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New Zealand household purchases of sugar-sweetened, artificially sweetened, and unsweetened beverages: 2015–2019

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Abstract

Objective: To assess annual household purchases of sugar-sweetened beverages (SSBs), artificially sweetened beverages (AFSBs), and unsweetened beverages (USBs) by household composition and income, and over time.

Design: Observational cohort study using beverage purchasing data linked to a supermarket database. ANOVA was used to compare total household purchase volumes (L) and the contribution of beverages purchased by category, household composition (size), household income (four categories from New Zealand (NZ) < $30 000 to > $90 000), and over time (trend from 2015 to 2019).

Setting: Aotearoa NZ.

Participants: ~1800 households in the NielsenIQ Homescan® market research panel.

Results: In 2019, the mean (SD) annual household purchase volume and relative contribution to total beverage volume of SSBs were 72·3 (93·0) L and 33 %, respectively. Corresponding values for AFSBs were 32·5 (79·3) L (15 %), and USBs were 112·5 (100·9) L (52 %). Larger households purchased more of all beverage types except AFSBs. Total purchases were similar by income, but households earning < $NZ 30 000 purchased fewer AFSBs and USBs (but not SSBs) than households earning > $NZ 90 000. Total and USB purchases were unchanged over time, but SSBs dropped by 5·9 L (P-trend = 0·04), and AFSBs increased by 5·3 L (P-trend = 0·00).

Conclusions: USBs contributed the most to household beverage purchases. Total purchases were higher for larger households and similar by income, including for SSBs. The reduction over time was too small for health benefits. Findings support policies and interventions to reduce SSB consumption and highlight the importance of focusing on equitable outcomes.

Keywords
Beverages
Household purchasing
Sugar
Sweeteners
Monitoring

High dietary intake of free sugars poses a major risk to health, specifically by increasing the risk of dental caries, high blood pressure, cardiometabolic disease (including overweight/obesity, type 2 diabetes mellitus, cardiovascular disease (CVD), non-alcoholic fatty liver disease, and gout), and certain adiposity-related cancers[1–3]. As such, in 2015, the World Health Organization (WHO) set a global goal to reduce dietary free sugar consumption to less than 10 % of an individual's energy intake[4]. For added health benefits, consuming less than 5 % of daily energy from free sugars is recommended[4].

Reducing consumption of sugar-sweetened beverages (SSBs) in particular has been widely identified as an appropriate target for policy-based and multisectoral interventions to reduce dietary free sugars; this is because SSBs contribute significantly to dietary total and free sugars

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while lacking nutritional value[4,5]. Furthermore, the increased risk SSBs contribute to dental, cardiovascular, and metabolic health may be higher than that incurred by sugars present in solid foods[3,6]. Globally, an estimated 184 000 deaths per year were attributed to SSB consumption in 2010[7].

In Aotearoa New Zealand (NZ), obesity affects 34·3 % and 12·7 % of adults 15 years and older and children aged two to 14 years, respectively, with a higher impact on the populations traditionally underserved by the health system, including Māori whānau (indigenous New Zealanders; 51 % of adults and 18 % of children) and Pasifika families (71 % of adults and 35 % of children)[8]. In 2019, approximately 8 in 10 beverages available for sale in NZ supermarkets were sugary, and among those, 73 % had sugar content ≥ 5 g/100 ml[9]. Recent data from the New Zealand Health Surveys (2018/19 and 2019/20) showed that among 2–14 year-olds, 14 %, 19 %, and 10 % were having cordials, fruit juices, and fizzy drinks 3 times or more per week, respectively. The survey also showed that the prevalence of intake was overall higher among children from Māori whānau and Pasifika families (in relation to children of European or Other ethnicities) and from most deprived households—deciles 1–2 (in relation to those from least deprived households, deciles 9–10)[10]. Data from a nationally representative NZ birth cohort showed that the picture is similar for pre-schoolers, with 50 % of 2-year-olds and 58 % of 4·5-year-olds having at least one serving per week of soft drinks (with or without sugar), energy drinks, fruit juices, and/or fruit drinks[11]. Moreover, there is evidence that the mean sugar content of SSBs is higher in NZ than in comparable countries such as Australia and Canada[12].

Policies and guidelines such as mandatory front-of-package labelling showing added sugar content and SBB taxes can help reduce population sugar consumption by encouraging both lower intake and reduced sugar content of SSBs[13]. The WHO now strongly recommends that member states implement SSB taxes[14]; these are in place in more than 45 countries and show promising effects on population nutrition[13]. However, despite advocacy for and public support of public policy actions targeting SSBs[15–19], the beverage industry in NZ is largely unregulated with respect to health. The voluntary front-of-pack nutrition labelling in the form of the Health Star Rating[20] is used by some manufacturers but uptake is low[21]. As such, the obesogenic and unequal food and beverage environment is one of the most important factors driving SSB consumption[9,21,22]. To reduce the health burden and disparities that are persistent in the non-alcoholic beverage environment in NZ, further interventions and policies must be developed and implemented. However, there is limited information available regarding the context for such interventions.

