Assessing Beverages Consumption Patterns of 11-14-year-old Aotearoa New Zealand Children Before, During, and After Sport.

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Abstract

Background: Sports settings may be an important but understudied beverage consumption environment for children where there is evidence consumption of SSB such as sports drinks. This consumption is despite water being the only recommended beverage for exercising children.

Aims: To review the existing literature on children's habitual beverage consumption and beverage consumption in a sporting environment including factors that influence beverage consumption. To analyse novel data collected in the assessment of 11-14-year-old New Zealand (NZ) children's beverage consumption before, during, and after organised sport and the influencing factors on beverage choice and compare the findings against current international literature.

Methods: Articles for the literature review were found using Google Scholar, Scopus, and Massey University's article database. Searches were limited between the years 2010 and 2022. A 13-item questionnaire was used to survey children in the upper north island region of NZ regarding their beverage consumption practices in a sporting environment. The questionnaire was based on the top 20 sports participated in by NZ children. The inclusion criteria were as follows: aged 11-14 years old, able to read and write in English, and played at least one game of organised sport. The participants' self-reported beverage intake on the survey indicating what beverages they consumed up to 2 hours before, during, and up to 2 hours after sport.

Results: Gender, age, and socioeconomic status (SES) were identified to influence milk, and sugar sweetened beverage consumption in literature. The same factors were found to influence beverage consumption in the present study.

The mean age of the participants (n = 1339) was 12.1 (±0.9) years, 51.3% were female, 50.3% were European, 53.7% attended high decile ranking schools. Water (91.7%), sports drinks (25.7%), and milk (23.4%) were the top three consumed beverages. Water was consistently the leading beverage consumed

by participants before (67.3%), during (70.6%), and after (51.1%) sport and if given the choice, participants would prefer to drink water for hydration (89.9%).

Conclusion: Water was the most consumed and preferred beverage for this cohort of young sportspeople. Sports drinks were the next most consumed beverage overall, thus public health messaging is needed in sports settings for SSB such as sports drinks as there is no evidence to support their efficacy for children participating in exercise <60 min and that is not vigorous.

Key words: beverage consumption, children, organised sport, motivations, beverage preferences, influences

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List of Abbreviations and Symbols

AI – Adequate Intake

ANOVA – Analysis of Variance

BMI – Body Mass Index

ED – Energy Drink

ESFA – European Food Safety Authority

et al. – and others

IOM – Institute of Medicine

IOTF – International Obesity Task Force

MoH – Ministry of Health

MVPA – Moderate to Vigorous Physical Activity

NHANES – National Health and Nutrition Survey

NZ – New Zealand

NZBGP – New Zealand Beverage Guidance Panel

PA – Physical Activity

OECD – Organisation for Economic Co-operation and Development

RSOs – Regional Sporting Organisations

SD – Standard deviation

SES – Socioeconomic Status

SPSS – Statistical Packaging Software System

SSB – sugar-sweetened beverage

SSBC – sugar-sweetened beverage consumption

WHO – World Health Organisation

1 Introduction

1.1 Background

Fluid replacement is essential to maintaining hydration when participating in physical activity regardless of the intensity of the sport (Kenefick & Cheuvront, 2012). The amount and type of fluid required to maintain hydration, and/or achieve rehydration is dependent on the amount of fluid lost through sweating (Kenefick & Cheuvront, 2012). Sweat losses depend on the duration and intensity of the sport, clothing, and ambient temperature (Kenefick & Cheuvront, 2012; Popkin et al., 2010; Rowland, 2011). Previously, children were thought to have diminished thermoregulatory responses when exercising due to reduced sweat rates compared to adults (Morrison & Sims, 2014; Rowland, 2008, 2011). However, more recent studies have established that children's thermoregulation is not impaired when exercising (Rowland, 2008, 2011) and they get equally dehydrated as adults as children's water losses are equivalent to adults when adjusted for body mass (Rowland, 2011). Therefore, fluid requirements are not lower in children because of reduced sweating capability (Rowland, 2011).

Children's fluid requirements have been calculated conservatively as a fluid intake of 13 mL/kg bodyweight per hour (Rowland, 2011; p. 279). For recreational exercise the optimal fluid is water (Baker & Jeukendrup, 2011; Popkin et al., 2010), however, carbohydrate and electrolyte-containing beverages can be used for higher intensity exercise or prolonged exercise >60 min (Baker & Jeukendrup, 2011; Kenefick & Cheuvront, 2012). In practice, children consume various beverages such as milk, fruit drinks, sports drinks (Broughton et al., 2016; Wiens et al., 2014), and energy drinks (Cruz-Muñoz et al., 2020; Trapp et al., 2020) in addition to water when participating in physical activity. The volume of these beverages consumed by children participating in physical activity has yet to be quantified in the literature and the reasons behind their consumption have yet to be elucidated.

Sugar-sweetened beverages (SSB) such as flavoured water, soft drinks, sports drinks, fruit drinks, flavoured milks, and energy drinks have been associated with weight gain and obesity in children (Abbasalizad Farhangi et al., 2022; Bleich & Vercammen, 2018; Malik et al., 2013; Pereira, 2014) and the World Health Organisation (WHO) recognised them as a probable cause of increased risk of obesity in children (World Health Organization., 2003). These SSB are high in refined sugar content and poor in nutritional value; the high caloric content of these beverages lends them to being a possible vehicle for increased energy intake thus contributing to an increased risk of obesity (World Health Organisation., 2014). Consequently, the WHO has since singled out reducing SSB consumption as one of the recommended strategies to end childhood obesity (World Health Organization., 2016b).

In New Zealand (NZ), the prevalence of obesity has been characterised as a public health concern (Chiavaroli et al., 2019). One in three NZ children are overweight or obese (Ministry of Health., 2021). Despite the indication of a plateau in global rates of increase in obesity in high-income countries (NCD Risk Factor Collaboration., 2017), new data emerging from the Ministry of Health (MoH) revealed that NZ children's once steady rates of childhood obesity increased from 9.5% in 2019/2020 to 12.7% in 2020/2021 (Ministry of Health., 2021). New Zealand also has the second-highest rate of overweight and obese children (40%), second only to the US among the 38 countries in the Organisation for Economic Co-operation and Development (OECD;(United Nations Children's Fund., 2021). Although it is difficult to make projections of childhood obesity (OECD, 2010), current trends in NZ indicate a need for intervention. A strategy that has been proposed by NZ Beverage Guidance Panel (NZBGP) to address childhood obesity is the taxation of SSB (New Zealand Beverage Guidance Panel., 2017).

In line with the WHO recommendations, several countries in the OECD have introduced taxation of SSB as a strategy to disincentivise the purchase and, therefore, consumption of SSB (Global Food Research Program., 2019). In NZ, there is discussion whether to introduce such a tax (New Zealand Beverage Guidance Panel., 2014) due to the popularity of SSB consumption among NZ children (New Zealand Beverage Guidance Panel., 2017). The Food and Nutrition guidelines recommend that *"if [SSB] are*

consumed, have them only occasionally (less than once a week)..."(Ministry of Health., 2012). However, data from the 2008 National Nutrition survey indicated that half (51%) of children consumed carbonated SSB at least once a week and 73% consumed fruit-based SSB once a week (Ministry of Health., 2012). More recent data obtained from school-aged children indicates that 39 % of children consumed carbonated SSB at least once a week, and fruit-based SSB ranged from 16% to 40% (Smirk et al., 2021). Although it appears that the proportions of SSB consumptions are lower than the MoH's findings, unlike the MoH guidelines, the researchers also investigated the consumption of milk-based SSB. Consumption of milk-based SSB was greater than the MoH guidelines as 85% of participants consumed at least once a week (Smirk et al., 2021).

In addition to an apparent high consumption of SSB among children in NZ (Ministry of Health., 2012; Smirk et al., 2021) and around the world (Dereń et al., 2019), increased SSB consumption, specifically sports drinks have been associated with children who participate in organised sport (Larson et al., 2014; Nelson et al., 2011). This consumption is despite water being the only recommended beverage for fluid replacement for active children (Ministry of Health., 2012; Pound et al., 2017). Although fluid intake is vital for children and adolescents when participating in physical activity to replace sweat losses and to prevent dehydration (Desbrow et al., 2014; Purcell et al., 2013; Schneider & Benjamin, 2011), it is widely agreed that consumption of SSB such as sports drinks are unnecessary unless children or adolescents are participating in prolonged vigorous physical activity (> 60 min) (Desbrow et al., 2014; Ministry of Health., 2012; Pound et al., 2017; Schneider & Benjamin, 2011). Despite these guidelines, there is evidence that children who participate in physical activity consume (Nelson et al., 2011) and are more likely to consume SSB than children who do not participate in physical activity (Bibiloni et al., 2016; Larson et al., 2014; Tomlin et al., 2013). This SSB consumption poses a health concern as there is also evidence that consumption of SSB during physical activity may influence habitual consumption of SSB and perpetuate the risk of obesity (Larson et al., 2014).

