

Sweetened and unsweetened non-alcoholic beverages in New Zealand: assessment of relative availability, price, serve size, and sugar content

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ABSTRACT

Background : Sweetened beverages are a major contributor to sugar intakes in New Zealand, yet little information exists regarding the retail environment and the characteristics of sweetened and unsweetened beverages available for purchase.

Aim : Our aim was to assess the availability, price, serve size and sugar content of sweetened and unsweetened non-alcoholic beverages available for purchase in New Zealand supermarkets. We also review and summarise the evidence for policy options relating to beverage availability, price, serve size and sugar content.

Methods : Data on all non-alcoholic beverages available for purchase in two large Auckland supermarkets were sourced from Nutritrack, a brand-specific packaged food composition database.

Results : Of 680 beverages available for sale in 2012, less than one in five (17%) was low-energy or unsweetened. However, low-energy options were cheaper, on average, than their sugar-sweetened counterparts (by approximately one third). The sugar content of beverages available ranged from zero to 23g/100mL. Some beverages contained more than 80g of sugar (16 teaspoons) per single serve. National and international evidence suggests that increasing prices of fizzy drinks could reduce consumption, but long-term impacts on obesity and population health are unknown. Little evidence exists regarding other strategies to create healthier retail food environments.

Conclusion : The vast majority of beverages available for purchase in New Zealand supermarkets are either sugar-sweetened or contain naturally occurring sugars. Options to decrease availability and reduce consumption of sweetened beverages should be urgently explored.

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Introduction

High intakes of dietary sugars are associated with increased body weight¹, and greater risk of gout², Type 2 diabetes, and cardiovascular disease in adults^{3,4}. Whilst there is no specific dietary recommendation for maximum sugar intake, the New Zealand food and nutrition guidelines recommend limiting consumption of foods, drinks and snacks with added sugar⁵. Almost one fifth of total sugar intake of New Zealand adults (17%) comes from non-alcoholic beverages⁷. There is little difference in this proportion by ethnic group but marked differences by age; 27-29% sugar intake in 15-18 year olds comes from non-alcoholic beverages versus 7-8% in those aged 71+ years⁷. Younger New Zealand children (5-14 years) obtain 24% of their sugar intake from beverages⁸. There is particular concern about sugar-sweetened beverage consumption because these drinks are nutrient poor and energy in liquid form may be less satiating than when derived from solid foods, resulting in increased consumption⁹.

Food environments have considerable impact on our food choices¹⁰. In New Zealand, the current food environment is largely dominated by energy-dense, nutrient-poor processed foods that are widely available, relatively inexpensive and heavily promoted^{11,12}. This food environment promotes unhealthy diets, energy overconsumption and unhealthy weight gain¹². In order to reduce our high rates of obesity and nutrition-related disease, we need to create a healthier food environment, and thus shift population diets towards dietary guidelines¹³.

Aspects of the food environment known to impact on food and beverage purchases and consumption include product availability, price, and serve size. However, the only one of these aspects where guidelines are provided for manufacturers is serve size, where Government departments such as the United States Food and Drug Administration (FDA) provide reference amounts¹⁴. The aim of our research was to assess current availability, price, serve size, and sugar content of sweetened and unsweetened beverages available for purchase in New Zealand supermarkets. We also summarise available evidence for policy actions that could reduce sugar-sweetened beverage consumption.

Data sources and methods

The availability, price, serve size, and sugar content of sweetened and unsweetened beverages in New Zealand were assessed using 2011 and 2012 data from the Nutritrack database, a branded food-composition database^{15,16}. Nutritrack data are collected using a cross-sectional survey design. Data are collected directly from the nutrition information panels (NIP) on all packaged food and beverage products for sale at selected supermarkets. Two fieldworkers collect data and categorise products in-store between February and May each year. Quality of data is ensured by one person who completes value range checks on the full sample and a 10% quality check on a random 10% sample of collected data.

In 2011 (n=6,020) Nutritrack data were collected from one large Auckland supermarket. Pricing data as displayed on the supermarket shelf were also collected. Where products were

on sale, the sale price, rather than the regular price, was recorded. Price was recorded for one pack size per product (where more than one pack size was available, prices were collected for the most commonly purchased pack). 2012 Nutritrack data (n=8,440) were collected in the same way from two large Auckland supermarkets. However, pricing data were not collected in 2012 because prices vary by supermarket, and products already collected at the first supermarket were not collected again.

