collected information on food and beverage consumption with a 24-hour dietary recall. The target population included residents of private dwellings older than 0 years in 2004 and older than 1 year in 2015. Both surveys excluded members of the regular Canadian Forces; people living in the territories, on reserves or other Aboriginal settlements, in institutions, and in some remote regions; and all residents (military and civilian) of Canadian Forces bases.

During the initial 24-hour dietary recalls, a total of 35,107 respondents took part in 2004, and 20,487 took part in 2015. In addition, 10,786 (2004) and 7,608 (2015) respondents completed a second recall 3 to 10 days later to allow for usual intake and within-individual variance estimation. Data were mainly collected in person for the first recall and through telephone interviews for the second recall. The 2004 response rates were 76.5% for the first recall and 72.8% for the second recall. The corresponding 2015 response rates were 61.6% for the first recall and 72.0% for the second recall.

To be representative of the Canadian population at the national and provincial levels, both surveys were weighted to account for the sample design and non-response. Details about the design, sample and collection are available online.[10,11]

Beverage intake

Respondents were asked to report everything they ate and drank during the 24 hours before the interview. To maximize recall, both surveys used the Automated Multiple Pass Method,[12] which consists of the following five elements: (1) a quick list of easily remembered foods, (2) probes for commonly forgotten foods, (3) groupings by time and occasion for foods consumed at the same time, (4) detailed questions on the previously reported foods (including serving size), and (5) a final review.

A food model booklet was used to show respondents pictures of plates, bowls, glasses and mugs to increase accuracy in the reporting of food and beverage sizes: dishes were represented by drawings in 2004, but were replaced by pictures in 2015. Standard amounts were generally smaller in 2015 than in 2004, especially for bowls, glasses and mugs.[10]

Beverages can be classified using food categories based on the Bureau of Nutritional Sciences (BNS) classification or the four-digit CFG classification.[13] Results using these different classification schemes can differ because of how recipes are coded within the CFG. The BNS classification is a highly precise and detailed scheme and includes an entire beverage recipe within a BNS group. The BNS classification scheme was used to describe the frequency, quantity and nutrient intake (including water, or moisture, and energy) for beverages in this analysis. The CFG classification was used to estimate the contribution of various beverages to a CFG group.

The 2015 BNS classification (the first classification scheme used in this study) was used to classify beverages into the following categories: skim, 1% or 2% white milk, fluid or reconstituted; whole milk, fluid or reconstituted, and flavoured milk; plant-based beverages; vegetable juice; fruit juice; regular soft drinks; diet soft drinks; fruit drinks; sports drinks; spirits and liqueurs; wine; beer and coolers; alcoholic beverages; tea; coffee; and water, including vitamin water. Total beverages was calculated as the sum of all the beverage categories listed above and included three minor additional categories for adults: evaporated milk (mainly added to coffee), other types of milk (including buttermilk, and sheep and goat milk, but excluding human milk) and energy drinks. Among children younger than 19, wine, spirits and liqueurs, and alcoholic beverages did not have a separate category, but were included in the total beverages category. Although the categories of energy drinks,

sports drinks and vitamin water did not exist in 2004, the Canadian Nutrient File (CNF) food description was used to identify these beverages. Infant formula, liquid meal replacement and protein powder are not included in beverages.

The second classification scheme was proposed by Health Canada in 2014 as a surveillance tool to classify foods and beverages according to the 2007 CFG.[13] Foods and beverages were first classified into four food groups: vegetables and fruit, grain products, milk and alternatives, and meat and alternatives. Groups were then further classified into four tiers based on thresholds for sodium, total fat, saturated fat and sugars content. The top three tiers contributed toward meeting CFG recommendations. Subcategories of vegetable and fruit juices include fruit juices (subcategories 1132 and 1133) and vegetable juices and cocktails (subcategories 1252 and 1253). The milk and alternatives food group includes subcategories for milk tiers 1 and 2, which include skim, 1% or 2% white milk and fortified plant-based beverages (subcategories 3101 and 3102), as well as milk tier 3, which includes whole milk and flavoured milk (subcategory 3103). The CFG classification scheme also includes standard sizes for each item so that the amount in grams can be converted into servings. Because CFG recommendations apply to the population aged 2 years or older, analyses related to the CFG were limited to this population.

The 2015 CNF was used to estimate energy, water (moisture) and nutrient intake with the 2015 CCHS – Nutrition data.[14] The 2001b Supplement version of the CNF was used with the CCHS – Nutrition 2004. Nutrients were chosen to show the variability in how different beverages contribute to each nutrient total intake.

Analytical methods

Descriptive statistics were used to present the percentage of the population that consumed a specific beverage on the day before the interview; the average consumption of that beverage (for all respondents including non-consumers, and for consumers only); and the relative (i.e., percentage) contribution of that beverage to energy, water (moisture) and nutrient intake. Only the first recall was used at this stage, since only averages are presented, and average daily intake is the same as average usual intake.

The univariate National Cancer Institute (NCI) method[15-17] was used with both recalls to estimate the proportion of the population that consumed more juice than whole fruit and vegetables (or just whole fruit). More juice than whole fruit and vegetables (or just whole fruit) represents a usual intake above 50% of the ratio for juice servings over total servings.

The NCI method is used to first estimate the probability of consuming a food or beverage using logistic regression, and, second, to estimate the amount consumed using linear regression. Both parts use a person-specific effect that can be correlated. In these analyses, both survey years were pooled with the weekend and sequence of recalls included as covariates in both parts of the model. Estimates for each year were presented separately.

The bootstrap method was used to estimate confidence intervals because it takes into account the complex nature of the survey. Comparisons between years were done using t-tests with different significance levels to take into account multiple comparisons: $p < 0.05$ for single comparison, $p < 0.001$ for 25 comparisons (accounting for all beverages within an age group, for example) and $p < 0.0001$ for 250 comparisons (accounting for all beverages and age groups).