In addition to being used as fluid replacement beverages, some SSB are also used as supplements. The use of supplements among young people who participate in sport is widespread (Parnell et al., 2016; Wiens et

al., 2014). Although the reasons these young athletes use supplements vary, in one study, nearly half of the participants (47.6%) considered nutritional supplements a necessity (Manore et al., 2017; McDowall, 2007). The most frequently cited reasons for supplement use are health improvement and performance enhancement (McDowall, 2007; Wiens et al., 2014; Zdešar Kotnik et al., 2017) and in the US, the average age of children consuming supplements to enhance their sports performance was 10.8 years old in a sample of 9417 respondents (Evans et al., 2012); a slight decrease from 11 years old observed almost a decade earlier (O'Dea, 2003). There is also evidence of Japanese children as young as six years old using supplements for performance enhancement, albeit the prevalence of supplement use is lower in Japan (Kobayashi et al., 2018). While these studies assessed varying supplements (Evans et al., 2012; Kobayashi et al., 2018; Manore et al., 2017; McDowall, 2007; Parnell et al., 2016; Wiens et al., 2014; Zdešar Kotnik et al., 2017), some limited their investigation to the use of vitamin and mineral supplements (Evans et al., 2012; Kobayashi et al., 2018), herbal supplements (Evans et al., 2012), or fat and protein supplements (Kobayashi et al., 2018; Zdešar Kotnik et al., 2017), whereas others also included SSB such as sports drinks and vitamin water (Manore et al., 2017; McDowall, 2007; Parnell et al., 2016; Wiens et al., 2014). Regardless, a balanced and varied diet can meet the nutritional needs of young athletes (McDowall, 2007); therefore, there is no need for supplement use. Nevertheless, children who participate in sports are turning to dietary supplements, particularly SSB such as sports drinks for performance enhancement.

Children's beverage choices, consumption patterns and preferences can be influenced by socioeconomic status (SES; (Armfield et al., 2013; Rao et al., 2015; Vereecken et al., 2005). In an assessment of children's habitual beverage consumption, children from low SES have been observed to have a greater likelihood of SSB consumption (Han & Powell, 2013; Ministry of Health., 2021), consume more SSB (Armfield et al., 2013; Cockburn et al., 2018), and consume SSB more frequently (Bolt-Evensen et al., 2018) while children from high SES have a greater likelihood of water and fruit juice consumption (Vieux et al., 2017). While SES influences habitual beverage consumption, this influence varies across countries (Rao et al., 2015) likely due to the use of different SES indicators (Vereecken et al., 2005). In NZ, one indicator of SES is the (formerly used) school decile system which is a measure of SES of the schools (New Zealand Ministry of

Education., 2021); see Appendix 5.1 provides a full explanation of the NZ school decile system). While NZ children from low school deciles i.e. low SES were found to consume more SSB (Smirk et al., 2021), the influence of SES on beverage consumption patterns within the sporting environment remains to be investigated.

The type of sport played, among other factors such as, interindividual variability in sweat rates (Sawka et al., 2007) climate, and clothing (Popkin et al., 2010; Rowland, 2011) influence sweat rates (Baker & Jeukendrup, 2011; Sawka et al., 2007). These sweat rates in turn determine fluid requirements (Rowland, 2011; Sawka et al., 2007) as sweat losses are due to thermoregulation during physical activity and this is "dependent on primarily metabolic rate, but also on exercise duration and environment." It follows then that participants of different types of sports may consume different volumes of beverages as Kenefick and Cheuvront (2012) state that "water requirements … parallel sweat losses…" (2012; p. 138) and sport participants should drink fluids according to the volume and composition of their sweat losses (Baker & Jeukendrup, 2011; Sawka et al., 2007). Sweat rates during exercise have been estimated to range from 0.5 L to 2 L/h (Baker & Jeukendrup, 2011; Sawka et al., 2007). The differences in sweat rates based on the type of sport played suggest differing fluid requirements and thus different fluid consumption patterns. However, previous research (Baker & Jeukendrup, 2011; Sawka et al., 2007) has focused on youths and adults (>15 years old). As such this research is not always applicable to children because children have lower sweat rates compared to adults (Rowland, 2008, 2011). Thus, the differences in fluid consumption based on the type of sport participated in remains to be investigated in children and young adolescents.

Previous research into children's motivations behind beverage preferences has primarily focused on habitual consumption of beverages such as soft drinks (Cruz-Muñoz et al., 2020), sports drinks (Cruz-Muñoz et al., 2020; Fairchild et al., 2017) and energy drinks (Cruz-Muñoz et al., 2020; Trapp et al., 2020). Taste appears to be a primary motivator for consumption of these SSB (Fairchild et al., 2017; Sylvetsky et al., 2020; Trapp et al., 2020). Enhancing sports performance was another leading motivator for SSB consumption (Cruz-Muñoz et al., 2020; Sylvetsky et al., 2020; Trapp et al., 2020). This use of SSB for sports

performance enhancement suggest consumption of these beverages in the sporting environment. However, there is no research sporting contexts to investigate the reasons for children's consumption of these beverages. To date, Wiens et al (2014) remain the only researchers to have investigated the motivations of supplement use (including beverages such as sports drinks) in Canadian athletes aged 11 to 17 years. Wiens et al (2014) found that sports drinks were among the top five supplements consumed by 90.9% of participants (n=509) and 'staying healthy' and 'increasing energy' were the top two cited reasons for supplement consumption. However, Wiens et al (2014) failed to investigate why specific supplements were preferred and neglected to ask the participants which supplements were consumed in sports settings. Although the motivating factors for children's chosen beverage(s) for consumption when participating in physical activity have yet to be investigated, Rowland (2011) concluded that exercising children's beverage consumption should be driven by "taste preferences" to achieve adequate rehydration.

Rowland (2011) also recommends that parents and coaches should be responsible for ensuring that exercising children are adequately hydrated. While it is unclear who are the main providers of children's beverages, parents primarily provide children with water and SSB to conform to perceived social norms in organised sports contexts (Bolter et al., 2020; Spruance et al., 2020). Furthermore, parents acknowledge that they lack the knowledge on what beverages are suitable to provide their children for hydration (Bolter et al., 2020). This is disconcerting as 'family' was within the top three sources of dietary information cited by young Canadian athletes (Wiens et al., 2014). While there is some evidence that parents provide sport-playing children's beverages and are the sources of dietary information overseas, in NZ, it has yet to be determined i.e., who provides sport-playing children with beverages, where the children source their beverages, or where they seek dietary information.

Fluid should be consumed before, during, and after physical activity to achieve adequate hydration (Purcell et al., 2013). To date, we are only aware of one study that details student athletes' beverage intake before, during, and after sport (Manore et al., 2017). In their investigation of Latin and white American high school soccer players' dietary practices, Manore et al. (2017) found that the following beverages were consumed

before, during, and after sport: water, sports drinks, fruit juices, and fruit drinks; milk was consumed only after sport. In NZ, much less is known about children's beverage consumption practices during organised sport. The two studies to date have focused on NZ children's perceptions of beverages associated with sport (Smith et al., 2014) and on the beverages available in children's environments rather than what beverages children consume before, during, and after sport (Smith et al., 2019).

To determine NZ children's perceptions of beverages associated with sport i.e., beverages seen, taken to, consumed by children, or promoted at organised sport, Smith et al (2014) gave 82 pre-adolescent children disposable cameras to photograph beverages they associated with sport (Smith et al., 2014). The researchers found that SSB made up half of the 30 beverages children photographed (Smith et al., 2014). However, a major drawback of this study was that participants did not record the quantity or timing of consumption of the beverages identified. Smith et al. (2019) revised their approach by using 24-hour wearable cameras in their subsequent research to investigate the beverages available to, purchased, and consumed by 11–14-year-old children. Although the researchers found that SSB were the main beverages available in recreational settings (including sporting venues) they did not specify which beverages were consumed in sporting venues or quantify the volume of beverages consumed by the participants, nor did they elucidate the timing of consumption in relation to physical activity (Smith et al., 2019).

The NZ MoH guidelines state that *"sports drinks are not necessary for most children and young people"* and that "*plain water is the best source of fluid replacement if exercising for less than 60–90 minutes"* (Ministry of Health., 2012) however, to date, there is no data in NZ to compare children's current beverage consumption patterns in the sporting context against these guidelines. Given that the sporting context has been identified as an environment that NZ children regularly frequent (Smith et al., 2019), particularly for 12-to-14-year-olds who have the highest weekly sports participation rates of any age group (Sport New Zealand., 2020). Thus, the sporting context may constitute a significant part of their beverage consumption environment; an environment where they may be exposed to a wide availability of SSB (Smith et al., 2019). Furthermore, children may consume these SSB not just before, during, or after sport, but also in non-

sporting situations (Broughton et al., 2016). Moreover, these behaviours learnt as children may carry through to adulthood (Fitzgerald et al., 2010; Kvaavik et al., 2005). Consequently, it is imperative to assess beverage consumption in the sporting environment where these children spend a considerable amount of time (Smith et al., 2019; Sport New Zealand., 2020).

1.2 Aims and Objectives

This study, therefore, aims to assess the beverages 11-14-year-old NZ children consume before, during, and after organised sport and the influencing factors on beverage choice with the following specific objectives:

- Assess beverage types and quantities consumed by 11-14-year-old NZ children before, during and after sport.
- Investigate consumption patterns relative to age, gender, and school decile.
- Determine the most preferred beverages for consumption.
- Determine the reason for their preference of said beverages.
- Determine who provides the beverages to the children.
- Determine where the children source information about what beverages to consume.

This research will be the first to contribute to the literature data regarding NZ children's beverage consumption patterns in the context of organised sport. This data may also provide important insight into children's current beverage consumption practices in the sporting environment compared to NZ MoH's guidelines. The data could also inform future reviews of children's beverage consumption guidelines by the MoH. Furthermore, stakeholders such as sporting organisations, health professionals, coaches and parents may also find this research helpful. The findings may also make a vital contribution to the discussion regarding public health interventions and policies targeted towards children's SSB consumption.