The objective of our research was to assess NZ household purchases of SSBs, artificially sweetened beverages (AFSBs), and unsweetened beverages (USB) by household composition and income, and over time from 2015 to 2019.

Methods & materials

Study design and household purchase data

This study featured an observational cohort study design. We used data from The NZ NielsenIQ Homescan® consumer panel, a geographically and demographically representative consumer panel of ~2500 NZ households who electronically record purchases of all grocery goods brought into the home. The panel is an open cohort, recruiting households continuously to account for attrition and limiting demographic changes over time. Homescan® consumer panel members are recruited via Instagram, Facebook, and TikTok. Panellists must own a smartphone and be the main grocery shoppers for their households. Respondents to social media leads complete an online survey to collect demographics including geographic location, household size, household life stage, and household income. Eligible households meet demographic quota requirements, and the remaining households are placed into a reserve. The precise sample size for analysis can vary each year as NielsenIQ Homescan® excludes data for households that scan items inconsistently, show sudden changes in scanning behaviour, or do not meet minimum spending criteria, but is usually ~72 % (n 1800) of the original 2500 panel members. Panellists are based in major urban and secondary urban sites, as defined by Statistics NZ[23], accounting for 92 % of the country's population[24]. Based on national supermarket scan sales, it is estimated that the panel purchases reflect about 52 % of all household grocery purchases in New Zealand.

Once recruited, households are provided with an electronic scanner and User Guide and are asked to record all food and beverage purchases made at any store and then brought into the home, including groceries from supermarkets, convenience stores, specialist stores, pharmacies, liquor stores, and online. Purchases made at restaurants, take-away outlets, and cafes are excluded. After a product is purchased and brought home, the Homescan® panel shopper enters the date, quantity purchased, price of the product, whether it was on promotion (yes/no), and the store from which it was bought. Panel members then scan the product barcode to link information on the item description, product category and department, package size, unit (e.g. g, kg, L, ml), and brand. For purchases without barcodes such as fresh produce, the shopper selects a corresponding barcode from a supplied list. Households are incentivised through a points-based system where points can be converted into monetary rewards.

The NielsenIQ dataset thus contains detailed information about all household food and beverage purchases for consumption within the home. The following demographic information about the household is also included: size (total

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number of people), income group (collapsed into four categories for the current analysis i.e. NZ ≤ $30 000; $30 001 to $50 000; $50 001 to $90 000; and ≥ $90 001), life stage (e.g. young families, mixed families, older families, older singles and couples, other adult households), age group and sex of primary shopper, number of adults and children, and residential postcode.

For this study, we used 12 months of continuous annual household purchasing data for each of the years 2015–2019.

Beverage inclusion and classification

All non-alcoholic, ready-to-drink (RTD) beverages were included. Due to evidence that consumers reconstitute non-RTD beverage products by varying dilution factors[25], these products (e.g. cordials, concentrates, powders, and syrups) were excluded. Our sample included products whose NielsenIQ-assigned product department was 'Beverages' as well as drinks extracted from the following departments: drinking yoghurts, lassis, kombucha, and RTD coffees (identified by barcode descriptions including terms 'drink', 'beverage', 'smoothie' or 'lassi'), and excluding observations that NielsenIQ had classified as belonging to the 'Alcohol' department.

All beverages within the aforementioned categories were re-classified into a two-tier system based on that previously used by Gontijo de Castro et al. (2021)[9]. Level 1 was classified based on sweetener type and amount. Beverages containing ≥ 1 g/100 ml of free sugars, as defined by the WHO[4] were classified as 'sugar-sweetened beverages' (SSB); because the WHO includes sugars naturally present in fruit juices as 'free', this meant most fruit juices were included in Level 1[4]. Beverages containing < 1 g/100 ml of free sugars, and one or more non-nutritive sweetener ingredients were classified as 'artificially sweetened beverages' (AFSB). The remaining beverages without added or intrinsic sweetener ingredients were classified as 'unsweetened beverages' (USB). Level 2 categories were assigned based on the type of beverage; for SSBs, these were: soft drinks; electrolyte drinks, energy drinks, and flavoured waters; dairy milk; plant-based milk; and fruit and vegetable juices and drinks. Corresponding level 2 categories for AFSBs were: soft drinks; electrolyte drinks, energy drinks, and flavoured waters; and for USBs were: plain bottled waters; and dairy and plant-based milks (combined).