All non-alcoholic, ready-to-drink beverages in the Nutritrack database were included and categorised as 'sweetened', 'unsweetened' or 'low energy' (box 1).

Sweetened drinks were defined as those containing high amounts of sugar, whether sugar was added during processing or naturally occurring. Unsweetened drinks were defined as those containing a naturally low level of sugar; low energy drinks were artificially sweetened. Dry and concentrated cordial/beverage mixes (e.g. Raro, hot chocolate) were excluded because Nutritrack data are entered 'as purchased', prior to reconstitution, and these types of beverages have substantially different serve sizes and sugar contents (prior to reconstitution) compared with ready-to-drink beverages. Soda water and plain bottled waters were also excluded because it is not mandatory for such products to display a NIP in New Zealand¹⁷.

Analyses were completed in Microsoft Excel. Mean (SD), minimum and maximum sugar content, price, serve size, and pack size were calculated overall and by beverage category. For serve and pack size analyses, beverages included were only those intended to be consumed in one sitting and hav-

Box 1: Beverage classification system*

Sweetened	Unsweetened	Low energy
Sugar sweetened: Electrolyte drinks Energy drinks Fizzy drinks Flavoured milk Fruit drinks Ice tea drinks Liquid breakfasts	Low natural sugars: Plain milk Vegetable juice	Artificially sweetened**: Energy drinks Fizzy drinks Flavoured waters Fruit drinks Ice tea drinks
Natural sugars: Fruit and vegetable juice Fruit juice		

* Plain water was excluded because it is not mandatory for these beverages to display a nutrition information panel in NZ17

** No low energy electrolyte drinks or liquid breakfasts were recorded during 2012 Nutritrack data collection

ing a pack size of 800mL or less. Multi-serve packs were excluded from this analysis since they are generally intended to be consumed over multiple occasions. The United States Food and Drug Administration (FDA) beverage reference/guideline amount to be consumed in one sitting¹⁴ (240mL for fizzy drinks, non-carbonated beverages, milk, and water) was used to assess the proportion of beverages that met serve size guidelines.

Results

Availability

Six hundred and eighty non-alcoholic, ready-to-drink beverages were available for sale in two major Auckland supermarkets in 2012 (Table 1). This number encompassed all available product pack sizes and reflected 484 unique beverage products.

Table 1: Sugar content of low energy, sweetened and unsweetened beverages available for purchase at two major Auckland supermarkets (2012)*

Type of beverage	N	Sugar content (g/100mL)				Sugar content (g/serve)			
		Mean	SD	Range		Mean	SD	Range	
				Minimum	Maximum			Minimum	Maximum
Low energy	79	0.88	1.22	0.00	4.10	4.26	7.09	0.00	28.00
Artificially sweetened	79	0.88	1.22	0.00	4.10	4.26	7.09	0.00	28.00
Energy Drinks	8	0.16	0.46	0.00	1.30	0.81	2.30	0.00	6.50
Fizzy drinks	42	0.17	0.43	0.00	1.70	0.55	1.46	0.00	5.78
Flavoured water	25	2.20	1.18	0.00	4.10	11.57	8.62	0.00	28.00
Fruit drinks	3	2.00	0.00	2.00	2.00	5.00	0.00	5.00	5.00
Ice tea drinks	1	0.50	n/a	0.50	0.50	2.50	n/a	2.50	2.50
Sweetened	532	9.86	2.28	3.30	23.00	30.38	13.14	4.10	81.65
Added sugars	348	9.64	2.36	3.90	23.00	32.36	14.48	4.10	81.65
Electrolyte Drinks	28	6.40	1.72	3.90	14.20	39.52	13.73	14.00	60.00
Energy Drinks	39	10.91	1.16	5.90	13.90	42.32	12.81	16.82	69.50
Fizzy drinks	176	10.44	2.29	4.10	23.00	34.55	14.83	4.10	81.65
Flavoured milk	44	8.78	0.93	5.80	11.30	23.68	10.90	13.60	55.20
Fruit drinks	26	10.54	1.82	5.90	14.10	23.72	7.38	4.13	33.66
Ice tea drinks	18	6.70	1.13	4.53	8.40	23.47	7.89	11.33	36.00
Liquid breakfasts	17	7.69	0.35	7.30	8.40	20.12	2.46	18.25	26.60
Natural sugars	184	10.28	2.05	3.30	17.80	26.64	9.05	6.13	54.50
Fruit and vegetable juices	9	8.82	0.59	7.50	9.30	23.09	3.02	18.75	27.90
Fruit juice	175	10.36	2.07	3.30	17.80	26.83	9.22	6.13	54.50
Unsweetened	69	4.63	0.65	1.50	5.10	9.62	1.26	3.75	12.25
Low natural sugars	69	4.63	0.65	1.50	5.10	9.62	1.26	3.75	12.25
Plain milk	65	4.76	0.43	1.50	5.10	9.78	1.09	3.75	12.25
Vegetable juice	4	2.63	0.05	2.60	2.70	6.89	0.62	6.50	7.80
TOTAL BEVERAGES	680	8.29	3.74	0.00	23.00	25.24	15.42	0.00	81.65