1.3 Scope

This cross-sectional study will be limited to a convenience sample of NZ children who participate in an organised sport and can read and write in English. The data will be collected within the upper North Island region due to practical constraints. Although the highest weekly sport participation rates are seen in 12-to-14-year-old New Zealanders, this study will survey 11-to-14-year-olds to acknowledge the different exposures to physical activity depending on school age (Sport New Zealand., 2012), of which in the NZ school system, the 11-14-years-old age bracket encompasses children in intermediate school and junior high school (Sport New Zealand., 2012).

1.4 Thesis Structure

This thesis is divided into four chapters. Chapter 1 provides a background to the research. This introduction chapter has defined and presented an overview of children's hydration requirements when participating in physical activity, current hydration practices, and factors influencing children's consumption of beverages. It has also highlighted the scant literature on SSB consumption in the sporting context, and the need for further research regarding children's beverage consumption in the sporting environment in NZ. Chapter 2 will present a review of the literature written in manuscript form. Chapter 3, is concerned with the methodology used for this study and will present, discuss, and draw conclusions from the research findings (written in manuscript form). Chapter 4 will conclude the thesis by summarising the overall findings and relating them back to the literature. This final chapter will present recommendations based on the findings, the limitations of the study, and directions for future studies.

1.5 Researchers Contributions Table

Table 1.1 Researchers Contributions Table

Researcher	Contribution
Carol Muodza	Main researcher
Professor Ajmol Ali	Primary academic supervisor
Assoc Prof Andrew Foskett	Associate academic supervisor
Dr Rachel Batty	Associate academic supervisor
Daniel Gordon PhD candidate	Associate researcher
Dr Daniel Walsh **Dr Hajar Mazahery**	Statisticians
Dr Cherie Williamson Todd	Writing supervisor

The following narrative review of the literature regarding children's beverage consumption is formatted based on the submission guidelines of the Appetite Journal. Reviews can be of any length.

2 Narrative Literature Review

2.1 Introduction

The purpose of the following chapter is to review the literature on children's habitual beverage consumption and in the sporting environment including the factors influencing beverage consumption. Articles were found using the search terms in Table 2.1 were used in Google Scholar, Scopus, and Massey University article database. The search was limited to articles available in English published between 2010 and 2022.

Table 2.1 Search terms

sport* beverage* OR sport* drink* AND child* OR youth OR adolescen* AND Sport* OR Team Sport* OR Organi* Sport OR Individual Sport
child* OR adolescen* OR youth OR teenager AND sugar-sweetened beverages Intake OR consumption OR drinking AND organised sport OR sport
drink* OR beverage* OR fluid AND intake OR consumption OR drinking AND organis* sport AND child* OR adolescen* OR youth OR teenager.

The New Zealand (NZ) Ministry of Health's (MoH) Food and Nutrition Guidelines for Children aged 2 to 18 years old recommend water and milk as the main beverages for consumption (Ministry of Health., 2012). Sugar-sweetened-beverages (SSB) such as fruit drinks are recommended for limited consumption while soft drinks and energy drinks are not recommended for consumption (Ministry of Health., 2012). Despite not being recommended for consumption, adolescents are the highest consumers of SSB of any age group (Della Corte et al., 2020). In the US the consumption of SSB has been identified as commonplace among children and adolescents alongside milk and water (Brener et al., 2011). The normalcy of SSB consumption in children is widespread despite the consumption of SSB being associated with behavioural and health risks (Bleich & Vercammen, 2018). Examples of these health risks include overweightness (Hardy et al., 2018; Utter et al., 2018), obesity (Field et al., 2014; Gallagher et al., 2021), insulin resistance (Bleich &

Vercammen, 2018), dental caries (Armfield et al., 2013; Hardy et al., 2018; Pitchika et al., 2020), and impacts on sleep (Chaput et al., 2018) and mental health (Kadel et al., 2020; Mrug et al., 2021; Utter et al., 2018). Moreover, SSB consumption also contributes significantly to discretionary sugar intake in Western diets (Della Corte et al., 2020). The World Health Organisation (WHO) strongly recommends for the reduction of free sugar intake – which for children should be less than 10% of total energy intake (World Health Organization., 2015) – as a means to end childhood obesity (World Health Organization., 2016b). The WHO thus recommends reducing SSB consumption as one of the strategies to reduce sugar intake to end childhood obesity (World Health Organization., 2016b).

One common reason for consumption of SSB is for sports performance enhancement (Cruz-Muñoz et al., 2020; Trapp et al., 2020; Wiens et al., 2014). Although water is the only recommended beverage for consumption for children participating in physical activity (Ministry of Health., 2012; Pound et al., 2017; Schneider & Benjamin, 2011), sport-playing children consume SSB such as sports drinks (Nelson et al., 2011) and view them as a necessity when participating in physical activity (Manore et al., 2017; McDowall, 2007). Despite this apparent consumption of these beverages within the sporting context, there is scant literature investigating children's beverage consumption pattern in the sporting environment. Therefore, this literature review aims to elucidate children's habitual beverage consumption patterns, the factors influencing beverage consumption; and the gaps in the literature regarding beverage consumption within the sporting environment.

2.2 Youth Beverage Consumption of Children Between the Ages of 5 and 18

2.2.1 Water Consumption Patterns

Water can be ingested directly by consuming plain tap or bottled water, or indirectly through consumption of other beverages and food. While water intake can refer to total water intake, that is direct and indirect water consumption, according to the Institute of Medicine (IOM) (Electrolytes & Water, 2004) and European Food Safety Authority (EFSA) Panel's definitions (Nutrition & Allergies., 2010), in this section

water intake will refer to direct water consumption only to assess the amount of plain water consumed by children.

Water is vital to the physiological function of the human body (Benelam & Wyness, 2010), however, few countries have set water intake recommendations due to the variability in water requirements between individuals (Benelam & Wyness, 2010). The IOM (Electrolytes & Water, 2004) and EFSA Panel (Nutrition & Allergies., 2010) set adequate intake levels for water intake, which are based on the median total water intake observed in the US National Health and Nutrition Survey (NHANES) III (Electrolytes & Water, 2004) and the average water intake observed in people with desirable hydration statuses in the European population respectively (Nutrition & Allergies., 2010). The NZ MoH (Ministry of Health., 2012) has not set recommendations for water intake for any age group. The NZ MoH also does not assess children's water consumption, but it does recommend that children "drink plenty of water" (Ministry of Health., 2012).

Across 19 countries Suh & Kavouras (2019) calculated that more than half of children (60 ± 24%) did not meet the recommended water intake recommendations. Additionally, the proportion of children who did not meet adequate intake of fluid, that is, the recommended average volume of water intake which is based on populations observed to have a desirable hydration status (Nutrition & Allergies., 2010) ranged from 10% to 90% across 13 countries (Iglesia et al., 2015). However, it is challenging to compare and to determine the trends in water consumption over time between countries due to the differing methodologies used within (Drewnowski et al., 2013) and across countries (Benelam & Wyness, 2010). As shown in

Table 2.2 different countries assess water consumption in different age groups making it difficult to compare consumption patterns. Furthermore, unlike the US, countries like the UK (Vieux et al., 2017) and France (Bellisle et al., 2010) reported the average volume of water consumed over time rather than individual values for each year. This reporting does not allow for changes in water consumption over time to be ascertained. Moreover, some countries such as South Korea (Hwang et al., 2020) do not assess water consumption at all, thus there is limited research into children's water drinking patterns (Drewnowski et al., 2013).

Table 2.2 Children's daily water consumption (mL/d) in selected countries

References	Country	Sample size (n)	Age of participants (y)	Water consumption (ml/day)	Comments
Lioret 2010	France	1444	3-17	484.4 ± 339.1	• A drawback is the main aim of the study was to assess food intake not beverage intake
Bellisle et al., 2010	France	566	6-11	549	• Data are limited to a cross-sectional analysis of average daily fluid intake • Data were collected using a 7-day food record survey completed by parents and children and thus may be subject to over and underestimation of intakes. However, food-records were checked for accuracy by a trained interviewer • Analysis accounted for seasonal variations in water consumption by conducting their study over four periods
		333	12-19	577.8	
Vieux et al., 2017	UK	845	4-13	257.6 ± 275.7	• Reported the mean volume of water consumed over 3-year cycles of the UK National Diet Nutrition Survey and neglected to report the volume of water consumed in each cycle time to allow for time-trend analysis
Ng et al. 2012	UK	1798	4-18	189	• Acknowledged that estimated intake might be affected by the differing durations of the food diaries (4 vs 7 day) used in the different years of the surveys and accounted for this variation in their analysis
		462	4-18	383	
Drewnowski et al., 2013	USA	4766	4-13	431.0 ±13.1	• Data are based on 24-hr recalls conducted by trained interviewer. 24-hour recalls may not representative of usual dietary intake.
Vieux et al., 2020	USA	2644	4-8	430 ±15	• Data sourced from two 24-hr recalls conducted by a trained interviewer
		2501	9-13	577 ±19	

			4-18	577 ± 29	
			4-18	642 ± 24	
			4-18	663 ± 34	
		2308	14-18	866 ±34	
Iglesia-Altaba et al., 2021	Spain	65	4-9	470	Iglesia-Altaba et al., (2021) • Innovative approach in their use of a validated questionnaire that is dedicated for assessing fluid intake. • Comprehensive exclusion criteria which excluded children following restricted fluid diet and children of parents working for beverage companies and/or in beverage related industries • A drawback is the small sample size with majority (63%) male participants • Authors neglected to justify their selected cut-off values for data excluded from analysis as being low and excess water intake.
		81	10-17	496	

Sample size not reported

Despite the limited data, Table 2.2 shows that UK children had the lowest water consumption and US children had the highest water consumption albeit water consumption for US children was comparable to French adolescents in the 2011-12 cycle. While the data suggests that US children's water consumption increased between 2005 and 2010 from 431 mL/day (±13.1) (Drewnowski et al., 2013), to 663 ± 34 mL/day in 2015 and 2016 (Vieux et al., 2020), comparisons are limited by the differences in age ranges assessed in the former and later cycles of the NHANES. A similar increase in water consumption was observed in UK children as consumption was lowest in 1997 (189 mL/d) and increased to 383 mL/d in 2008-08 (Ng et al., 2012), suggesting children's water consumption may have increased over the years. However, the methodologies used to assess water consumption differed between the countries. In the US, the data was collected from 24-hour food records (Drewnowski et al., 2013; Vieux et al., 2020) whereas multi-day food records were used in the UK (Ng et al., 2012). Across France, US, and Spain, adolescents consumed more water than younger children.