Because nutrient data are not available in the Homescan® database, we used the NZ Nutritrack database to obtain information on sugar and sweetener content and enable classification. Nutritrack is a branded food composition database developed by the National Institute of Health Innovation at the University of Auckland[26]. The database contains ingredient and nutritional information for the packaged food and beverage supply across major NZ supermarkets[26]. In NZ, the distribution of packaged food and beverages is dominated by supermarkets, accounting for 75 % of such purchases nationally[26]. Nutritrack data are collected annually between February and May each year via systematic surveys undertaken by trained fieldworkers in the Auckland region, in the largest of each of the four nationally dominant supermarket franchise stores[26]. Data quality and accuracy are monitored each year, and 2019 Nutritrack data had a 99·1 % accuracy rate across key fields[26]. Where Nutritrack data were not available for a beverage product, ingredients and nutrition information were sourced through the websites of manufacturers, retailers, and distributors, and physical product labels through store visits when necessary. Where these sources provided insufficient data for classification (e.g. if products were discontinued), manufacturers were contacted directly, all of which provided the information.

Outcomes

The primary outcome of this study was total annual household purchase volume (L per household per year) for all beverages together and by beverage category (Level 1 and Level 2). The percentage of purchases by beverage category were also calculated.

Statistical analyses

Household purchase data were imported to SAS version 9·4 (SAS Institute Inc.) for analysis. For each household, total annual household purchase volumes were obtained by multiplying the total purchase quantity (number of units) with the unique item's unit size, in litres (L). Relative percentage contributions of 'SSBs', 'AFSBs', and 'USBs' were calculated in relation to the total beverage volumes. Relative percentage contributions of Level 2 beverage types were also calculated in relation to the total purchased beverage volumes.

Categorical data were summarised in frequencies and percentages, and continuous data were summarised in mean and SD. The differences between annual household purchase volumes by household characteristic and year were tested using the ANOVA at a 5 % significance level. Additional post-hoc tests were conducted using pairwise comparisons. The trend over time was tested using linear trend analysis. Missing data were excluded from the analysis.

Results

Demographic characteristics

The demographic composition of the NZ NielsenIQ Homescan® household consumer panel from 2015 to 2019 is shown in Table 1. The number of households with valid data for analysis ranged from 1743 in 2018 to *n* 1839 in 2016. In 2019, the most recent year of data, the sample consisted of 1800 households. The mean household size, number of adults, and number of children per household appeared similar across all years. The mean number of

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Table 1 Characteristics of the New Zealand NielsenIQ Homescan® panel households: 2015–2019*

	2015		2016		2017		2018		2019	
Year	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Households per year (*n*)	1827		1839		1778		1743		1800	
Household structure										
One to two adults										
No children	1000	54·7	982	53·4	983	55·3	983	56·4	1013	56·3
One child	171	12·7	165	9·0	156	8·8	136	7·8	147	8·2
Two+ children	281	15·4	267	14·5	235	13·2	215	12·3	214	11·9
Three+ adults										
No children	232	12·7	253	13·6	253	14·2	253	14·5	262	14·7
One child	82	4·5	102	5·6	79	4·4	86	4·9	93	5·2
Two+ children	61	3·3	70	3·8	72	4·0	70	4·0	69	3·8
Total adults										
Mean	2·1		2·1		2·1		2·1		2·1	
SD	0·9		0·9		0·9		1·0		1·0	
Total children										
Mean	0·6		0·6		0·6		0·5		0·5	
SD	1·0		1·0		1·0		0·9		1·0	
Household income $NZ										
$30 000 and less	384	21·0	390	21·2	386	21·7	361	20·7	365	20·3
$30 001 to $50 000	371	20·3	361	19·6	371	20·9	365	20·9	378	21·0
$50 001 to $90 000	623	34·1	603	32·8	538	30·3	498	28·6	517	28·7
$90 001 and over	449	24·6	485	26·4	483	27·2	519	29·8	540	30·0

*NielsenIQ Homescan® panel for the 52 weeks ending 8th October each year. All data are *n* (%) unless otherwise stated.

adults per household was 2·1 (SD = 0·9–1·0) for all years and the mean number of children ranged from 0·5 (SD = 0·9) in 2018 to 0·6 (SD = 1·0) in 2015, 2016, and 2017. Most households had no children, with childless households making up 67 % of the sample in 2016 to 71 % in 2018.

Household income was spread relatively evenly between categories, across each year.

Classification of beverages purchased

Of the 4615 unique product identifiers (UPIs) for beverages in the NielsenIQ data across 2015–2019, 100 % were classified into Level 1 and Level 2 beverage categories. Most (e.g. 72 % in 2019) unique products purchased were SSBs. Numbers and relative contributions of total UPIs for beverage products identified in the NielsenIQ Homescan® data each year are presented in online supplementary material, Supplemental Table S1.

Recent household beverage purchases

In 2019, the largest volume of beverages purchased by Homescan® panel members was from USBs (mean 112·5 L) followed by SSBs (72·3 L) and AFSBs (32·5 L) (Table 2).

Within the USB category, dairy and plant milk contributed the most volume (mean 99·2 L) and plain bottled waters contributed the least (11·4 L). Sugary soft drinks contributed the most to household SSB purchases (mean 34·0 L), followed by fruit and vegetable juices and drinks. For AFSBs, purchase volumes were dominated by soft drinks (Table 3).