Results

Among children aged 1 to 13 (Table 1), the most popular beverages consumed the day before the interview were water, milk, fruit juice, regular soft drinks and fruit drinks. Among teenagers aged 14 to 18, tea (including iced tea) replaced fruit drinks in the five most commonly consumed beverages in 2015. Changes in the proportion of the population younger than 19 consuming regular soft drinks and fruit drinks explain most of the changes in quantity consumed shown in Table 2. Changes in the serving size (amount consumed on average by consumers) explain most of the changes in the quantity of milk and fruit juice consumed. The percentage of children and teenagers drinking water was over 85% in 2015, compared with around 75% in 2004 (Table 1).

Among adults (Table 3), water remained the most commonly consumed beverage the day before the interview. Compared with 2004, in 2015, the percentage of water consumers was at least 7 points higher across all adult age and sex categories, the percentage of regular soft drink and fruit drink consumers was lower among adults aged 19 to 50, and the percentage of fruit juice consumers was lower among adults aged 19 or older. For skim, 1% or 2% milk, both the percentage of consumers and the average quantity consumed were lower in 2015 than in 2004. Finally, the percentage of people who consumed tea, coffee and all alcoholic beverages was relatively stable from 2004 to 2015.

Nutrients

Among the population younger than 19, the contribution of total beverages to daily energy intake was 4 to 5 percentage points lower in 2015 than in 2004 (Table 2) for all age and sex groups. This was mostly a result of the lower energy contribution from regular soft drinks and fruit drinks. Among adults aged 19 to 50 (Table 4), daily energy intake from total beverages also decreased by about 3 percentage points, with low-fat milk, regular soft drinks and fruit drinks mostly contributing to the decrease. This trend was not observed among adults aged 51 or older. Sugar intake from beverages followed the same trends as energy intake by age and sex.

In both survey years, beverages—mostly fruit juice—provided most of the population's vitamin C: over 50% among people younger than 19 (Table 2) and over 25% among adults aged 19 and older (Table 4). This proportion was lower in 2015 among all age groups, except for adults aged 71 or older. Similarly, bev-

Table 1
Percentage of population consuming beverages the day before and quantity consumed, by age, year and type of beverage, household population aged 1 to 18, Canada excluding territories, 2004 and 2015

	Aged 1 to 8 years		Aged 9 to 13 years		Aged 14 to 18 years, male		Aged 14 to 18 years, female	
	2004	2015	2004	2015	2004	2015	2004	2015
Beverage	percent							
Percentage of population consuming the day before								
Water	73.1	88.1***	75.5	90.5***	76.8	88.8***	73.7	86.5***
Skim, 1% or 2% milk	60.8	52.9**	65.9	59.5*	60.3	58.2	51.9	44.1*
Whole milk and flavoured milk	37.4	35.9	23.7	22.4	19.2	16.7	19.5	17.8
Fruit juice	54.0	46.1**	42.8	38.7	38.1	37.7	38.6	24.8***
Regular soft drinks	14.1	6.3***	31.0	17.7***	52.3	29.8***	34.6	20.8***
Fruit drinks	36.8	14.4***	43.8	19.9***	32.1	14.1***	32.9	12.9***
Sports drinks	0.9	F	2.6	1.7[E]	2.8[E]	6.0[E]*	2.1[E]	F
Diet soft drinks	1.6	F***	5.1	2.5*[E]	3.1	2.3[E]	7.8	2.5[E]***
Tea (including iced tea)	5.9	5.4	10.7	13.8*	13.9	16.7	17.1	23.5
Coffee	F	F	1.7[E]	2.6[E]	9.0	14.4*	13.0	17.4
Plant-based beverages	2.1	4.0*	1.5[E]	1.8[E]	F	F	1.1[E]	3.4[E]*
Vegetable juice	1.8	1.2[E]	1.9[E]	1.4[E]	F	F	1.9[E]	F
Beer and coolers	F	F	F	0.0	4.9[E]	2.2[E]*	2.4[E]	F*
Total beverages	98.7	99.8***	99.9	100.0	100.0	100.0	100.0	99.9
	grams							
Quantity consumed in grams by consumers								
Water	411	508***	657	735*	1,016	1,131*	939	1,043
Skim, 1% or 2% milk	399	360*	438	364***	519	411**	387	336*
Whole milk and flavoured milk	446	366***	393	288***	550	368***	400	363
Fruit juice	327	266***	373	313**	501	429	425	314***
Regular soft drinks	302	229*	422	376	718	543***	515	384***
Fruit drinks	332	277*	425	340***	556	432*	508	404*
Sports drinks	374	283[E]	614	521	701	664	387[E]	607*
Diet soft drinks	224	95[E]**	409	278*	508	418	470	379
Tea (including iced tea)	313	249	390	316*	579	374**	471	306***
Coffee	194[E]	F	244	244	429	371	403	304**
Plant-based beverages	421	212***	379	258	500[E]	437[E]	292[E]	215
Vegetable juice	255[E]	233	276	264[E]	F	346[E]	394	530[E]
Beer and coolers	F	F	358	0.0	1,201	709[E]*	602[E]	328[E]
Total beverages	1,106	977***	1,451	1,276***	2,175	1,901**	1,693	1,487**

[E] use with caution
F too unreliable to be published
* significantly different from 2004 ($p < 0.05$)
** significantly different from 2004 ($p < 0.001$)
*** significantly different from 2004 ($p < 0.0001$)

Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

erages—namely milk—provided most of the population's vitamin D: over 45% among children and teenagers younger than 19 and over 25% among adults aged 19 and older. Milk also contributed the most to daily intake of proteins and saturated fats from beverages. Beverages contributed between 7% and 12% of total daily intake of saturated fats and between 7% and 14% of total intake of proteins among the population aged 9 or older. Among children aged 1 to 8, beverages provided around 20% of saturated fats and proteins consumed in a day.