The studies presented in Table 2.2 were chosen as their data was sourced from the respective countries' national nutrition surveys and as such were representative of children's beverage consumption within the respective countries. Furthermore, for ease of comparison, the countries represented in the table are OECD members, countries which are alike (Srinivasan et al., 2006). Although available, data on German (Sichert-Hellert et al., 2001) and Flemish (Bel et al., 2019) youth's water intake was excluded due to the age of the data and because it included indirect water intake from sugar free beverages, respectively.

2.2.2 Milk Consumption Patterns

Milk consumption is recommended for children worldwide for growth and development and for bone health (Dror & Allen, 2014; Ministry of Health., 2012; Willett & Ludwig, 2020). Plain low-fat milk is recommended over full-fat milk for consumption due to fat content (Dror & Allen, 2014; Ministry of Health., 2012). Milk alternatives fortified with calcium are classified under milk in the NZ guidelines, albeit differing in nutrient composition compared to mammalian milk (Ministry of Health., 2012). While adults' global milk consumption patterns (Singh et al., 2015) and overall milk consumption for all ages have been

described (Lara-Castor et al., 2019), there is no data which indicates global temporal trends in children's milk consumption.

The use of national data to compare children's milk consumption trends presents a challenge as the measures of milk consumed differ between studies and some studies may or may not include milk alternatives in their assessment. For example, Ng et al., (2012) and Vatanparast et al.'s (2021) data from were in agreement that children's milk consumption has declined over the years in their respective countries. However, Ng et al. (2012) reported their findings as the change in energy consumption (kJ) from milk per capita per day, while Vatanparast et al (2021) reported the change in proportion of Canadian children consuming milk which fell from 81.4% in 2004 to 71.2% in 2015. Although their data is older, (Dror & Allen, 2014) similarly reported that the proportion of US children consuming milk has fallen from 94% in 1977 to 84% in 2001. The data suggests a general decline in children's milk consumption over the decades as declines in children's milk consumption have also been reported elsewhere in Great Britain (Ng et al., 2012), Germany (Dror & Allen, 2014), and France (Dror & Allen, 2014),.

From the selection of countries presented in Table 2.3, Korean adolescents (16-18 years old) are shown to have the lowest milk consumption (Hwang et al., 2020). This is in line with literature that milk consumption is low among adults in Asian countries (Singh et al., 2015). However, the data on Korean adolescents' milk consumption is limited in that it only presented an average volume of milk consumed over multiple cycles of national nutrition surveys. This reporting does not allow for temporal trends in milk consumption to be ascertained as the volume of milk consumed in each cycle was not stated. Nevertheless, US children had the highest milk consumption of the countries presented in Table 2.3 , but this consumption has declined (Stewart et al., 2021). Iglesia-Altaba et al., (2021) reported Spanish children's milk intake their data presented the volume of water consumed from the milk not the amount of milk consumed, therefore, this data was excluded from the data in Table 2.3. Iglesia-Altaba et al., (2021) also similarly failed to report the volume consumed of the following beverages: fruit juice, soda, fruit drink, sports drink, and energy drink.

Table 2.3 Children's daily milk consumption (mL/d) in selected countries

References	Country	Sample size (n)	Age of participants (y)	Milk consumption (ml/day)	Comments
Lioret et al., 2010	France	574	3-10	196.6 ±179.2	• Drawback is that the main aim was to assess food intake not beverage intake • Relied on parents and children completing a 7-day food record and thus may be subject to recall bias and social desirability bias.
		456	11 -14	166.0 ± 132.8	
		425	15 - 17	141.6 ±124.1	
Dror & Allen, 2014	Ireland		5-12	238 ± 188	• Reported boys' milk consumption and neglected to report girls' milk consumption • Distinguished the types of milk consumed (whole vs. low fat) in their reporting.
			13-17	206 ± 232	
Hwang 2020	South Korea	2,405	10-12	178.7 ±5.0	• Data reported are limited to 10- to 18-year-olds which may not provide an accurate overview of children's milk consumption. • Data are based on single 24-hour recall and may not be representative of habitual milk consumption patterns
		2089	13-15	149.5 ±5.3	
		1627	16-18	111.8 ±5.2	
Vieux et al., 2017	UK	845	4-13	212.3 ±169	• Included flavoured milk in their reporting milk consumption
Stewart et al., 2021	USA		<12	253.1	• Longitudinal analysis of data pooled from 8 cycles of the NHANES
			<12	186.9	
Drewnowski et al., 2013	USA	4766	4-13	87.2 ±3.9	• Reported the water content of milk consumed instead of the actual volume of milk consumed which may introduce inaccuracies • Included flavoured milk in their reporting milk consumption

Sample size not reported

There is no data on temporal trends in milk consumption for neither NZ nor Australian children. The volume of beverages they consume is not assessed in the national nutrition surveys (Ministry of Health., 2012). This lack of data is despite recommendations for children two years and older drink plain low-fat cow's milk (Ministry of Health., 2012). However, as in other findings (Brener et al., 2011; Dror & Allen, 2014; Herrick et al., 2018; Vieux et al., 2017), similar trends were observed in the 2008/2009 NZ national nutrition survey (Ministry of Health., 2012) and 2007 Australian national nutrition survey (Baird et al., 2012) that milk consumption declines with age (Dror & Allen, 2014; Herrick et al., 2018; Vieux et al., 2017), and males consume and/or are more likely to consume milk than females (Brener et al., 2011; Dror & Allen, 2014; Herrick et al., 2018; Vieux et al., 2017). Furthermore, research investigating New Zealanders' attitudes to milk and milk consumption including youth aged 16 to 20 years old, showed that over one-third of participants were low milk consumers (<250 mL per day) (Wham & Worsley, 2003). Although the volume of milk consumed was not quantified, recent research found that 85% of NZ school-aged participants consumed milk-based SSB at least once a week (Smirk et al., 2021). Additionally, (Marsh et al., 2018) observed that children's milk significantly increased following the NZ Milk in Schools programme which provided school-aged children with free milk.

2.2.3 Fruit Juice Consumption Patterns

Fruit juice is 100% juice extracted from fruit without added sugar (Benton & Young, 2019; Caswell, 2009). Several countries' food and nutrition guidelines count fruit juice intake as contributing to daily servings of fruit intake (Benton & Young, 2019). Whole fruit is, however, encouraged more than fruit juice due to its nutrient density (Crowe & Murray, 2013). Considerable research into children's fruit juice consumption has emanated from the US (Lasater et al., 2011; Lin & Morrison, 2016; Nelson et al., 2009; Perrar et al., 2019). The proportion of school-aged children in the US consuming fruit juice was 50% in 2007/08 and this increased over the years from 46% in 1989/91 (Lasater et al., 2011). Energy intake from fruit juice increased significantly from 38 kcal in 1988 to 48 kcal in 2004 (Wang et al., 2008). The decline of 100% fruit

juice in the US has been attributed to a reduction in consumption of orange juice (Lin & Morrison, 2016). Intake of 100% fruit juice appears to also decline with increasing age (Nelson et al., 2009). Similar increasing trends were also observed in the UK where the proportion of school-aged children consuming fruit juice was 53% in 2008/09 and this increased over the years from 44% in 1997 (Ng et al., 2012).

With the exception of Nelson et al (2009), the literature suggests that fruit juice consumption increased up until the mid-2000s (Beck et al., 2013; Lasater et al., 2011; Moreno et al., 2010; Ng et al., 2012; Perrar et al., 2019; Ribas-Barba et al., 2007; Wang et al., 2008), and subsequently fell until the mid-2010s (Miller et al., 2017; Nicklas et al., 2020; Perrar et al., 2019), however, the different outcome measures used in the studies to assess fruit juice consumption make it difficult to draw conclusions on consumption patterns. Nevertheless, a decline in free sugar intake from fruit juice was observed from 2005 to 2016 in the German population (Perrar et al., 2019). Table 2.4 shows that UK children had the highest fruit juice consumption. However, caution should be taken in interpreting Vieux et al's (2017) finds as they combined fruit and vegetable juices likewise with Hwang et al.'s findings (2020). The data presented in the Table 2.4 was limited to South Korea, UK, and the US as although available, Australian (Miller et al., 2020) and additional US data (Miller et al., 2017) only presented the percentage of participants consuming fruit juice and neglected to investigate the volume of fruit juice participants were consuming. In NZ, there is evidence to show that fruit juice is the second most consumed beverage by children after water (Ministry of Health., 2012), however there is no data regarding consumption of fruit juice only by children and adolescents.