The largest relative contribution of beverages purchased by Homescan® panel members in 2019 was in the same order as for the largest volumes; for USBs, this was 52 % of the total volume of household beverage purchases in that year, followed by 33 % for SSBs and 15 % for AFSBs (Fig. 1).

The order of relative contribution from the minor categories within each major beverage group was also the same as for results by volume; for the USB category, dairy and plant milk contributed the most (46 %) and plain bottled waters the least (5 %). Sugary soft drinks contributed the highest relative contribution to SSBs (16 %), followed by fruit and vegetable juices and drinks. For AFSBs, the largest relative contribution was from soft drinks (14 % in 2019). (Table 3).

Differences in beverage purchases by household composition and income (2019)

Larger households purchased a higher mean volume of all beverages, SSBs, and USBs (all *P*-values < 0·05), with no difference for AFSBs (Table 2). Households with the lowest mean annual household incomes purchased significantly lower mean volume of all beverages combined. The mean volumes of SSBs purchased did not vary significantly between households of different income levels. However, compared to households with an annual income of ≥ $90 001, low-income households purchased significantly fewer AFSBs (mean 17·6 (SD = 43·3) *v.* 38·0 L (86·3)), and USBs (93·4 L (84·1) *v.* (121·3 (107·9)).

Changes in household beverage purchases over time

There was no significant change to the mean household volume of all beverages purchased from 2015 to 2019. However, there was a decreasing trend over the five years

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Table 2 Total annual household purchases (litres) of all products in major beverage categories in 2019*, by household characteristics (*n* 1800)

Household characteristics	Number of households	All beverages		Sugar-sweetened beverages		Artificially sweetened beverages		Unsweetened beverages	
		n	%	*n*	%	*n*	%	*n*	%
Household structure									
One to two adults									
No children	1013	174·1	143·0^{A}	57·6	75·4^{A}	29·3	75·7^{A}	87·3	78·9^{A}
One child	147	203·3	133·4^{bC}	64·5	61·7^{bC}	23·5	53·6^{B}	115·4	87·0^{abC}
Two+ children	214	307·6	189·6^{abc}	97·3	111·9^{ac}	34·6	77·6	175·7	123·5^{abc}
Three+ adults									
No children	264	264·0	190·9^{aB}	91·8	105·6^{aB}	36·6	72·8	135·6	123·9^{aB}
One child	93	305·0	254·5^{abc}	113·2	144·6^{ac}	53·0	123·9^{ab}	138·8	105·5^{a}
Two+ children	69	301·2	208·4^{ac}	96·6	126·4^{ac}	48·4	116·5^{b}	156·3	107·0^{ac}
Household income									
$30 000 and less	365	172·0	143·7^{A}	61·0	84·2	17·6	43·3^{A}	93·4	84·1^{A}
$30 001–$50 000	378	216·8	163·5^{a}	75·3	100·3	28·2	72·5	113·4	90·7
$50 001–$90 000	517	234·1	196·6^{a}	77·8	100·0	40·3	93·3^{a}	116·0	110·0
$90 001 and over	540	231·7^{a}	176·2	72·4	85·9	38·0	86·3^{a}	121·3	107·9^{a}
Total households									
Mean	1800	217·2		72·3		32·5		112·5	
SD		175·3		93·1		79·3		100·9	

*NielsenIQ Homescan® panel data for the 52 weeks to the 8th of October 2019. Data are presented as *n* (%) or mean (SD). Significant differences between household characteristics in each beverage category and overall were assessed using the ANOVA, followed by post-hoc tests using pairwise comparisons. Values with upper-case superscripts are significantly different to values with lower-case superscripts within the same household characteristic and column (all $P < 0·05$). For example, A is different to a, but not to B, b, C, or c.

in the mean household volume of SSBs purchased (–5·9 L; linear trend *P*-value = 0·030) and an increasing trend in the household volume of AFSBs purchased (+5·3 L from 2015 to 2019; linear trend *P*-value = 0·003) (Fig. 2).

Although the total mean household volume of USBs did not significantly change over the five years, there was a significant change to the two minor categories within, with households purchasing significantly more bottled water and less dairy and plant-based milk in 2019 compared with 2015 (+ 4·4 L and –9·9 L, respectively; linear trend *P*-value = < 0·001 for both) (Table 3).

Discussion

Our analysis of NielsenIQ Homescan® data found that in 2019, USBs contributed the greatest volume of beverage purchases made by NZ households, followed by SSBs and then AFSBs. Total beverage purchases were higher for larger households but similar across income groups. However, lower-income households purchased fewer USBs and AFSBs but a similar volume of SSBs. From 2015 to 2019, there were significant trends towards a small reduction in household purchases of SSBs and a corresponding small increase in household purchases of AFSBs but no change to the mean volume of USBs purchased.