Beverages provided most of the daily hydration in the form of water (moisture), which did not change between 2004 and 2015, except among children aged 1 to 8 (see the orange arrows pointing down in Figure 1). However, the share of water (moisture) provided by water was higher in 2015 than in 2004 (see the green arrows pointing up in Figure 1), a result of both an increase in water consumption and a decrease in the consumption of other beverages.

Canada's Food Guide recommendations

On average, the relative share of fruit or vegetable juice servings from the vegetables and fruit group was 15% in 2015, 5 percentage points lower than in 2004 (data not shown). This difference was more than 10 percentage points lower among children aged 2 to 3 years and females aged 14 to 18 years in 2015 compared with 2004 (data not shown). Looking at the usual intake distribution of the ratio, less than 10% of the population consumed more juice than vegetables and fruit (see the orange arrows in Figure 2).

Since most of the juice consumed was fruit juice rather than vegetable juice, it is appropriate to examine the relative share of fruit juice servings over total servings of fruit. Overall, the average relative share of fruit juice to total fruit was 30% in 2015, compared with 40% in 2004 (data not shown). In 2015, the relative share was lower by at least 10

Table 2
Quantity and contribution of selected beverages to nutrient intake by year, age and sex group, and type of beverage, household population aged 1 to 18 years, Canada excluding territories, 2004 and 2015

	Total beverages		Skim, 1% or 2% milk		Whole milk and flavoured milk		Fruit juice		Soft drinks		Fruit drinks	
	2004	2015	2004	2015	2004	2015	2004	2015	2004	2015	2004	2015
Both sexes, 1 to 8 years												
Quantity (grams)	1,091.0	975.0***	243.0	190.0***	167.0	131.0**	176.6	122.5***	42.4	14.5***	122.2	40.0***
Proportion of energy (%)	22.6	17.6***	6.7	6.1	6.4	5.6	4.8	3.8***	1.0	0.4***	3.3	1.1***
Proportion of vitamin C (%)	65.2	51.0***	1.8	0.3***	1.3	0.6***	45.1	38.6**	0.0	0.0	16.3	10.0***
Proportion of calcium (%)	52.2	45.9***	29.0	25.0*	18.8	15.8*	1.5	2.2**	0.1	0.0***	1.1	0.4***
Proportion of vitamin D (%)	69.9	58.7***	42.2	33.8***	26.4	22.3*	0.0	1.3***	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	24.3	21.7**	10.9	10.0	13.1	11.5*	0.1	0.1*	F	F	0.1	0.0***
Proportion of moisture (%)	66.8	63.5***	14.5	11.8***	9.6	7.9*	10.4	7.5***	2.5	0.9***	7.2	2.5***
Proportion of proteins (%)	22.8	18.7***	12.8	10.6**	8.5	6.9*	1.1	0.8***	0.0	0.0[E]*	0.1	0.1***
Proportion of sugars (%)	45.6	36.6***	10.9	10.5	9.7	8.5	15	11.3***	3.6	1.2***	6.1	3.6***
Both sexes, 9 to 13 years												
Quantity (grams)	1,449.0	1,276.0***	289.0	217.0***	93.0	64.0***	159.9	121.0***	130.7	66.4***	186.3	67.6***
Proportion of energy (%)	19.0	14.8***	6.0	5.4	3.0	2.4*	3.3	3.1	2.4	1.4***	3.8	1.5***
Proportion of vitamin C (%)	61.6	53.7***	1.9	0.4***	0.9	1.1	36.6	36.1	0.0	0.0	21.6	14.0***
Proportion of calcium (%)	46.3	40.1***	32.0	27.4**	9.4	6.7**	1.4	2.4*	0.4	0.2***	1.5	0.5***
Proportion of vitamin D (%)	60.7	53.1***	47.7	40.4***	12.2	9.9*	0.0	1.6[E]***	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	15.1	12.4***	9.8	8.4*	5.0	3.5**	0.1	0.1*	F	F	0.1	0.0***
Proportion of moisture (%)	69.1	68.1	13.3	10.9**	4.0	3.0*	7.2	6.0*	6.0	3.4***	8.4	3.4***
Proportion of proteins (%)	16.7	13.6***	11.8	9.9**	3.6	2.6**	1.0	0.7***	0.0	0.0[E]***	0.1	0.1*
Proportion of sugars (%)	43.4	38.5***	10.3	10.4	5.4	5.1	9.0	9.6	9.0	5.0***	7.9	5.3**
Male, 14 to 18 years												
Quantity (grams)	2,175.0	1,901.0**	313.0	239.0*	106 .0	62.0*	191.1	161.5	375.3	161.6***	178.4	61.2***
Proportion of energy (%)	20.9	15.9***	5.1	4.9	2.7	1.9*	3.0	3.2	5.3	2.7***	2.8	1.1***
Proportion of vitamin C (%)	60.9	57.2	1.9	0.4***	0.9	0.9	41.1	38.9	0.0	0.0	15.7	12.4[E]
Proportion of calcium (%)	44.3	38.8**	29.8	25.2*	9.1	5.4*	1.3	2.5*	0.9	0.4***	1.3	0.4[E]***
Proportion of vitamin D (%)	56.5	46.7**	43.7	35.4*	12.2	7.5*	0.0	1.4[E]**	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	13.5	11.7*	8.6	7.7	4.6	2.8*	0.1	0.1	0.0	F	0.1	0.0[E]***
Proportion of moisture (%)	74.5	72.9	10.3	8.5*	3.2	2.1*	6.2	5.7	12.3	5.8***	5.8	2.2***
Proportion of proteins (%)	14.0	10.9**	9.5	7.8*	3.0	1.8*	1.0	0.8	0.0	0.0[E]***	0.1	0.1*
Proportion of sugars (%)	52.6	47.0*	9.2	10.4	5.1	4.4	8.0	10.6	22.3	11.8***	5.2	3.9
Female, 14 to 18 years												
Quantity (grams)	1,693.0	1,486.0**	201.0	149.0*	78.0	64.0	164.1	77.9***	178.2	80.0***	167.4	52.0***
Proportion of energy (%)	19.7	15.9***	4.5	4.0	2.7	2.6	3.7	2.1***	3.5	1.9***	3.7	1.3***
Proportion of vitamin C (%)	61.1	57.2	1.4	0.3***	1.0	1.7	38.6	28.5**	0.0	0.0	18.7	11.7[E]
Proportion of calcium (%)	42.8	38.8*	26.9	21.9*	9.2	7.5	1.5	1.4	0.6	0.3***	1.8	0.5[E]***
Proportion of vitamin D (%)	55.5	46.7*	41.3	30.1**	12.7	9.9	0.0	F*	0.0	0.0	F	0.0
Proportion of saturated fats (%)	12.1	11.7	7.3	5.9*	4.1	3.3	0.1	0.1***	F	F	F	0.0[E]*
Proportion of moisture (%)	73.6	72.9	8.3	6.7*	3.0	2.7	6.7	3.5***	7.4	3.6***	6.8	2.4***
Proportion of proteins (%)	14.5	10.9***	9.3	7.2*	3.3	2.5	1.2	0.6***	0.0	0.0[E]***	0.2 [E]	0.1[E]*
Proportion of sugars (%)	47.3	47.0	8.0	8.0	5.4	6.0	9.9	6.7**	14.1	7.8***	7.4	4.5*