Table 2.4 Children's daily fruit juice consumption (mL/d) in selected countries

References	Country	Sample size (n)	Age of participants (y)	Fruit juice consumption (ml/day)	Comments
Hwang, 2020	South Korea	2405	10-12	35.5 ±2.4	• Data reported are limited to 10- to 18-year-olds which may not provide an accurate overview of children's fruit juice consumption. • Data were collected using a single 24-hour recall which may not be representative of habitual fruit juice consumption patterns.
		2089	13-15	45.1 ±3.4	
		1627	16-18	49.4 ±4.1	
Vieux et al., 2017	UK	845	4-13	91.8 ±121.8	• Data were sourced from three cycles of the National Diet Nutrition-Surveys, which were based on 4-day food records that included a weekend day. Therefore, may reflect habitual intake
Ng et al. 2012	UK	1798	4-18	145	• Acknowledged that estimated intake might be affected by the differing durations of the food diaries (4- vs 7-day) used in the different years of the surveys and account for the variation in their analysis
		462	4-18	154	
Drewnowski et al., 2013	USA	4766	4-13	87.2 ±3.9	• Reported the water content in the fruit juice consumed instead of the actual volume of fruit juice consumed which may introduce inaccuracies.

2.2.4 Sugar-sweetened Beverage Consumption Patterns

In broad terms, SSB are non-alcoholic beverages which contain added sugars (World Health Organization., 2016a). Examples of such beverages include carbonated beverages like soft drinks, energy drinks, and non-carbonated beverages such as sports drinks, flavoured waters, fruit drinks and cordials, or sweetened milk (World Health Organization., 2016a). Much of the literature on SSB consumption in children has emanated from the US (Bleich et al., 2018; Dai et al., 2021; Della Corte et al., 2020; Han & Powell, 2013; Kit et al., 2013; Nelson et al., 2009; Nielsen & Popkin, 2004; Ogden et al., 2011; Rosinger et al., 2017; Vercammen et al., 2020), therefore the literature is biased towards the US.

Nielsen and Popkin (2004) identified increasing trends in US children's SSB consumption and Della Corte et al. (2020) elaborated that energy intake from SSB increased from the 1960s to about 2000 (Della Corte et al., 2020). The increase in SSB consumption has since been followed by a sustained decline in consumption (Della Corte et al., 2020). Data from the US NHANES reports that the prevalence of SSB consumption in 2–11-year-olds was 66% in 2007-2008 and this has fallen over the years from 78% in 1999-2000 (Han & Powell, 2013). Similarly, SSB consumption in 12–19-year-olds was 77% in 2007-2008 and this decreased from 87% in 1999-2000 (Han & Powell, 2013). More recent evidence suggests that US children's SSB consumption declined to 60.7% in 2014 (Bleich et al., 2018). In addition to the declining consumption an increased proportion of children (35.8% ± 1.3%) reportedly did not consume SSB (Kit et al., 2013).

Declines in consumption were also observed in the amount of energy intake from SSB between 1999 and 2010 (Kit et al., 2013). Kit et al equated the decline in energy intake to slightly more than one can of coke (Kit et al., 2013). Although Della Corte et al., (2020) attributed the sharp decline in SSB consumption in the US to the release of Kraak et al's (2005) report on childhood obesity prevention, children's increasingly restricted access to SSB could also be a contributing factor (Wang et al., 2008). Della Corte et als' (2020) review highlighted the limitations of the literature as 39 of the 43 studies reviewed were determined to have risk of a bias using the Risk of Bias in Non-randomised Studies of Intervention (ROBINS-I) tool. However, it remains the only study to clearly illustrate that "…consumption levels rose substantially in the

decades preceding the peak year 2000, followed by a dramatic drop until the year 2012." (Della Corte et al., 2020).

Declining trends in SSB consumption observed in the US were also observed in the UK (Beverley et al., 2020), Australia (Jensen et al., 2012), Norway (Bolt-Evensen et al., 2018) and Canada (Della Corte et al., 2020), but the changes in consumption patterns are not as distinct as in the US. For example, UK and Chinese children's SSB consumption decreased, while South Korean and Mexican children's consumption increased (Della Corte et al., 2020). There was also a clear decrease in SSB consumption in Norwegian children between 2001 and 2008 (Bolt-Evensen et al., 2018; Della Corte et al., 2020). While Australian children's SSB reportedly decreased from 77% in 2003 to 71% in 2008 in 4-18-year-old (Jensen et al., 2012),

Table 2.5 shows that Australian children had greater soft drink and fruit drink consumption compared to UK and Korean children. However, a shortcoming of the Jensen et al., (2012) study is that they included 100% fruit juice as SSB which is inconsistent with WHO's (2016) definition of SSB and may have overestimated SSB consumption. Jensen et al., (2012) also neglected to investigate sports drinks and energy drink consumption.

In New Zealand there is no data pertaining to changes in SSB consumption patterns (Ministry of Health., 2012). However, among 2-to-19-year-olds, 51% consumed soft drinks and 72% consumed fruit drinks (including 100% fruit juice; (Ministry of Health., 2012). In more recent research 96% of children aged 8-12 years old consumed one or more SSB per week (Smirk et al., 2021). Although the evidence predominantly points to a declining trend in children's SSB consumption, some studies' definition of SSB were inconsistent with the WHO's definition (Jensen et al., 2012; Ministry of Health., 2012) which presents difficulties for drawing comparisons on SSB consumption patterns.

Table 2.5 Children's daily sugar-sweetened beverage consumption (mL/d) in selected countries

Reference	Country	Sample size (n)	Age of participants (y)	Type of SSB consumed	SSB consumption (ml/day)	Comments
Hafekost et al., 2011	Australia	1263	4-8	Soft drink	134	• Although the authors conducted two 24-hour recalls, a minimum of one recall was required for participants' data to be included in analysis which might not reflect actual intake • Classified children who consumed SSB for both recalls as regular consumers and children who did not consume SSB as non-consumers which is unlikely to accurately reflect participants' usual SSB consumption
				Fruit drink	176	
				Cordial	28.7	
				Sports drink	8.4	
				Flavoured milk	74.3	
				Milkshake/Smoothies	21.8	
		1219	9-13	Soft drink	305	
				Fruit drink	157	
				Cordial	40.3	
				Sports drink	30.1	
				Flavoured milk	84.3	
				Milkshake/Smoothies	28.9	
		1161	14-16	Soft drink	426	
				Fruit drink	175	
				Cordial	38.4	
				Sports drink	38.2	
				Flavoured milk	131	
				Milkshake/Smoothies	25.2	
Beverley et al., 2020	UK		4-8	Soft	46.7 ± 92.0	• Neglected to state the sample size, however, data were sourced from four cycles of the UK National Diet Nutrition-Surveys
			4-8	Fruit Drink	91.3 ± 114.0	
			4-8	Sports drink	3.9 ± 29.2	
			4-8	Flavoured water	8.2 ± 44.3	
			9-13	Soft	130.8 ± 176.8	
			9-13	Fruit Drink	92.3 ± 129.6	

			9-13	Sports drink	20.1 ± 67.4	
			9-13	Flavoured water	16.2 ± 61.0	
			4-10	Total (undefined)	52	
			11-18	Total (undefined)	142	
Vieux et al., 2017	UK	845	4-13	Soft drink	89.3 ± 145.9	• Data were sourced from three cycles of the National Diet Nutrition-Surveys, which were based on 4-day food records that included a weekend day. Therefore, may reflect habitual intake
				Fruit drink	242.1 ± 248.3	
				Sports drink	12.1 ± 52.0	
				Flavoured water	12.2 ±53.2	
Hwang et al., 2020	South Korea	2405	10-12	Soft drink	64.9 ±3.8	• Data reported are limited to 10- to 18-year-olds which may not provide an accurate overview of children's soft drink consumption • Data were collected using a single 24-hour recall which may not be representative of habitual soft drink consumption patterns
		2089	13-15	Soft drink	93.1 ±6.0	
		1627	16-18	Soft drink	128.3 ±7.4	
Vieux et al., 2020	US		4-18(2011-12)	Total SSB	324 ± 9	• Definition of SSB was limited to diet and non-diet soft drinks
			4-18 (2013-14)	Total SSB	291 ± 16	
			4-18 (2015-16)	Total SSB	237 ± 14	

Sample size not reported

2.2.4.1 *Differences in Sugar Sweetened-beverage Consumption Trends by Type of Beverage*

Although consumption of SSB overall is on the decline (Della Corte et al., 2020), there are differences in consumption trends depending on the type of SSB. Consumption of beverages such as soft drink and fruit juice consumption has declined (Della Corte et al., 2020), while consumption of beverages such as sports drinks (Field et al., 2014; Kit et al., 2013; Larson et al., 2014; Wang et al., 2008) and energy drinks (Kit et al., 2013; Larson et al., 2014) has increased. In the US, Wang et al (2008) observed a 200% increase in calorie consumption from sports drinks by 2-to-19-year-olds between 1988 and 2004. However, Bleich et al., (2018) did not observe any changes in sports drink consumption in the same population between 2004 and 2016. This discrepancy may reflect the overall decline in SSB consumption since 2000 (Bleich et al., 2018; Della Corte et al., 2020). Furthermore, although consumption has increased, sports drinks and energy drinks appear to make up a small proportion of energy intake from SSB consumed by children and adolescents (Kit et al., 2013).