It is unsurprising that larger households purchased greater volumes of total beverages than those with fewer members. Similarly, we might expect that households in the highest income group would purchase more total beverages than those in the lowest income group, given their differences in disposable income. However, there was no significant difference in the mean volume of SSBs purchased between households in the lowest and highest income groups. This finding suggests that SSB price, or purchasing power, is not a significant barrier to consumption for lower-income households in NZ. This theory is supported by household purchasing data from Australia, where Sharma et al (2014) observed that the average SSB unit price paid by low-income households was lower than that paid by high-income households, suggesting that low-income households may buy cheaper products, or that prices for the same product may vary across retail outlets located in areas with different socioeconomic profiles[27]. In fact, the budget share for SSBs for Australian households, as a share of all beverages (reflecting the combined effect of variations in total consumption and unit prices paid across income groups), was slightly lower for low-income households when compared to all households, despite higher relative levels of SSB consumption volume[27]. The SSB market in NZ is diverse, accounting for the majority of 'unique' products or UPIs in our dataset, and therefore encompassing a range of price points. 'Craft' SSBs such as iced teas, kombuchas, tonic wellness, and similar are also on the rise in NZ[9] and add to this price diversity as they tend to be more expensive, and thus likely more popular among higher-income households[25].

While a step in the right direction, the observed reduction in SSB purchases (5·9 L per household per year) is likely too small to be meaningful in terms of reducing the population intake of free sugars; for an average household of two adults and 0·5 children in the 2019 Homescan® dataset, 5·9 L equates to 113 ml per week or < 50 ml per

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Table 3 Total annual household purchase volumes (litres) of beverages, overall and by major and minor categories, from 2015 to 2019*

	2015 (*n* 1827)		2016 (*n* 1839)		2017 (*n* 1778)		2018 (*n* 1743)		2019 (*n* 1800)		*P*-value	Linear trend
Year (number of households)	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	(overall)	*P*-value
Sugar-sweetened beverages												
Soft drinks	37·3	62·2^{A}	34·1	57·6	31·0	53·8^{a}	33·3	60·0^{a}	34·0	63·2	0·03	0·097
Electrolyte drinks, energy drinks, and flavoured waters	4·8	17·0	4·8	16·9	5·3	19·4	5·2	18·1	5·0	17·3	0·91	0·581
Dairy milks	3·5	11·7	3·7	11·0	3·4	13·2	3·6	13·8	3·3	11·4	0·92	0·594
Plant based milks	3·6	13·7	3·9	14·9	3·9	14·7	4·3	16·2	4·2	16·3	0·67	0·168
Fruit and vegetable juices and drinks	29·1	39·7^{A}	26·6	38·5	25·4	38·8^{a}	25·0	38·0a	25·8	40·5^{a}	0·01	0·005
Total	78·2	91·5^{A}	73·1	86·9	68·9	85·2^{a}	71·4	88·0^{a}	72·3	93·0^{a}	0·03	0·039
Artificially sweetened beverages												
Soft drinks	26·3	72·0	25·5	69·5	26·2	73·2	30·8	76·6	30·9	77·3	0·05	0·005
Electrolyte drinks, energy drinks, and flavoured waters	0·9	4·6	0·9	4·7	1·2	8·1	1·4	10·5	1·6	12·8	0·09	0·008
Total	27·2	72·7^{A}	26·4	70·2^{B}	27·3	74·4^{C}	32·2	78·4^{b}	32·5	79·3^{ac}	0·03	0·003
Unsweetened beverages												
Plain bottled waters	7·0	23·8^{A}	9·1	32·2	10·0	33·9^{a}	11·3	37·8^{a}	11·4	43·1^{a}	<0·001	<0·001
Dairy and plant-based milks	109·1	97·1^{A}	109·5	99·7^{B}	104·5	97·1	101·2	92·5^{ab}	99·2	91·9^{ab}	<0·001	<0·001
Total	116·8	99·8	119·5	105·2	115·5	103·3	114·3	101·1	112·5	100·9	0·30	0·069
Total beverages	222·2	170·4	219·0	167·7	211·7	168·5	217·8	170·6	217·2	175·3	0·47	0·378

*NielsenIQ Homescan® panel data for the 52 weeks to the 8th of October each year. Volume data (L) are presented as mean (SD). Significant differences between years in each beverage category were assessed using the ANOVA, followed by post-hoc tests using pairwise comparisons. Significant differences in annual household purchase volumes over time were assessed overall and in major beverage categories using linear trend analysis. Values for years with lower-case superscripts are significantly different to values for years with the same capital letter superscripts, within the drink category (all $P < 0·05$). For example, A is different to a, but not to B, b, C, or c.