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*** significantly different from 2004 ($p < 0.0001$)
Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

percentage points among children aged 2 to 3, the population aged 14 to 30 and females aged 51 to 70 than in 2004 (data not shown). In 2015, between 5% and 37% of the population consumed more fruit juice than whole fruit. This proportion was lower by at least 10 percentage points in 2015 among the population younger than 19 and females aged 51 to 70 (see the green arrows pointing down in Figure 2).

For milk consumption, the 2007 CFG recommends 500 mL, or two servings, a day of skim, 1% or 2% milk or fortified plant-based beverages. The number of total milk and alternatives servings, including milk, cheese and yogurt, was above two servings a day, on average, among children aged 2 to 13 and boys aged 14 to 18 (Figure 3), but not for the rest of the population. This translated to the majority of adults failing to meet the 2007 CFG recommendation of consuming at least two servings of milk and alternatives a day (data not shown). Among the population younger than 19, one-third to one-half consumed less than two servings of milk and alternatives a day. Among the entire population, skim, 1% or 2% milk or fortified plant-based beverages represented, on average, one-third of all milk and alternatives servings (Figure 3). This means that

more than 90% of Canadians were not consuming at least two servings a day of these products in 2015 (data not shown).

Although the average number of milk and alternatives servings consumed has changed little since 2004 among most age and sex groups, there was a significant decrease in the average number of servings of skim, 1% or 2% milk or fortified plant-based beverages among all age and sex groups (Figure 3).

Discussion

The first objective of this study was to describe any changes in beverage consumption between 2004 and 2015. Changes in the consumption of a specific beverage can result from a change in the number of consumers (fewer people consuming the same amount), serving size (the same number of people consuming less), or a combination of the two. The changes observed for water, regular soft drinks and fruit drinks were mostly because of a change in the proportion of consumers for each specific beverage type the day before, rather than a change in the quantity consumed. For milk and fruit juice, especially among children, most of the changes observed were because of a change in serving sizes.

The second objective was to relate these changes to the 2007 CFG recommendations. The 2007 CFG included four statements related to beverages, each emphasizing one or more beverages.

Table 3
Percentage of population consuming beverages the day before and quantity consumed, by age, year and type of beverage, household population aged 19 or older, Canada excluding territories, 2004 and 2015

	19 to 50 years, male		19 to 50 years, female		51 to 70 years		71 years or older	
	2004	2015	2004	2015	2004	2015	2004	2015
Beverage	percent							
Percentage of population consuming the day before								
Water	76.8	86.3***	83.5	90.8***	77.1	84.5***	74.5	82.3***
Skim, 1% or 2% milk	50.0	38.0***	55.3	44.3***	56.0	49.0***	67.1	55.2***
Whole milk and flavoured milk	14.0	14.3	12.6	14.4	11.3	10.1	11.4	9.5
Fruit juice	29.6	25.0*	29.6	22.2**	31.5	19.6***	36.2	28.5**
Regular soft drinks	36.1	23.6***	21.9	13.0***	17.6	13.3*	9.4	9.6
Fruit drinks	15.7	7.2***	15.7	7.6***	9.2	6.5*	12.7	9.4*
Sports drinks	2.2	2.1[E]	F	F	F	0.7[E]*	F	F*
Diet soft drinks	7.6	6.4	11.3	6.9**	11.5	10.0	5.7	6.1
Tea (including iced tea)	24.6	24.2	33.5	36.5	39.9	36.8	52.8	44.7**
Coffee	59.8	64.3*	55.2	57.6	76.6	73.3*	70.7	73.6
Plant-based beverages	1.5[E]	3.8[E]*	3.5	5.3	2.6	4.5*	1.9[E]	2.6[E]
Vegetable juice	3.7	2.6[E]	3.8[E]	1.3[E]*	5.3	2.3[E]***	4.2	4.1
Beer and coolers	25.7	21.8	8.5	6.1*	13.3	12.6	6.3	6.7
Wine	7.0	6.9	10.5	9.9	16.1	16.2	12.0	15.0
Spirits and liqueurs	4.1	3.4	2.1	2.4[E]	3.7	3.4	4.0	3.8
Alcoholic beverages	1.9[E]	1.5[E]	2.7	2.0[E]	1.9	1.1[E]*	1.6[E]	1.7[E]
Total beverages	99.9	100.0	99.7	99.7	99.9	99.8	99.9	99.7
	grams							
Quantity consumed in grams by consumers								
Water	1,204	1,266	1,245	1,103*	1,003	1,022*	790	746
Skim, 1% or 2% milk	329	257**	275	196***	236	199**	243	206*
Whole milk and flavoured milk	332	363	321	286	239	241	214	177
Fruit juice	443	349**	342	283*	280	245*	223	237
Regular soft drinks	627	524**	500	416*	485	479	330	362
Fruit drinks	498	462	431	323**	339	270*	246	248
Sports drinks	838	719[E]	500	675[E]	453	760*	441[E]	571
Diet soft drinks	639	557	530	462	461	509	419	411
Tea (including iced tea)	499	517	488	429*	503	449*	484	407***
Coffee	632	554**	572	449***	551	520*	443	411
Plant-based beverages	F	228	272	196*	267	204	218	229
Vegetable juice	360	296	229	302	288	276	225	220
Beer and coolers	994	930	616	574	778	746	544	571
Wine	356	303	273	244	265	322*	188	248*
Spirits and liqueurs	128	210[E]	188[E]	184[E]	91	182[E]*	70	81
Alcoholic beverages	547[E]	446[E]	454	441	347	365	200	292[E]
Total beverages	2,461	2,279**	2,175	1,817***	1,995	1,893**	1,591	1,488*