2.2.4.2 *Milk-based sugar-sweetened beverage consumption*

Milk-based SSB consumption, in the form of flavoured milk or high fat high sugar milk has increased in the US (Lasater et al., 2011) and Canada (Vatanparast et al., 2021). Vatanparast et al., (2021) observed that flavoured milk consumption was 7.5% in 2004 and increased to 11.1% in 2015. Thus, flavoured milk consumption increased while plain milk consumption declined (Vatanparast et al., 2021). The consumption of flavoured milk in the US also increased between 1989 and 2008 from 38% to 63% (Lasater et al., 2011). However, in NZ, consumption trends have yet to be determined. Nevertheless, 85% of 8 to 12 years olds in NZ consumed milk-based SSB (Smirk et al., 2021), and flavoured milks were also identified among the SSB children associate with participating in sport (Smith et al., 2014).

2.3 Factors affecting beverage consumption

Gender (Jensen et al., 2012; Rosinger et al., 2017), age (Özen et al., 2015), ethnicity (Dai et al., 2021; Han & Powell, 2013; Ogden et al., 2011) and SES (Han & Powell, 2013) are factors which have been identified to

influence children's consumption of SSB and non-SSB beverages. The following sub sections detail how these factors influence beverages consumption.

2.3.1 Gender and beverage consumption

Males drink (Collison et al., 2010) and are more likely to drink milk (Maillot et al., 2018) and fruit juices than females (Brener et al., 2011; Guelinckx et al., 2015; Nelson et al., 2009). Males consume significantly more SSB than females (Collison et al., 2010; Jensen et al., 2012; Ogden et al., 2011; Rosinger et al., 2017) excluding Vieux et al., (2017) who did not observe gender differences in UK children's SSB consumption. More males consumed (Costa et al., 2016; Reid et al., 2017; Trapp et al., 2020) and were more likely to consume (Brener et al., 2011; Frayon et al., 2019) energy drinks (Costa et al., 2016; Frayon et al., 2019; Larson et al., 2014; Reid et al., 2017; Zucconi et al., 2013), soft drinks (Field et al., 2014), and sports drinks (Broughton et al., 2016; Field et al., 2014). Miller et al., (2018) did not observe any gender differences in SSB consumption except in energy drink consumption. While gender differences are evident in children's milk, fruit juice, and SSB consumption, gender differences in water consumption are unclear. Among Australian children, significantly more females were observed to consume water (Cockburn et al., 2018), whereas, Özen et al., (2015) identified that adolescent males consumed more water than adolescent females in their systematic review of beverage consumption. Still, no gender differences were identified in water intake by Vieux et al., (2017). There was evidence to support patterns of gender differences in beverage consumption in a review of beverage intake across 13 countries, however, these differences were not universal (Guelinckx et al., 2015). Therefore, findings pertaining to gender differences should be contextualised to the country of research (Guelinckx et al., 2015).

2.3.2 Age and beverage consumption

Milk consumption may be inversely related to age (Baird et al., 2012; Dror & Allen, 2014; Herrick et al., 2018; Vieux et al., 2017), while SSB consumption increases with increasing age (Nelson et al., 2009). Older children appear to consume less milk than younger children (Baird et al., 2012; Guelinckx et al., 2015; Vieux et al., 2017), suggesting that milk consumption is replaced by SSB in older children and during adolescence

(Özen et al., 2015; Vieux et al., 2017). Moreover, SSB consumption is most prevalent among adolescents and peak consumption is observed in this age group (Ogden et al., 2011). This increase of SSB consumption with age is most evident in consumption of soft drinks (Vieux et al., 2017), sports drinks (Vieux et al., 2017), and energy drinks (Cruz-Muñoz et al., 2020; Vieux et al., 2017). Notably Vieux et al., (2017) also observed that older children drank significantly more bottled water. While the largest increases in SSB consumption were observed in adolescents in the US during the rise of SSB consumption (Wang et al., 2008), the largest declines in SSB consumption in the past decade have also been observed among adolescents (Della Corte et al., 2020) but not observed in all age categories (Kit et al., 2013). Like milk, fruit juice consumption decreases in adolescents (Nelson et al., 2009). Additionally, Vieux et al (2017) observed that older children consumed more water whereas water consumption was observed to remain high across all age groups in Australian children by Cockburn et al (Cockburn et al., 2018).

2.3.3 Ethnicity and beverage consumption

Ethnic differences in beverage consumption patterns have been the focus of several US studies (Brener et al., 2011; Drewnowski et al., 2013; Herrick et al., 2018; Russo et al., 2020). In the US, ethnic minorities consumed more SSB (Ogden et al., 2011), specifically non-Hispanic black children and Hispanic children were found to consume significantly more SSBs specifically soft drinks (Herrick et al., 2018) and more likely to consume sports drinks (Brener et al., 2011). While the largest increases in SSB consumption were observed in ethnic minorities in the US during the rise of SSB consumption (Wang et al., 2008), the largest declines in SSB consumption in the past decade have also been observed among ethnic minorities (Bleich et al., 2018; Dai et al., 2021). Ethnic differences in non-SSB consumption were also observed. Non-Hispanic white and non-Hispanic Asian children consumed more water (Drewnowski et al., 2013; Herrick et al., 2018; Vieux et al., 2017). Furthermore, non-Hispanic white children were more likely to drink water (Brener et al., 2011; Drewnowski et al., 2013) and milk (Brener et al., 2011) and less likely to drink 100% fruit juice (Brener et al., 2011). Outside of the US, Reid et al., (201) and Utter et al., (2018) observed that in Canada and NZ

respectively, indigenous ethnicities were more likely to consume energy drinks or have greater prevalence of energy drink consumption.

2.3.4 Socioeconomic status and beverage consumption

Children from low SES have been observed to have a greater likelihood of consuming SSB (Han & Powell, 2013). Australian children from low SES had higher SSB consumption (Cockburn et al., 2018) and in Norway more frequent SSB consumption was associated with low SES (Bolt-Evensen et al., 2018). In the Pacific region low SES has also been associated with increased consumption of energy drinks (Frayon et al., 2019; Utter et al., 2018) and participants from low SES were also more likely to report energy drink consumption than high SES (Frayon et al., 2019). Children from the most deprived neighbourhoods in NZ were 2.1 times more likely to consume soft drinks once a week than children from the least deprived neighbourhoods (Ministry of Health., 2021). In the UK, Vieux et al., (2017) established that there was an inverse relationship between income and tea and coffee consumption. In contrast, children from high SES in the UK were found to consume more fruit juice and water (Vieux et al., 2017). Total water intake increased with increasing income and this high-water intake in participants from higher SES remained significant after adjustment for age, gender, BMI, region, and ethnicity (Vieux et al., 2017). High SES has also been associated with an increased likelihood of water consumption compared to low SES (Drewnowski et al., 2013). Vieux et al., (2017) however did not observe any differences in milk consumption by income. It follows then that there are likely to be SES-related differences in beverage consumption with children from low SES consuming more SSB in sporting environments and therefore needs to be explored.

2.4 Aspects influencing beverage consumption

The following sections discuss the different factors that influence children's beverage consumption.

2.4.1 External influences on beverage consumption

Parental attitudes towards SSB, and consumption habits influence children's habitual SSB consumption patterns (Bogart et al., 2017). Children of parents who had less favourable opinions of SSB, consumed SSB in moderation, and did not keep SSB in the house consumed less SSB (Bogart et al., 2017). The inverse was also true as children with parents who frequently consumed SSB daily (≥2 times/day) were more likely to consume SSB daily (≥1 times/day) (Lundeen et al., 2018). Furthermore, children cited seeing their parents consume SSB as a reason for SSB consumption (Sylvetsky et al., 2020). In contrast, 35.5% of New Caledonian high school students from a Pacific background stated they did not consume energy drinks as they were disallowed by their parents (Frayon et al., 2019). This parental influence may only be a significant a factor in young children as there is evidence that peer influence is greater than parental influence in older children's beverage consumption (Cruz-Muñoz et al., 2020; Reid et al., 2017).

The influences on children's beverage consumption patterns within the sporting environment are less clear. Some influences that have been identified within the sporting environment include the pressure to conform to the social norms of the sporting environment, and the types of beverages available in the environment (Caswell & Hanning, 2018). Children's consumption may also be partly influenced by the sponsorship of local sport events by corporate beverage companies which event organisers rely on for funding to make the events possible (Batty et al., 2016). Thus, marketing appears to be another influence on children's beverage consumption within the sporting environment (Batty et al., 2016; Batty & Gee, 2019; Caswell & Hanning, 2018; Larson et al., 2014). However further investigation that focuses on the influences within sporting environment is warranted.

2.4.2 Children's source of beverages and nutrition information

Parents were the primary providers of SSB for 8- to 14-year-old US children in the context of habitual SSB consumption as Sylvetsky et al., (2020) found that 82% (27/37) of the children obtained the beverages from

parents. Children also sourced beverages from establishments such as supermarkets (23/37), restaurants (19/37), conveniences stores (15/37). However, schools (3/37) were the least common place to purchase beverages (Sylvetsky et al., 2020). In the UK, most children (80.4%) purchased sports drinks from convenience stores and supermarkets (54.4%) (Broughton et al., 2016). In the sporting environment parents and/or guardians volunteered to provide the beverages that US children consume during and after their games (Spruance et al., 2020). The same was true in the top three beverages provided by parents in order were 100% fruit juice, sports drinks, and water (Spruance et al., 2020). Parents also typically provided children with sports drinks, fruit drinks, and flavoured milk after sport (Bolter et al., 2020). In Australia, water was the most popular beverage provided by parents and parents were more likely to provide adolescents with sports drinks (Devlin et al., 2022). While the literature points to parents being the primary providers for children's beverages, parents indicated that coaches influence children's beverage choices (Thomas et al., 2012). Furthermore, there is limited research to suggest that coaches may instruct parents to provide healthy beverages (Spruance et al., 2020) and coaches at 16/109 clubs provide players primarily with water (Kelly et al., 2010). It is unknown to what extent coaches are a source of beverages or dietary information from the children's perspective and who other providers are of children's beverages are. Therefore, there is need to investigate who provides children with beverages and nutrition information regarding what beverages to consume when participating in physical activity.