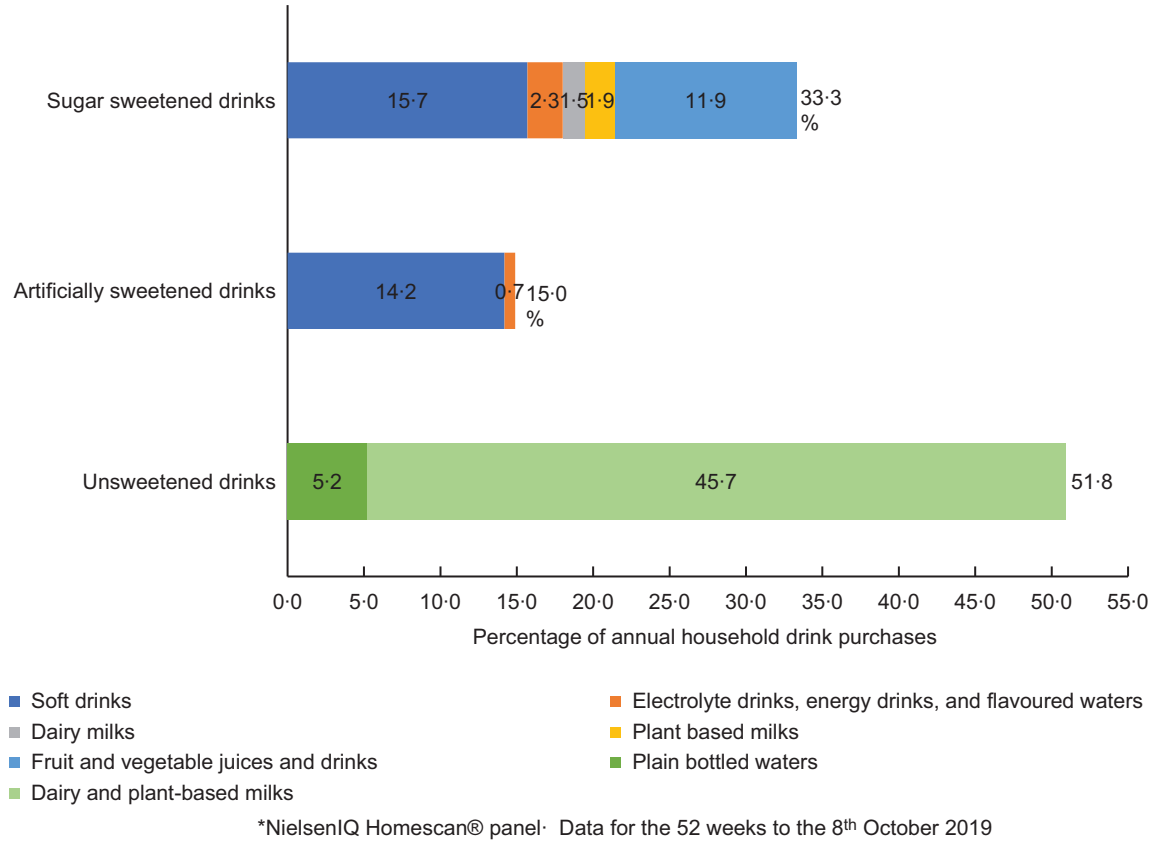

Fig. 1 The relative contribution of major and minor beverage categories to total household purchase volumes in 2019 (*n* 1800)*

person, and only 11 g or 2 ¾ tsp of sugar per household per week (< 1 tsp per person). By comparison, this represents only one-third of the reduction reported post-implementation of the UK soft drinks industry levy (30 g per household, per week in the first year, based on similar household purchasing data)[28].

Taken in combination with recent NZ research monitoring the food environment, our results support the need for urgent development of government-led policies and guidelines to reduce SSB consumption in NZ. In 2019, most beverages available in NZ supermarkets were sugar-sweetened or had naturally occurring sugars (79 %) and were sold in large serving sizes i.e. > 250 ml (81 %)[9]. Despite a modest reduction in SSB sugar content observed between 2013–2019, most SSBs available (73 %) still had sugar content higher than the benchmark set for the UK soft drinks industry levy's lower limit[9]. Further, previous research has found that the sugar content of beverages in NZ is higher than in Australia and Canada[12]. In early 2019, the NZ Beverage Council committed to a pledge of a 20 % sugar reduction for non-alcoholic beverages available for sale by 2025[29]. However, to date, this pledge has not been launched and the voluntary Health Star Rating nutrition label is still only present on ~25 % of eligible packaged food and beverages[21]. This indicates that the industry self-regulatory approach currently in place in NZ is not sufficient and that government-led regulatory measures are likely required to reduce the availability, affordability, sugar content, and serving size of sugary drinks.

Several regulatory levers are available to help reduce SSB consumption in NZ, and potentially incentivise reformulation resulting in a lower sugar content. For example, mandatory front-of-pack health warnings are 'more likely to be noticed, cause stronger emotional reactions, elicit more thinking about the health effects of SSBs, and lead consumers to choose healthier products while avoiding unhealthy ones'[13]. After Chile's implementation of a mandatory warning label on products 'high in' sugar, saturated fats, sodium, or energy, purchases of beverages with 'high in' labels fell by 23·7 % (a reduction similar across income groups)[30]; similar warnings are now required on eligible SSB labels in Peru, Uruguay, Mexico, Colombia, Brazil, and Israel[13].