[E] use with caution
F too unreliable to be published
* significantly different from 2004 ($p < 0.05$)
** significantly different from 2004 ($p < 0.001$)
*** significantly different from 2004 ($p < 0.0001$)

Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

Table 4
Quantity and contribution of selected beverages to nutrient intake by year, age and sex group, and type of beverage, household population aged 19 or older, Canada excluding territories, 2004 and 2015

	Total beverages		Skim, 1% or 2% milk		Whole milk and flavoured milk		Fruit juice		Soft drinks		Fruit drinks	
	2004	2015	2004	2015	2004	2015	2004	2015	2004	2015	2004	2015
Male, 19 to 50 years												
Quantity (grams)	2,458.0	2,279.0*	164.0	97.0***	46.3	51.7	131.0	87.2**	226.6	123.7***	78.3	33.4E***
Proportion of energy (%)	18.1	15.6**	2.9	2.0***	1.3	1.8E	2.3	1.8*	3.6	2.2***	1.3	0.6E***
Proportion of vitamin C (%)	46.6	41.5	1.2	0.2***	0.5	1.7E*	33.2	25.5*	0.0	0.0	9.3	9.1E
Proportion of calcium (%)	34.5	29.2**	20.3	12.9***	5.1	5.9	1.1	1.6	0.7	0.3***	0.7	0.3E***
Proportion of vitamin D (%)	38.6	31.7**	29.6	19.3***	6.9	8.1	0.0	0.9E**	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	7.9	8.1	4.7	3.2***	2.4	3.0E	0.1	0.1	F	F	0.0	0.0E**
Proportion of water (moisture) (%)	74.9	75.7	4.7	3.0***	1.2	1.5	3.7	2.6*	6.5	3.8***	2.2	1.0E***
Proportion of proteins (%)	9.0	7.4*	5.2	3.3***	1.4	1.6E	0.7	0.5*	0.0	0.0E***	0.0	0.0E
Proportion of sugars (%)	43.9	40.0*	6.6	5.2*	3.2	4.8E	8.0	7.5	18.5	12.1***	3.6	3.0E
Female, 19 to 50 years												
Quantity (grams)	2,169.0	1,813.0***	152.0	87.0***	40.4	41.0	101.2	63.0***	109.4	54.2***	67.6	24.5***
Proportion of energy (%)	16.2	12.9***	3.6	2.4***	1.5	1.8	2.4	1.8*	2.3	1.3***	1.5	0.6***
Proportion of vitamin C (%)	41.9	33.4**	1.2	0.1***	0.6	1.8E*	28.7	20.4***	0.0	0.0	9.3	5.7**
Proportion of calcium (%)	35.5	31.5**	21.8	14.2***	5.2	5.5	1.2	1.6	0.4	0.2***	0.6	0.2E***
Proportion of vitamin D (%)	41.3	34.6*	31.3	20.6***	6.9	7.6	0.0	0.6E*	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	9.4	8.7	5.6	4.0**	2.7	2.7	0.1	0.1E	F	F	0.0	0.0***
Proportion of water (moisture) (%)	76.1	74.2*	5.0	3.3***	1.2	1.4	3.2	2.3**	3.6	2.1***	2.2	0.9***
Proportion of proteins (%)	10.6	8.5***	6.7	4.1***	1.7	1.7	0.8	0.8E	0.0	0.0E***	0.1	0.0*
Proportion of sugars (%)	37.6	33.3**	7.7	5.7***	3.3	4.6E*	7.0	6.5	11.1	6.5***	4.0	2.8*
Both sex, 51 to 70 years												
Quantity (grams)	1,994.0	1,890.0*	132.0	97.0***	27.0	24.2	88.3	47.9***	85.5	63.9*	31.1	17.7***
Proportion of energy (%)	14.2	13.2*	3.1	2.5**	0.9	1.0	2.1	1.2***	1.7	1.4*	0.7	0.4***
Proportion of vitamin C (%)	33.9	26.8***	1.1	0.1***	0.3	1.0E*	24.1	17.0***	0.0	0.0	5.6	4.7
Proportion of calcium (%)	32.4	29.7*	20.6	15.8***	3.7	3.1	1.0	1.5*	0.3	0.2**	0.3	0.2E
Proportion of vitamin D (%)	29.1	27.2	23.3	19.5*	3.9	3.7	0.0	1.0E***	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	7.4	6.5*	4.9	3.9*	1.8	1.5	0.1	0.0***	F	F	0.0	0.0*
Proportion of water (moisture) (%)	72.4	73.7*	4.5	3.5***	0.9	0.8	2.9	1.7***	2.9	2.3*	1.0	0.6**
Proportion of proteins (%)	8.5	7.4**	5.4	4.3***	1.0	1.0	0.6	0.4***	0.0	0.0E**	0.0E	0.0
Proportion of sugars (%)	30.6	27.1*	7.1	6.2*	2.1	2.7	7.0	4.5***	8.8	7.0*	2.6	1.9*
Both sex, 71 years or older												
Quantity (grams)	1,589.0	1,484.0*	163.0	114.0***	24.4	16.7*	80.5	67.7*	31.2	34.7	31.3	23.3*
Proportion of energy (%)	12.7	12.4	4.5	3.3**	0.9	0.7	2.2	2.0	0.7	0.9	0.9	0.7*
Proportion of vitamin C (%)	36.5	36.8	1.5	0.2***	0.4E	0.3E	26.0	24.8	0.0	0.0	6.9	7.5
Proportion of calcium (%)	37.7	31.5***	27.6	20.4***	3.7	2.4*	1.1	2.1***	0.1	0.1	0.3	0.3E
Proportion of vitamin D (%)	32.7	30.8	27.7	24.7	3.5	2.9	0.0	1.4E***	0.0	0.0	0.0	0.0
Proportion of saturated fats (%)	10.1	6.9***	7.2	5.3**	2.1	1.1**	0.1	0.1*	F	0.0	0.0	0.0*
Proportion of water (moisture) (%)	69.0	70.5*	6.6	5.0**	0.9	0.7*	3.2	2.9	1.3	1.5	1.2	1.0
Proportion of proteins (%)	10.7	8.8*	7.8	6.0*	1.1	0.7*	0.7	0.6	0.0	F*	0.0	0.0E
Proportion of sugars (%)	25.8	26.7	9.3	7.6*	1.8	1.7	6.6	6.9	3.3	4.3	3.1	2.7