2.4.3 Children's preferred beverages for consumption when participating in sport

Children's beverage preferences are unclear due to limited research and this research being limited to exploring parental views. Some parents take their children's preferences into account (Bolter et al., 2020; Spruance et al., 2020) and other parents give their children varying degrees of freedom to choose what beverages to consume when participating in sport (Bolter et al., 2020). Therefore, it is evident that children's beverage preferences influenced parents' beverage choices for their children (Bolter et al., 2020; Spruance et al., 2020). In Bolter et al.'s (2020) research, one parent commented that their child chose water suggesting a preference for water. In contrast Spruance et al., (2020) stated that the children "… kind of expect something sugary [drinks]" (p. 20) suggesting a preference for SSB. However, neither Bolter al.,

(2020) nor Spruance et al., (2020) delved into what beverages the children preferred. Children's views of what beverages they would choose to consume when participating in sport if given the freedom of choice warrant investigation as preferences begin in early life (Parker et al., 2021), and may continue through to adulthood (Fitzgerald et al., 2010).

2.5 Beverage consumption in the sporting environment

Sports venues have not been the focus of investigation of beverage consumption (Carter et al., 2019; Smith et al., 2019) thus there is scant literature on the beverage environment in sporting venues. In New Zealand, Carter et al., (2019) observed that soft drinks were the leading beverages sold at netball (78%) and rugby venues (84.6%) in three regions. Sports drinks and energy drinks were also available at a third of these venues (Carter et al., 2019). The limited investigation of the sporting environment is further evidenced in Smith et al.'s study of beverage availability to children (Smith et al., 2019), as the study focused on the school and home environments not the sport environment. In an earlier study, participants photographed beverages in the sporting environment that they associate with sport, although half of the 30 beverages identified were SSB, there was insufficient evidence from the photographs to conclude whether children consumed these beverages (Smith et al., 2014). While it is evident that SSB are available in the NZ sporting environments (Carter et al., 2019; Smith et al., 2019), there is no evidence in NZ regarding what beverages children are consuming in the sporting environment.

2.5.1 Behavioural aspects of children's consumption habits

Despite the scant literature regarding the types of beverages children consume in the sport environment, when overall diet was assessed, Canadian children who participate in sports were found to consume more plain milk than children who do not participate in sport (Tomlin et al., 2013). In contrast, active adolescents from Spain had a greater consumption of sports drinks and energy drinks (Bibiloni et al., 2016). The opposing lack of differences in sports drinks consumption observed by between sport participating and non-sport participating Canadian children and overall low consumption of sports drinks, were likely due to the young age and moderate PA of participants (Tomlin et al., 2013) as SSB consumption increases with age

(Nelson et al., 2009) and regular sports drink consumption has been associated with higher moderate-to-vigorous-PA (Larson et al., 2014). In contrast, Swedish youth aged 11-to-17-years old who participated in organised PA had lower SSB intake compared to youth who did not participate in organised PA (Fröberg et al., 2022). Nevertheless, there is evidence that children consume more calories than they expend when participating in PA (Bennion et al., 2020). Furthermore, children's sugar intake exceeded recommended amounts, a significant amount of which came from SSB (Bennion et al., 2020). It is important to note that Bennion et al., (2020) only observed consumption, and did not quantitatively assess the children's intake and therefore may have overestimated or underestimated consumption. Despite the mixed findings in literature on children's consumption habits in the sporting environment, behaviours established in childhood may carry through to adulthood and therefore require further investigation.

2.5.2 Promotion of unhealthy beverage consumption in the sporting environment

Sporting environments, although they are not the strongest influence on children's beverage choices (Caswell & Hanning, 2018), present an opportunity for health promotion (Kelly et al., 2010). Instead, they promote unhealthy beverage consumption through the availability (Smith, 2010; Thomas et al., 2012) and sale (Kelly et al., 2008) of SSB. While water is the main beverage sold and/or purchased (Carter et al., 2019; Kelly et al., 2010), SSB such as soft drinks were as equally sold as water (Carter et al., 2019). Sports drinks and energy drinks were also available (Caswell & Hanning, 2018) and among the most purchased beverages (Kelly et al., 2010). Furthermore, parents (Caswell & Hanning, 2018; Kelly et al., 2010; Thomas et al., 2012) and children (Caswell & Hanning, 2018) perceive the beverages available in sporting environments as largely unhealthy, albeit parents self-defined the terms "healthy" and "unhealthy" and these definitions varied between parents. Moreover, although their studies were conducted almost a decade apart (Carter et al., 2019; Smith, 2010) came to the same conclusion that the beverages available in the NZ sporting environment are energy-dense and nutrient poor.

Parents (Caswell & Hanning, 2018; Smith, 2010) and players (Caswell & Hanning, 2018) expressed their desire for healthier beverages to be made available in sporting venues, yet conceded that these beverages

are the norm for the environment in agreement with sports administrators (Carter et al., 2019) and that there is consumer demand for unhealthy beverages (Carter et al., 2019; Smith, 2010). Youth sport environments thus do not foster a healthy beverage environment (Smith, 2010) as they promote exposure to unhealthy beverages while offering few healthy ones (Thomas et al., 2012). More recent research suggests parents would support a water-only policy at children's sporting events (Devlin et al., 2022). However, the researchers concede that the scope of future research needs to expand beyond policy into impartial assessment of children's consumption habits and behaviours at sporting events (Devlin et al., 2022).

2.6 Beverage recommendations for children participating in sports

Fluid intake is recommended before, during, and after exercise to achieve euhydration, prevent excessive dehydration (>2% change in body weight) and to rehydrate respectively (Sawka et al., 2007). This recommendation stems from the fact that heat generated during PA is dissipated from the body through dry and evaporative loss, i.e., sweating, particularly in hot and humid environments (Rowland, 2008) which results in water loss. Thus, hydration is essential to replenish water and electrolytes lost through sweating and prevent dehydration when participating in physical activity (Desbrow et al., 2014; Purcell et al., 2013; Schneider & Benjamin, 2011). While it has been established that children have lower sweat rates than adults, children's water losses during exercise are typically comparable to those of adults when body mass is considered (Rowland, 2011). Therefore, the recommended amount of fluid intake for children has been estimated conservatively as a fluid intake of 13 mL/kg bodyweight per hour (Rowland, 2011).

There are clear guidelines recommending competitive athletes to consume sodium and potassium containing beverages during sport and water and sodium after exercise; recommendations for pre-exercise beverage consumption are not as clear although sodium and glycerol with fluid has been suggested to achieve hyperhydration i.e., excess body water (Baker & Jeukendrup, 2011). Carbohydrate and protein

containing beverages may also aid in fluid retention post-exercise. Beverages containing carbohydrate and electrolytes such as sodium improve water absorption and stimulate thirst respectively (Baker & Jeukendrup, 2011). Sports drinks are such beverages formulated especially to replenish water and electrolytes lost during PA (Baker & Jeukendrup, 2011). However, sports drinks are only recommended for adults and for prolonged vigorous PA i.e., PA exceeding 60 min (Desbrow et al., 2014; Pound et al., 2017; Schneider & Benjamin, 2011). Carbohydrate and electrolyte-containing beverages are also recommended for recreational athletes, when exercise duration ≥1 h. For children participating in PA, water is the recommended beverage for hydration (Pound et al., 2017).

In seeming contradiction to the NZ children's food and nutrition guidelines which recommend against flavoured milk being the primary source of milk for children (Ministry of Health., 2012), flavoured milk has been proposed as an alternative to (Yang et al., 2020) or to be better than sports drinks for hydration (Baker & Jeukendrup, 2011). However, the mechanisms by which milk promotes fluid retention are unclear (Baker & Jeukendrup, 2011). Furthermore, the nutrient profile i.e., the carbohydrate and protein content of flavoured milk is suited to performance improvement and recovery (Baker & Jeukendrup, 2011). Moreover, when consumed during exercise, high carbohydrate containing beverages such as flavoured milks slow gastric emptying thus hindering fluid absorption (Baker & Jeukendrup, 2011). Thus, milk may be best suited as post-exercise beverage (Yang et al., 2020).