Furthermore, more than 45 countries have now implemented some sort of SSB levy (i.e. tax)[13,31]. One systematic review and meta-analysis assessing the impact of an SSB tax in eleven jurisdictions (in the US, France, Chile, Mexico, and Spain) found that a 10 % sugar tax was associated with an average 10 % decline in targeted beverage purchases and dietary intake, with a non-significant 1·9 % increase in total untaxed beverage (e.g. bottled water) consumption[32]. A larger and more recent systematic review and meta-analysis found SSB taxes were associated with 15 % lower SSB sales, with a price elasticity

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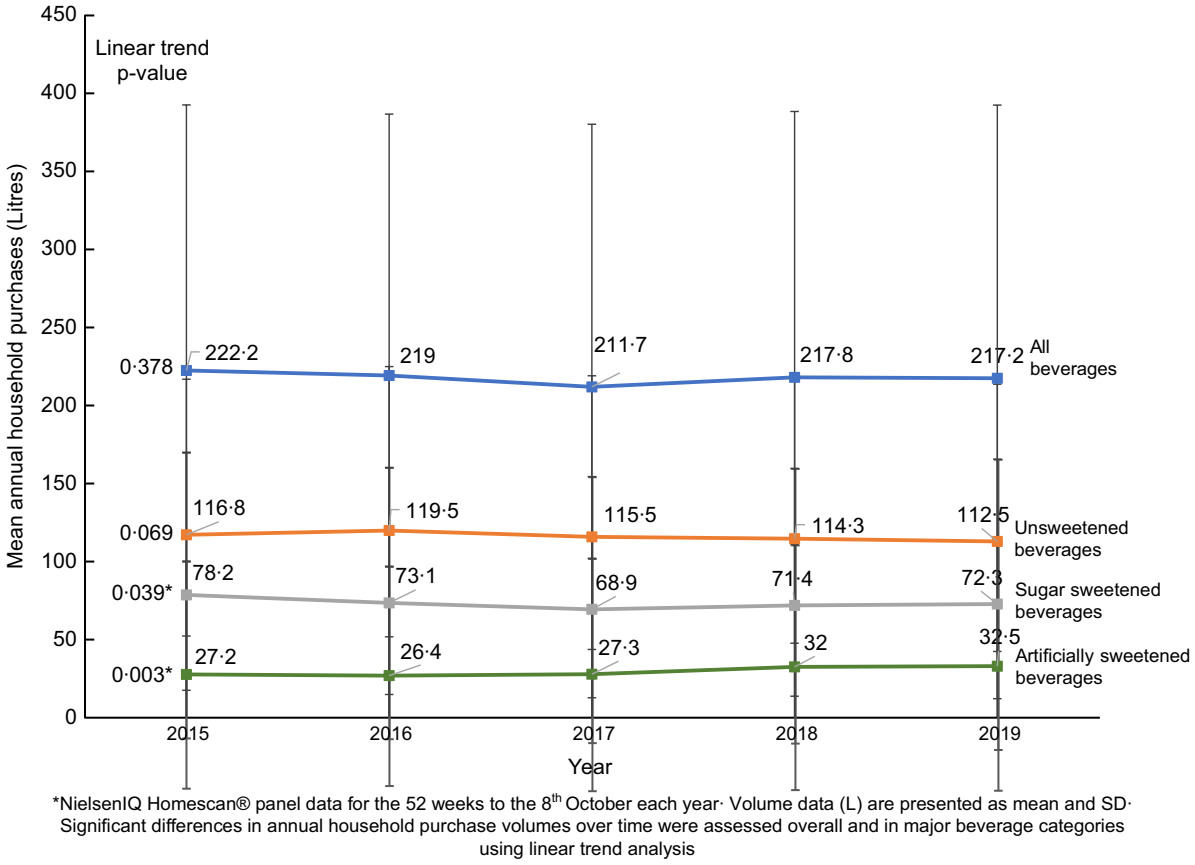

Fig. 2 The trend in annual household purchases of beverages overall and by category from 2015 to 2019

of demand of −1·59 (i.e. demand for SSBs highly sensitive to tax-related price increases), and no evidence of substitution to untaxed beverages[31]. The UK soft drinks industry levy has been particularly successful in reducing consumer SSB intake while incentivising the reduction of sugar content, which is attributed to its two-tiered design[28,33]. Only 19 months after its implementation in 2018, the levy was been associated with reduced prevalence of obesity in young girls, with the greatest difference among those living in the most deprived areas[34]. Chile's experience combining an SSB tax with mandatory nutrition labelling and restrictions on 'high in' food marketing and school sales indicates that a combination of policies may be most effective in reducing population-level purchasing and intake of SSBs[30].