E use with caution
F too unreliable to be published
* significantly different from 2004 ($p < 0.05$)
** significantly different from 2004 ($p < 0.001$)
*** significantly different from 2004 ($p < 0.0001$)
Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

1) Drink water regularly.

Water was the most popular beverage in 2015. Water consumption was higher in 2015 and contributed more to hydration in the form of moisture in 2015, compared with 2004. The new CFG also recommends water as the beverage of choice.[5] However, the recommendation to drink water regularly is not quantified because quantifying water intake is difficult and intake varies according to individual metabolism, environment and activity level.[1]

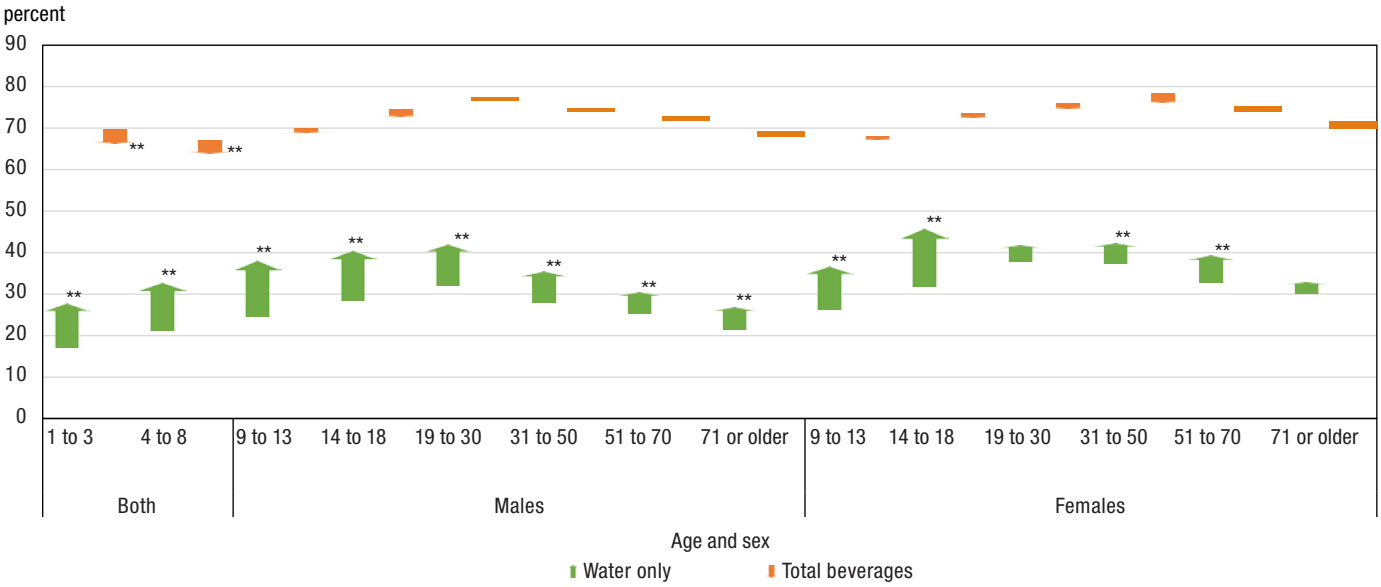
2) Have vegetables and fruit more often than juice.