* Plain water was not included these data were not collected in the Nutritrack database. It is not mandatory in NZ for such products to display a Nutrition Information Panel.

Electrolyte drinks, energy drinks, fizzy drinks, fruit drinks, and ice tea drinks combined (both sugar-sweetened and low energy/artificially sweetened varieties) comprised the largest share of beverages (n=341; 50%), followed by fruit and vegetable juices (28%), milk (plain, flavoured, and liquid breakfasts) (19%), and flavoured waters (4%) (Figure 1). Plain milk made up just 10% of all beverages available for purchase. The largest sub-categories of beverages were fizzy drinks (n=218; 32% of all beverages), and fruit juice (n=175; 26% of all beverages) (Table 1 & Figure 1).

Just 17% of the beverages available for sale in supermarkets were unsweetened or low energy/artificially sweetened (Figure 2). Beverage categories with the greatest number of unsweetened/low-energy options were: milk (n=65, 52%), fizzy drinks (19%) and energy drinks (17%). There were no artificially sweetened or low-energy options available in electrolyte drinks.

Price

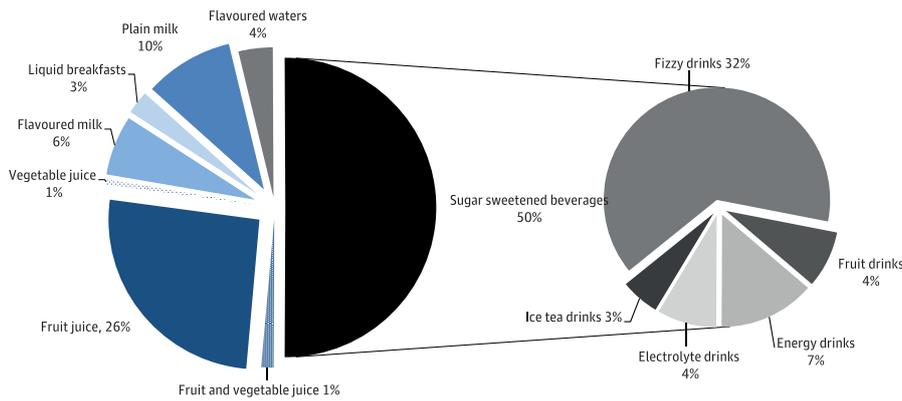
2011 price data were retrieved for 398 non-alcoholic, ready-to-drink beverages available in one large Auckland supermarket. Mean (SD) price of all available beverages was \$0.38 (0.27) per

100mL. Mean (SD) price of sweetened beverages was \$0.40 (0.30) per 100mL, whilst that of low-energy/artificially sweetened and unsweetened beverages was \$0.29 (0.20) per 100mL and \$0.27 (0.08) per 100mL respectively (Figure 3). A comparison of close substitute unsweetened and sweetened beverages showed that plain milk was cheaper than flavoured milk by 47% (\$0.26 versus \$0.48 per 100mL), and diet fizzy drinks were cheaper than sweetened fizzy drinks by 49% (\$0.17 versus \$0.34 per 100mL) (Figure 3).