Regardless of the lever or levers chosen, policies should be multifactorial, include education and public awareness, and should focus on children and underserved population groups. A key question is whether a fiscal policy, such as a sugar levy, would be effective in reducing purchase volumes for such groups, and whether it would be regressive (i.e. how much the financial burden and internality benefits from a tax fall upon the poor)[35]. The equal volumes of SSBs consumed across household income groups suggested that the price of SSBs is not a barrier to their consumption for lower-income households in NZ.[36] Ni Mhurchu et al (2013) studied the price elasticity i.e. the percentage change in demand associated with 1 % change in the price of a good for major commonly consumed food groups in NZ, by income and ethnicity, finding that carbonated soft drinks had a mean price elasticity of −1·27 (SE 0·27) overall[36]. However, when estimated by income level, for carbonated soft drinks as well as most other food groups, demand was more elastic among low-income households, indicating that these households were more sensitive to price changes. In addition, the authors concluded that a 'greater sensitivity of low-income households and Māori to price changes suggests the beneficial effects of such policies on health would be greatest for these groups'[36]. An overview of economic theory and empirical evidence suggests that SSB taxes are welfare-enhancing, even when SSB consumption (and therefore tax paid) is higher for such underserved groups[35]. However, there is the potential for increased financial hardship for low-income households that do not reduce their SSB intake after a tax; this can be partially mitigated with activities such as promoting water as a substitute (as is currently done in many NZ schools), improving access to drinking water fountains in public spaces (also done in parts of NZ), and requiring warning labels on SSBs so that potential consumers are informed of the hazard (not yet in place in NZ)[19].

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Finally, considering the modest increase observed in AFSBs but no change in USB sales volumes, it is worth considering whether policies should discourage 'switching' from SSBs to AFSBs, and promote unsweetened options instead. While the replacement of free sugars with artificial sweeteners may be considered a risk reduction approach, increased population consumption of AFSBs is still concerning given that evidence on the health risks of consuming artificial sweeteners is becoming clearer[37–40]. In May 2023, the WHO wrote an evidence-based guideline for the use of non-sugar sweeteners, including artificial sweeteners present in AFSBs[41]. Based on a systematic review and meta-analysis of the current evidence, the WHO conditionally advises against the use of non-sugar sweeteners in nutrition and public health policies and programmes; while they may assist in the control of body weight in the short term, over the long term, they are associated with an increased risk of obesity, type 2 diabetes, CVD, and mortality in adults[41]. Therefore, regulations would ideally encourage changing consumers' palates with respect to sweetened drinks rather than replacing them with AFSBs, and from an equity perspective, finding affordable healthy options to switch to is paramount.

Strengths and limitations

This is the first study to describe the NZ population's consumption (in this case purchases) of non-alcoholic beverages and their types. The strengths of this study are its use of a large dataset, featuring continuous annual data, which is representative of NZ by geography and income level. However, NielsenIQ Homescan® panels are not nationally representative by household composition nor weighted to all characteristics of the NZ population. For example, results from the 2018 census indicated there were fewer childless households, and fewer households with ≥ 3 adults in NZ than were in the Homescan® panel sample in the same year[42]. In addition, there is no Homescan® panel information on ethnicity or children's specific age, which could have allowed for a more comprehensive equity-focused analysis. Further, household purchases have been used as a proxy for intake, the latter which may be unequally distributed across household members. Finally, as noted earlier, this analysis excludes beverages purchased and consumed outside the home, and beverage concentrates, the latter of which is a growing market in NZ[25].

Conclusion

This study used NielsenIQ Homescan® household purchasing data and Nutritack beverage composition data to assess NZ household beverage purchase volumes and percentages for the total population, by household characteristics, and over time between 2015 and 2019. The highest purchase volumes were for USBs (i.e. dairy and plant milk, and plain bottled waters), followed by SSBs beverages (soft drinks, fruit and vegetables juices and drinks, sweetened dairy and plant-based milk, and electrolyte/energy drinks and flavoured waters), and AFSBs (soft drinks, and electrolyte/energy drinks and flavoured waters). Household SSB purchase volumes dropped and AFSB volumes increased between 2015 and 2019, but the changes were small and thus unlikely to improve health. Purchase volumes of SSBs were similar across all income groups, which was not the case for USBs or AFSBs. Findings support the need for policies and interventions to reduce SSB consumption in NZ and highlight that such strategies must focus on reducing inequities. Continuous monitoring of household beverage purchases is also important to drive accountability, including by the government and beverage sector. Given the low level of policy response to SSB consumption, this study offers data that can serve as a baseline to assess the impact of any future policies implemented to help control the intake of SSBs in NZ.

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Conflict of interest

The authors declare no conflicts of interest.

Authorship

Study design: H.E., S.D., Y.J., T.G.C.; data cleaning and preparation: S.D., Y.J.; statistical analysis: H.E., S.D., Y.J.; data interpretation: H.E., K.K.G., S.D., Y.J., T.G.C.; writing: K.K.G.; funding acquisition: H.E. All authors have read and agreed to the published version of the manuscript.

Ethics of human subject participation

N/A

Supplementary material

For supplementary material accompanying this paper visit https://doi.org/10.1017/S1368980023002793

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