Less than 10% of the population consumed more juice than vegetables and fruit. However, when only fruit are considered, the proportion of the population who consumed more juice was higher, particularly among teenage males (37%) in 2015. Fruit juice consumption was lower in 2015, which resulted in a higher proportion of the population consuming fewer than the recommended number of vegetable and fruit servings in 2015 compared with 2004. Evidence from other sources also suggests a decrease in fruit juice consumption in the Canadian population. The availability of apple and orange juice decreased by more than 25%

between 2004 and 2015.[8] The CCHS showed that the frequency of fruit juice consumption decreased from 0.9 times a day in 2007 to 0.6 times a day in 2014.[18]

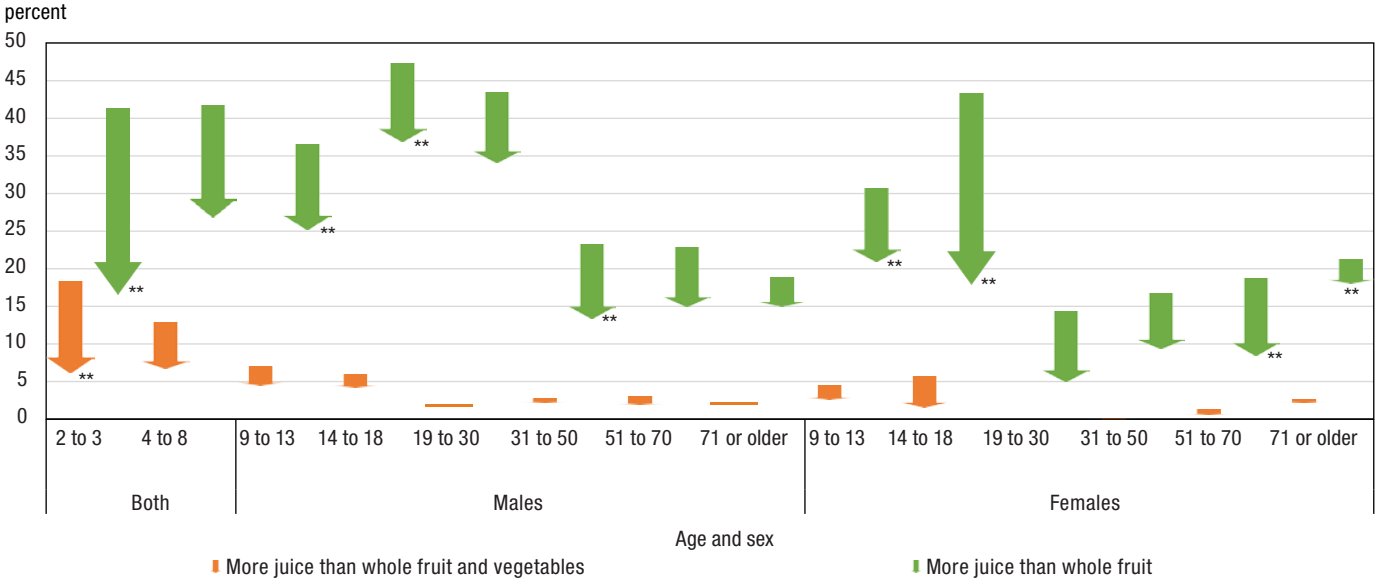
Fruit juice consumption has been under scrutiny recently,[19] mostly because of fruit juice's free sugars and energy content. The new 2019 CFG[5] recommends reducing free sugars, of which fruit juice is a source, by consuming a majority of total sugars from nutritious foods such as whole vegetables and fruit.

Figure 1
Change in the contribution of both total beverage and water to daily moisture intake, by age and sex, household population aged 1 or older, Canada excluding territories, 2004 to 2015



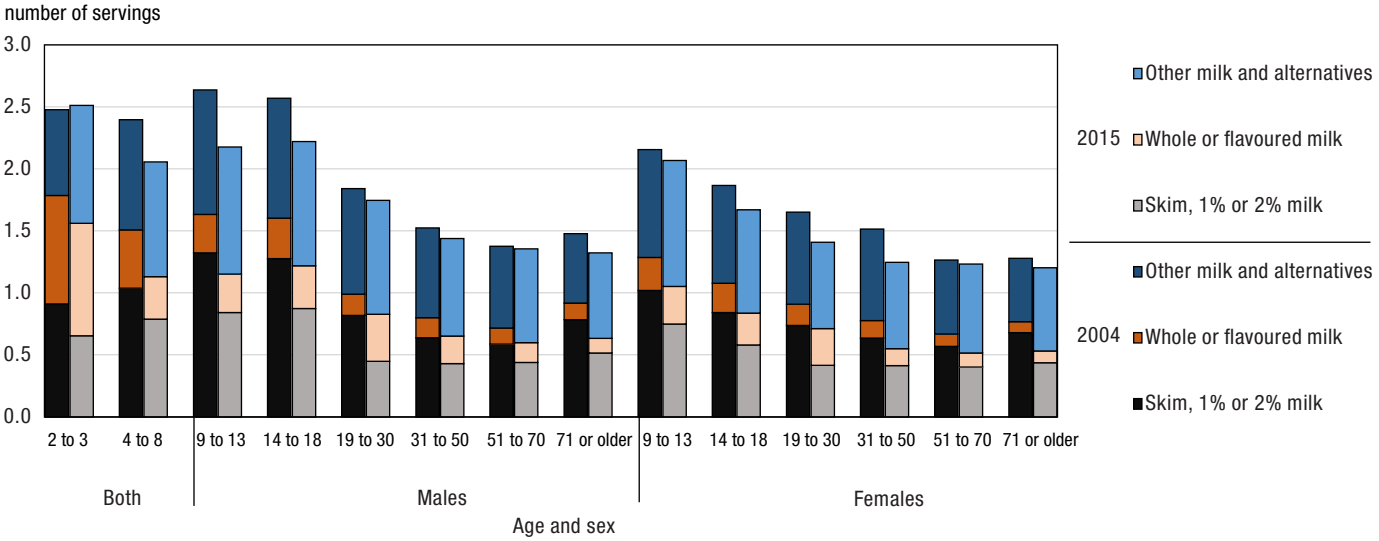
** significantly different from 2004 ($p < 0.001$)
Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

Figure 2
Change in the proportion of the population consuming more juice than whole fruit and vegetables or whole fruit only, by age and sex, household population aged 2 or older, Canada excluding territories, 2004 to 2015



** significantly different from 2004 ($p < 0.001$)
Note: More juice than whole fruit and vegetables (or whole fruit) represents a usual intake of the ratio of fruit and vegetable juice (or fruit juice) servings over all fruit and vegetable (or all fruit) servings defined by the 2007 CFG above 50%.
Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

Figure 3
Average servings of milk and alternatives consumed, by subcategory, age and sex, household population aged 2 or older, Canada excluding territories, 2004 and 2015



Notes: 2015 skim, 1% or 2% milk consumption is significantly different from 2004 at $p < 0.001$ for all categories, except among males aged 51 to 70.
Total milk and alternatives consumption is significantly different from 2004 for children aged 2 to 8 and women aged 31 to 50 at $p < 0.001$.
Source: Canadian Community Health Survey – Nutrition, 2004 and 2015.