Recommended serve size and pack size:

Manufacturer recommended serve size for single serve products covered a wide range from 70mL for sweetened fruit drinks to 800mL for flavoured waters and sweetened fruit drinks. Pack sizes varied from 200mL to 800mL (Table 2). Mean (SD) serve size was largest for low energy beverages (527 (223) mL), followed by sweetened (398 (176) mL) and unsweetened beverages (233 (41) mL) (Table 2). Only 12% of single serve beverages (n=28) displayed a recommended serve size that met FDA recommendations (≤ 240 mL). Most recommended serve sizes fell within the 241 to 420mL category (n=104; 46%) followed by

Figure 1: Proportional availability of beverages for sale at two major Auckland supermarkets (n=686; 2012)



* Plain water was excluded as it is not mandatory for such products to display a nutrition information panel in NZ

the 421 to 600 ml category (n=61; 27%) (Figure 4).

Sugar content:

As expected, the category with the highest average sugar content per 100mL was sweetened drinks (mean (SD), 9.9 (2.3) g/100mL). Within this, sub-categories with the highest mean (SD) sugar content were energy drinks (10.9 (1.2) g/100mL), fruit drinks (10.5 (1.8) g/100mL), fizzy drinks (10.4 (2.3) g/100mL), and fruit juice (10.4 (2.1) g/100mL) (Table 1). The mean (SD) sugar content of all sweetened beverages was approximately double that of unsweetened beverages (4.6 (0.7) g/100mL) and more than 10 times that of low energy beverages (0.9 (1.2) g/100g) (Table 2). Beverage sub-categories with the highest mean (SD) sugar content per serve were energy drinks (42.3 (12.8) g/serve), electrolyte drinks (39.5 (13.7) g/serve) and fizzy drinks (34.6 (14.8) g/serve) (Table 2).

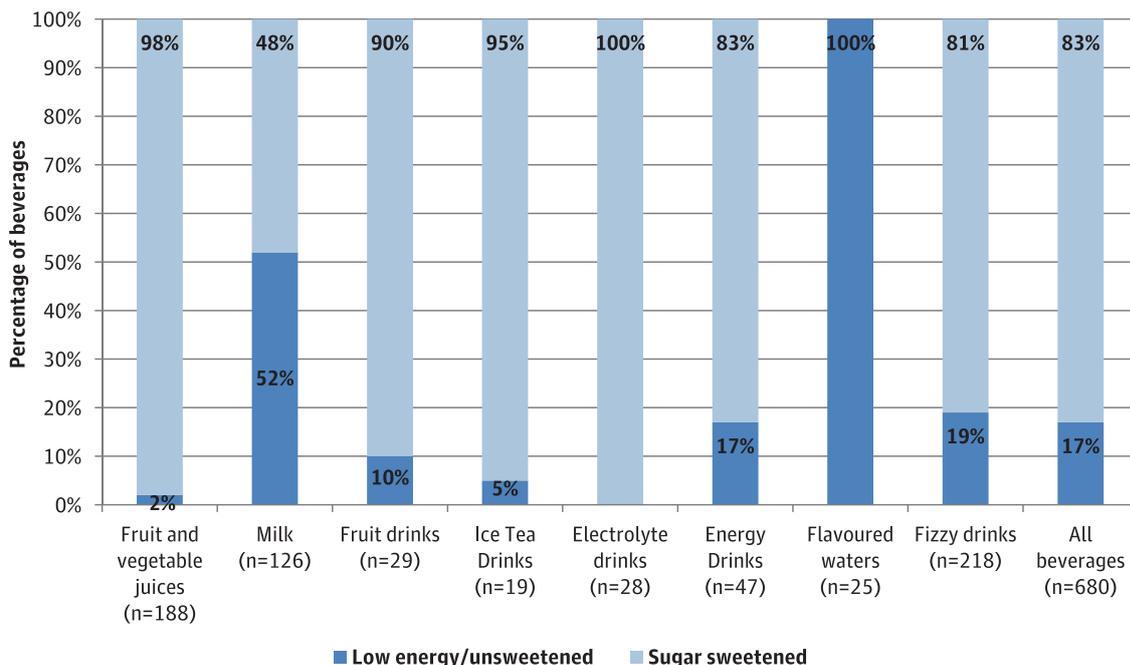
Evidence for policy action

Beverage availability:

To date, much of the focus with regards to restricting availability of sweetened beverages has been on schools. In the World Health Organization (WHO) Global Strategy on Diet, Physical Activity and Health, governments were ‘encouraged to adopt policies that support healthy diets at school and limit the availability of products high in salt, sugar and fats’¹⁸. In New Zealand, healthy food and beverage guidelines were developed and implemented by many schools; however these guidelines were repealed by the National government in 2008¹⁹. Retail food environments are increasingly considered influential in determining dietary behaviours and health outcomes. A recent review of the evidence on associations between food environments and dietary outcomes found that overall there is an association between retail food environments and dietary outcomes²⁰. Marketing studies have shown that product shelf space and displays in-store increase non-food product sales significantly²¹⁻²³. The cumulative shelf-space allocated to energy-dense snack foods is also positively associated with body weight; one study found that an additional 100 meters in shelf-space of snack foods within 1 km of place of residence was associated with an additional 0.1 BMI points²⁴.

To date, the New Zealand food retail environment has not been assessed systematically to determine the availability of healthy and unhealthy beverages. The data on availability of sweetened and unsweetened beverages presented in

Figure 2. Proportional availability of low energy and unsweetened beverage vs. sweetened beverages at two major Auckland supermarkets (2012)*



* Plain water was excluded as it is not mandatory for such products to display a nutrition information panel in NZ.

Table 2: Serve size and pack size of single serve beverages sold at two major Auckland supermarkets (2012)*

Type of beverage	Serve size (mL)					Pack size (mL)			
	N	Mean	SD	Range		Mean	SD	Range	
				Minimum	Maximum			Minimum	Maximum
Low energy	31	526.77	222.99	250	800	600.97	189.55	250	800
Artificially sweetened	31	526.77	222.99	250	800	600.97	189.55	250	800
Energy Drinks	4	295.00	52.60	250	350	295.00	52.60	250	350
Fizzy drinks	3	600.00	0.00	600	600	600.00	0.00	600	600
Flavoured water	23	558.70	236.28	250	800	658.70	166.28	350	800
Ice tea drinks	1	500.00	n/a	500	500	500.00	n/a	500	500
Sweetened	190	398.37	175.62	70	800	506.28	177.15	200	800
Added sugars	144	420.82	186.16	70	800	526.58	174.45	200	800
Electrolyte Drinks	24	581.25	207.37	250	750	612.50	168.92	300	750
Energy Drinks	30	413.10	101.03	250	500	413.10	101.03	250	500
Fizzy drinks	24	404.17	158.57	200	600	570.83	171.73	200	750
Flavoured milk	30	295.83	137.10	200	600	469.17	162.11	250	750
Fruit drinks	15	560.00	241.99	70	800	612.00	183.86	330	800
Ice tea drinks	10	433.00	86.93	325	500	433.00	86.93	325	500
Liquid breakfasts	11	268.18	40.45	250	350	677.27	161.81	350	750
Natural sugars	46	328.09	112.90	100	500	442.74	172.19	200	800
Fruit and vegetable juices	2	300.00	0.00	300	300	300.00	0.00	300	300
Fruit juice	44	329.36	115.33	100	500	449.23	173.32	200	800
Unsweetened	6	233.33	40.82	200	300	383.33	169.31	250	600
Low natural sugars	6	233.33	40.82	200	300	383.33	169.31	250	600
Plain milk	5	220.00	27.39	200	250	400.00	183.71	250	600
Vegetable juice	1	300.00	n/a	300	300	300.00	n/a	300	300
TOTAL BEVERAGES	227	411.54	187.72	70	800	515.96	182.17	200	800

* Plain water was not included these data were not collected in the Nutritrack database. It is not mandatory in NZ for such products to display a Nutrition Information Panel. Intended to be consumed in one sitting was defined as a package size 800mL or less. The US Food and Drug Administration reference amount to be consumed in one sitting for all beverages in the table is 250mL¹⁴

this paper were derived from two Auckland supermarkets and may not accurately represent beverage availability nationwide. However, a step-wise framework has been proposed to assess retail food environments globally, including availability of healthy and unhealthy foods and beverages in-store²⁰. Systematic, nationally representative, monitoring could provide robust data on availability of sugar-sweetened beverages over time; enable comparison of New Zealand with other countries; and identify the impact of any changes to sweetened beverage availability on health outcomes, such as obesity.