Confirming what was shown by Langlois et al.,[3] the proportion of total sugars from fruit juice was highest among the younger age groups and was lower in 2015 than in 2004. In fact, the largest difference in quantity consumed was observed among children aged 1 to 3, girls aged 14 to 18 and adults aged 51 to 70. The decrease in juice intake also largely explains the decrease in vitamin C intake among the same age groups. Among adults, the average vitamin C intake was 20% lower in 2015, translating to a 14 percentage point increase among the proportion of the population with vitamin C intake below the estimated average requirement.[20]

3) Drink skim, 1% or 2% milk each day. Have 500 mL of milk every day for adequate vitamin D. Drink fortified soy beverages if you do not drink milk.

For most of the population, consumption of milk and alternatives did not change between 2004 and 2015, remaining below two servings a day. Average consumption of skim, 1% or 2% milk (a subset of milk and alternatives) was below the 2007 recommended intake of 500 mL, or two servings, a day in both survey years—and lower in 2015 than in 2004. A recent systematic review[21] concluded that in addition to meeting nutrient recommendations, milk and alternatives contribute other potential health benefits and have few adverse effects. The new 2019 CFG includes milk in the protein foods category and includes consuming unsweetened milk as an example for lowering free sugar intake. Although lower milk intake decreased saturated fat intake in the population, it also decreased the intake of a number of other nutrients, including calcium and vitamin D. The majority of the population already has calcium and vitamin D intakes below the estimated average requirements.[20] Without knowing what milk is being replaced with, it is difficult to fully understand the effect of lower milk intake. Theoretically, it is possible to obtain similar nutrient intakes from other sources.[22]

4) Limit foods and beverages high in calories, fats, sugar or salt (sodium) such as… alcohol, fruit flavoured drinks, soft drinks, sports and energy drinks, and sweetened hot or cold drinks.

Consumption of energy-dense beverages, particularly regular soft drinks and fruit drinks, was lower in 2015 than in 2004. This difference was mostly because of a change in the proportion of the population consuming these beverages. These findings are in line with food availability statistics[8] that showed a decrease of 39% in soft drink availability between 2004 and 2015. Decreases in soft drink[23] and sugar-sweetened beverage consumption[24] have also been observed in the United States.

Strengths and limitations

This analysis is based on the first nationally representative, detailed nutrition survey in over 10 years. The 24-hour recall methodology allowed both the quantity and the frequency of beverage intakes to be examined. It was possible to compare beverage intakes with CFG recommendations using the NCI method. Compared with per capita statistics, this analysis was done using age and sex groups.

Some limitations of this study are inherent to nutrition surveys. Misreporting, especially underreporting, is common for self-reported dietary

intakes.[25-28] To examine the impact of misreporting, this analysis was repeated by classifying respondents as underreporters, plausible reporters and overreporters (data not shown) according to previously published methodology.[2] Although the estimated values were generally higher, the differences between 2004 and 2015 were similar among plausible reporters.

Different CNFs were used in 2004 and 2015. Changes to the CNF can reflect changes in the food industry (e.g., food reformulations) or the way the database was built (e.g., amalgamation of certain foods). These changes were minimal for beverages. The changes observed in this analysis for beverage intakes since 2004 were mostly due to changes in the frequency and quantity of beverages consumed, rather than changes in the nutrient profiles of a specific beverage.

Changes to the food model booklet could have affected the reported quantity of beverages consumed.[10] The average quantity of total beverages consumed was 12% lower in 2015 than in 2004 among children and teenagers (Table 1), and between 5% and 16% lower among adults (Table 2), which may reflect changes made to the food model booklet used in the survey. If changes to the booklet affected the reported quantity of beverages consumed, however, the expectation would be for all beverage quantities to be lower in 2015. In fact, the average quantity of water consumed was generally higher in 2015 than in 2004.

In cases where changes were explained by differences in the proportion of people who consumed a specific beverage the day before the interview, conclusions are unlikely to have been affected by changes made to the food model booklet. This is because the booklet should not affect the reporting of whether or not a person consumed a beverage. In cases where the quantity consumed explains most of the changes, the difference in overall quantity consumed between 2004 and 2015 will likely decrease. However, it is not possible to know whether a respondent would have chosen the same ranking of drawings for a given cup or glass in 2015 and in 2004. For example, respondents could have used the second-largest cup drawing in 2004 and the largest cup photo in 2015 to estimate the same drink container. Finally, not all beverages are reported with the help of the food model booklet. Direct quantities or standard servings (a can of soft drink, for example) may have been used and would mitigate the effect of changes resulting from the booklet.

Conclusion

Overall, beverage consumption patterns in Canada changed between 2004 and 2015. Except for water, the consumption of most beverages, including milk, fruit juice, fruit drinks and regular soft drinks, was lower in 2015 than in 2004. This affected energy intake and the intake of many nutrients such as sugar, saturated fats, calcium, and vitamins C and D. The trends observed are more in line with recommendations in the 2007 CFG, particularly for higher intakes of water and lower intakes of sugar-sweetened beverages. Increasing water consumption and lowering sugar-sweetened beverage consumption are also in line with recommendations in the 2019 CFG. ■

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