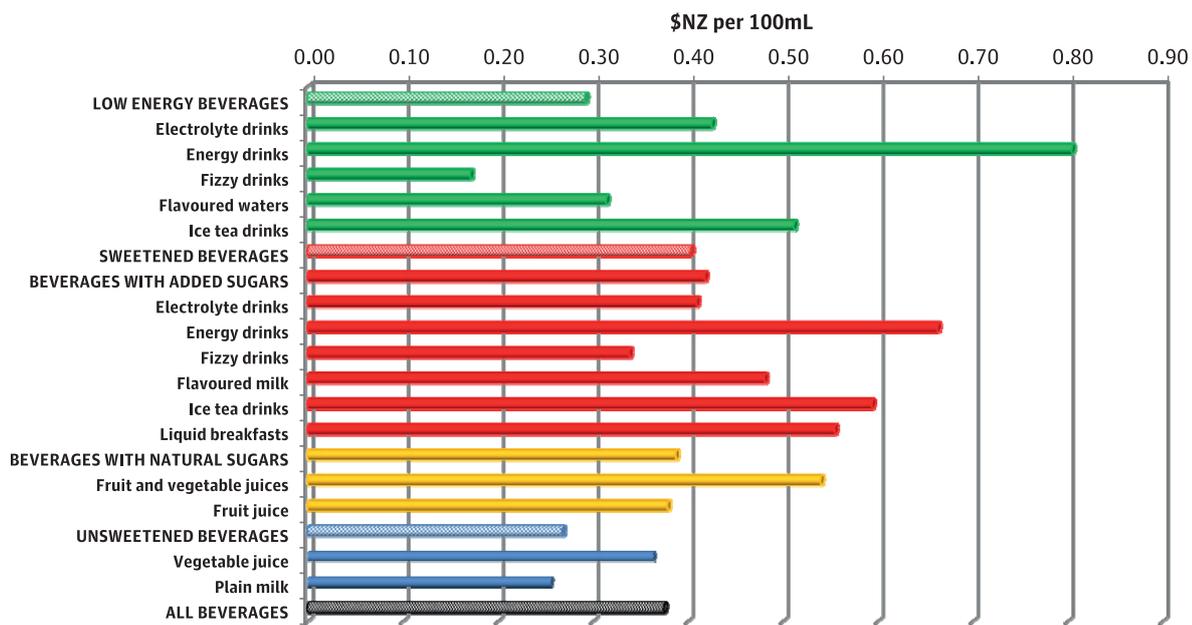
Beverage pricing:

A number of leading bodies have advocated health-related food taxes and subsidies to improve the nutritional quality of diets consumed, raise revenue to support population health

interventions, and send a clear message to consumers about which foods are healthier^{25,26}. We recently reviewed the international evidence on the association between carbonated drink taxes, and changes in consumption, health, and mortality from disease²⁷. When the findings of relevant studies were combined, we estimated that for each 1% increase in the price of fizzy drinks, there would be an overall 0.93% (range, -0.06%, -2.43%) reduction in consumption (n=5 studies) (Figure 5). These international data suggest that a fizzy drink tax of 20% would result in an overall 19% reduction in consumption of fizzy drinks.

In order to assess the effect of such pricing policies on population health and inequalities, it is important to determine consumer responsiveness to price changes across income levels and ethnic groups. In a recently published paper, we estimated price elasticity (PE) values for major commonly consumed

Figure 3. Mean price of beverages for sale at one major Auckland supermarket (2011; n=398)



* Plain water was excluded as it is not mandatory for such products to display a nutrition information panel in NZ.

food groups in New Zealand, by income and ethnicity²⁸. PE values represent percentage change in demand associated with 1% change in price of that good (own-PE) or another good (cross-PE). The own-PE estimate for fizzy drinks was -1.27 (SE 0.27), suggesting that a 20% tax on carbonated fizzy drinks in New Zealand could lead to a 26% decrease in population purchases. There was little difference in own-PE for carbonated fizzy drinks for the lowest versus highest income quintiles (average regression-based difference 0.07 (95% CI -4.71 to 4.84)), and no significant difference between Māori and non-Māori households (average difference 0.27 (95% CI -1.46 to 2.00)). These findings suggest that a SSB tax has potential to improve population diets. However, (in contrast to many other food groups in our analysis) income and ethnicity do not appear to influence consumer responsiveness to changes in price of carbonated drinks. Thus the potential impact of a SSB tax in New Zealand is likely to be similar across population groups.

Beverage serve and pack sizes:

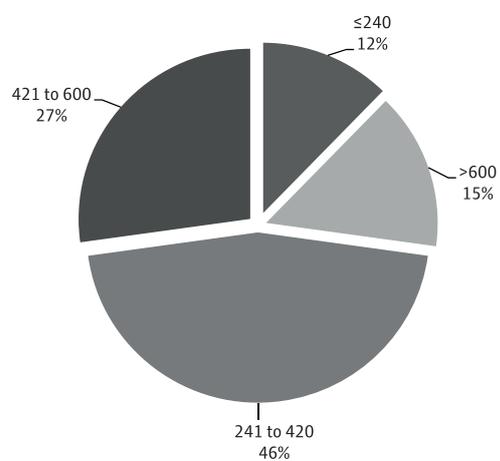
Empirical studies have shown that large portion sizes increase food intake²⁹⁻³¹ and it has been proposed therefore that interventions directed at portion size might help consumers to reduce their food intake³². In 2012, in an effort to curb obesity, New York City Mayor Michael Bloomberg introduced a proposal to limit beverage portion sizes of sugar-sweetened beverages to a maximum of 16 ounces (473mL). A state appeals court rejected the proposed regulation earlier this year, although the Mayor and the City are appealing the decision³³. The evidence regarding the impact of such portion size interventions is mixed. A portion size reduction of 25%, studies in a laboratory setting, was effective in decreasing energy intake³⁴. However, interventions to reduce portion sizes in college and worksite

settings have shown minimal effects on purchasing behaviour³⁵ and energy intakes³⁶.

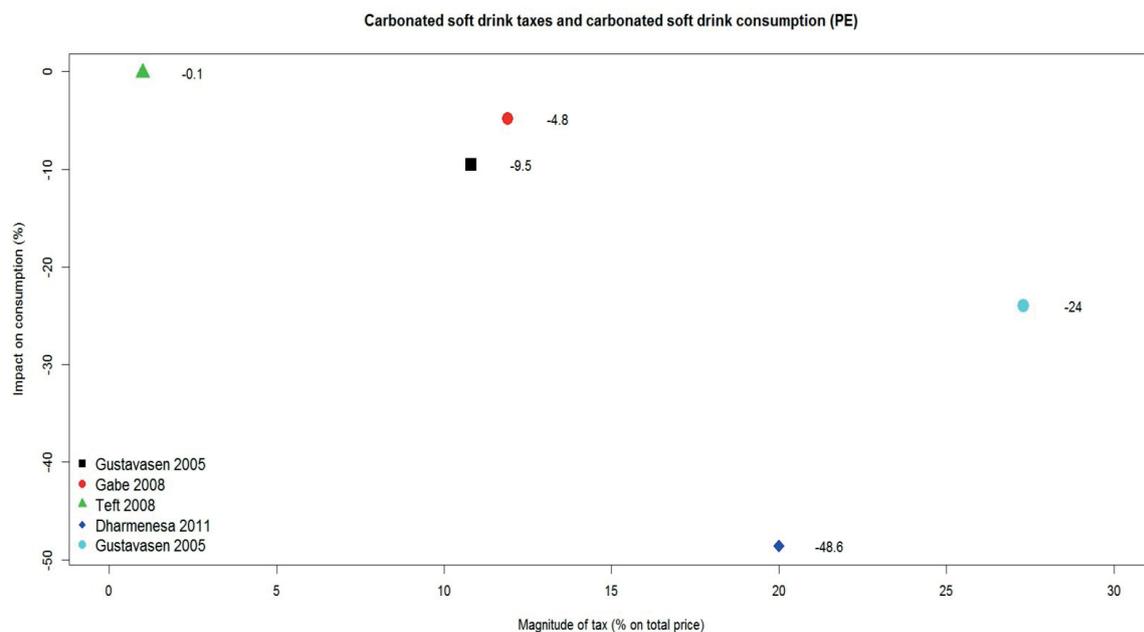
Sugar content:

There is currently no direct evidence regarding impact of policies to reduce the sugar content of beverages. However, there is evidence that sugar-sweetened beverage consumption is associated with weight gain. A recent systematic review and meta-analysis of the RCTs (n=30) and prospective cohort studies (n=38) explored the association between dietary sugars and

Figure 4. Percentage of single serve products meeting the FDA serving size recommendation (240ml; n=227; 2012)



body weight in both adults and children¹. For adults, reduced sugar intake was associated with a 0.80 kg (95% confidence interval 0.39 to 1.21; P<0.001) reduction in weight. No association

Figure 5: Relationship between fizzy drink prices and fizzy drink consumption*

* Figure from Eyles et al (2012) Food pricing strategies, population diets, and non-communicable disease: a systematic review of simulation studies
PLOS Medicine 9(12):e1001353 doi: 10.1371/journalpmed.1001353

was found for children, although dietary compliance in these trials was low. Recent randomised controlled trial data from the Netherlands ($n=641$ normal weight children) provides evidence that SSBs are associated with weight gain in children³⁷. Study participants were randomised to either 250mL of an artificially sweetened beverage or 250mL of a similar sugar-containing beverage each day for 18 months. Body weight increased by 6.35 kg in the sugar-free group as compared with 7.37 kg in the sugar group (95% CI for the difference, -1.54 to -0.48)³⁷. Artificial sweeteners and sugar substitutes, such as Stevia, offer important opportunities to reduce sugar content of sweetened beverages via reformulation.

Conclusions

The vast majority of beverages available for purchase in the two New Zealand supermarkets surveyed were either sugar-sweetened or contained naturally occurring sugars. Less than one in five (17%) beverages was low-energy or unsweetened. Whilst 17% is likely to be an underestimate (due to the fact that plain waters were not included in our dataset), our findings nevertheless show that sweetened beverages are by far the most common type of beverage available in supermarkets. Furthermore, plain waters were found to contribute ~2% of the total number of non-alcoholic beverages available for sale in the 2013 Nutritrack database. Beverage categories providing the greatest range of unsweetened or low-energy options were milk (plain milk, 52% of category), and fizzy and energy drinks (artificially sweetened varieties, 17% of category). Although substantially less available overall, low-energy and unsweetened beverages were approximately 30% cheaper than sweetened drinks. Plain milk and artificially sweetened fizzy drinks were 46-49% lower in price than flavoured milk

and sugar-sweetened fizzy varieties, suggesting that consumers wishing to purchase healthier options are not financially penalised. The sugar content of beverages varied from zero to 23g/100ml. Energy drinks and electrolyte drinks contained an average of 40g (eight teaspoons) of sugar per serve and some brands of fizzy drink contained more than 80g (16 teaspoons) in a single serve. Fruit juices and sweetened fizzy drinks contained similar amounts of sugars (approximately 10g/100mL).

National and international research provides evidence on a number of promising policy options. Limiting availability of sweetened beverages could possibly reduce their consumption and consumer body weight but, as yet, there are no robust intervention data for New Zealand. Local and international data suggest that price increases (e.g. sugar-sweetened beverage taxes) could reduce consumption, although it is unclear what the long-term impact would be on obesity rates and population health. Despite international debate regarding regulations to reduce portion sizes of sugar-sweetened beverages, the evidence for this strategy is currently weak. What is certain is that sweetened beverages are a major contributor to New Zealand population sugar intakes. Given the proven adverse effects of high sugar intakes on body weight and risk of diabetes and cardiovascular disease, it is imperative to systematically assess and monitor our food environment as outlined in this paper and to continue to explore effective options for reducing consumption of sugar-sweetened beverages.

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