2.6.1 Seasonal differences in beverage consumption patterns and preferences by sport

There is no data on seasonal beverage consumption patterns based on the sport played, but seasonal differences were observed in habitual water intake of French (Lioret et al., 2010) but not UK children (Vieux et al., 2017). The lack of seasonal differences in UK children's data may be a result of random variation in Lioret et al.'s (2010) sample as Vieux et al., (2017) had a larger samples size (n= 7453) than Lioret et al., (2010; n =1444). Furthermore, Vieux et al.'s (2017) data was based on three cycles of national survey i.e., from 2008 to 2011 whereas Lioret et al., (2010) compared two cycles 1998 to 1999 and 2005 to 2007 cycles. In their study of active Spanish adolescents, Bibiloni et al., (2017) found that active males and

females consumed significantly more water (1013.0 ± 59.4 and 950.2 ± 51.6 mL vs 803.7 ± 30.9 and 838.8 ± 43.8 mL) and diet soda (430.0 ± 23.0 vs. and 430.0 ± 33.3 mL) in warm seasons compared to cold seasons. Females also consumed significantly more 100% fruit juice in warm seasons to cold seasons, while males consumed significantly more low-fat milk and fruit drinks in warm seasons compared to cold seasons (Bibiloni et al., 2016). Bibiloni et al.'s (2017) findings, presented in Figure 2-1, should be interpreted with caution as the researchers' seasons were defined as warm seasons from May to September and cold seasons from November to March, whereas Lioret et al., (2010) and Vieux et al., (2017) albeit not having assessed PA nor found any seasonal differences in beverage consumption, analysed their findings according to the four standard seasons. Moreover, Bibiloni et al., (2017) stated they included sport trainings among the activities participated in by the children they did not state what these sports were. Nevertheless, Bibiloni et al.'s findings point to seasonal differences in active children's beverage consumption patterns, but seasonal differences in beverage consumption patterns within the sporting environment remain to be investigated.

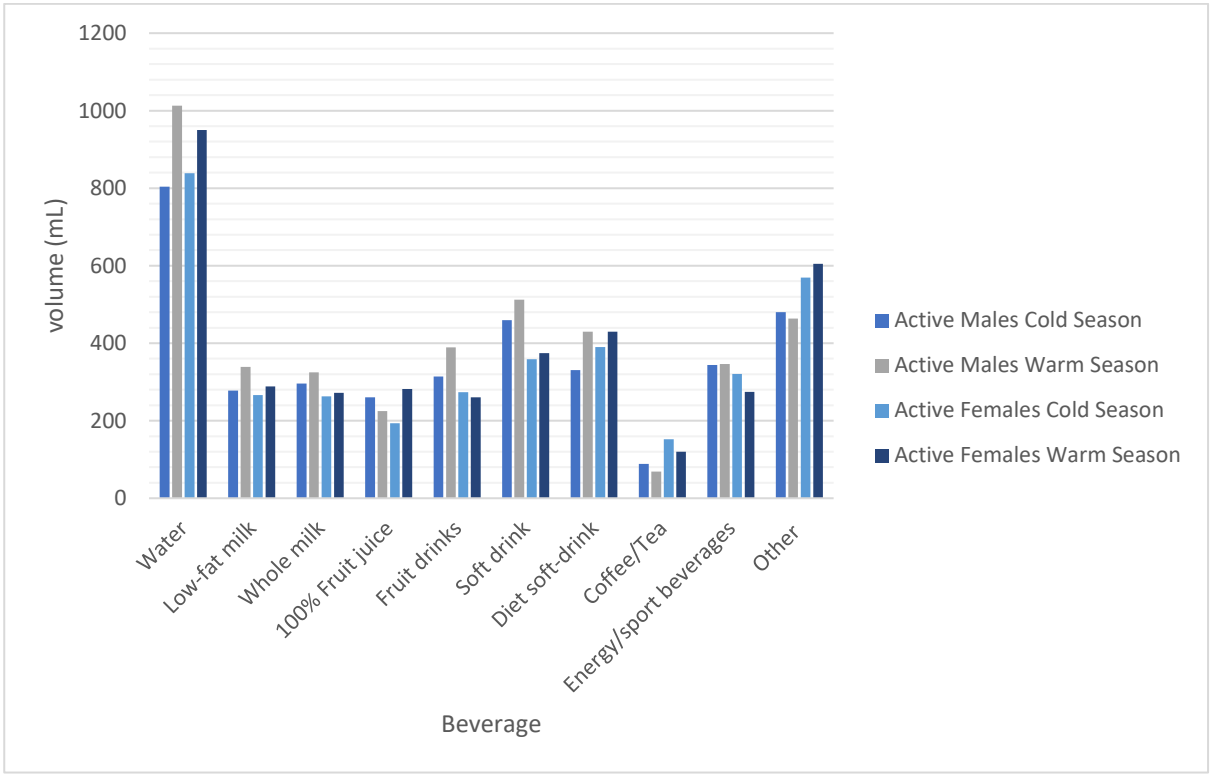


Figure 2-1 Seasonal differences in non-alcoholic beverage consumption amongst active Spanish adolescents (Biblioni et al., 2017)

2.7 Limitations of research and future directions

Although most studies to date have assessed habitual beverage consumption and identified sporting venues and recreational environments as contexts of where children consume some of these beverages (Cruz-Muñoz et al., 2020; Smith et al., 2019; Trapp et al., 2020), no single study exists which has assessed beverage consumption patterns in the sporting environment while participants engage in physical activity. Apart from Smith et al's (2014) research which asked their NZ participants to photograph beverages in their sporting environment that they associated with sport, there is a general lack of attention in literature placed on what beverages are children consume within the sporting environment. Smith et al's (2014) research highlighted that children predominantly associate SSB with sport, however, their research was limited by their lack of data regarding actual beverage consumption by the participants. Manore et al (2017) remain the only researchers to date that have, to the best of our knowledge, assessed children's beverage consumption practices before and after sport. While Manore et al's (2017) results indicate that water was the most preferred beverage for consumption and that more participants consumed sports drinks before sport and fruit drinks after sport, the researchers neglected to investigate the beverages consumed during sport and the volume of beverages participants consumed. Moreover, Bibiloni et al., (2016) investigated the relationship between PA and beverage, but the researchers did not define what sports participants played. As NZ children are highly engaged in organised sport, with organised sport participation rates previously ranking among the top 10 in the world before the Covid-19 pandemic (Oliver et al., 2018), there is a need to assess children's beverage consumption patterns in the sporting environment, what beverages children would prefer to drink if given the choice, who provides them with these beverages, and where they source the nutritional information regarding what beverage to consume when participating in physical activity.

2.8 Summary

Hydration is vital in sport participation to replace sweat losses and prevent dehydration. It is evident that children's habitual consumption of milk, fruit juice, and SSBC has decreased over the years. However,

consumption of some SSB such as sports drinks has increased. Gender, age, ethnicity, and SES are among the factors identified to negatively affect beverage consumption. Being older, male, of a minority ethnic group, and low SES is associated with a greater likelihood and greater consumption of SSB. Furthermore, being female and of older age is associated with a lesser likelihood and lower consumption of milk. Higher SES is associated with a greater likelihood and greater consumption of water. Data on children's beverage consumption trends are severely limited by the age of the data and largely limited to investigating habitual beverage consumption trends and methodologies assessing beverage consumption differ within and between countries. Moreover, consumption patterns within the sporting environment remain to be assessed.

The following chapter presents the study findings in manuscript form based on the guidelines of the International Journal of Behavioural Nutrition and Physical Activity

3 Determining Beverage Consumption Patterns of 11-14-year-old Aotearoa New Zealand Children Before, During, and After Sport and the Factors Influencing Beverage Preferences

Abstract

Background: Children spend a considerable amount of time in sporting environment particularly in New Zealand (NZ) where sports participation rates and time spent participating in sport are highest at the age of 12. However**,** children's beverage consumption patterns in the sporting environment have yet to be investigated.

Aim: To assess the beverages 11-14-year-old NZ children consume before, during, and after organised sport and the influencing factors on beverage choice.

Methods: Data was collected at sporting venues using a Qualtrics survey on iPads. The participants self-reported their beverage intake on the survey indicating what beverages they consumed up to 2 hours before, during, and up to 2 hours after sport, the quantity of the beverage(s) consumed, who provided them with the beverage(s), the location they sourced the beverage(s) from, their preferred beverage and why, and who they source nutritional information regarding beverage consumption.

Results: The mean age of the participants (n = 1339) was 12.1 (±0.9) years, 51.3% were female, 50.3% were European, 53.7% attended high decile ranking schools. The top three beverages consumed by participants were water (91.7%), sports drinks (25.7%), and milk (23.4%). Water was the leading beverage consumed by participants before (67.3%), during (70.6%), and after (51.1%) sport. Water was also the most preferred beverage by participants (63.9%). The leading motivation for water preference was hydration (89.9%). Gender, age, and socioeconomic differences were also observed in water consumption. Males consumed more sugar-sweetened beverages (SSB) than females (575 ± 464 mL vs 495 ± 361 mL; p = .032; d = 0.19).

School decile had a significant effect on SSB consumption ($p < .001$). Participants from low decile school students consumed more SSB than medium decile school students (652 ±517 mL vs 486 ±366 mL; d = 0.37) and high decile school students (652 ±517 mL vs 495 ±372 mL; d = 0.35). Parents or guardians (81.4%), and coaches (59.9%) were the top two sources of nutritional information for participants.

Conclusion: Water was the most consumed and most preferred beverage by participants. Gender, age, and socioeconomic status (SES) influenced water, milk, and sport drink consumption in agreement with previous literature.

Key words: beverage intake, habits, organised sport, youth, determinants, motivations

3.1 Introduction

Adolescents consume the most discretionary sugars of any age group (Della Corte et al., 2020; Han & Powell, 2013). Limiting discretionary sugar intake and thus caloric intake by reducing intake of SSB is one of the WHO's recommendations to end childhood obesity (World Health Organization., 2016b). In addition to the known associated risk of obesity with SSB consumption (World Health Organization., 2016b), SSB have also been associated with displacing micronutrient intake (Malik et al., 2013). While overall SSB consumption has been observed to be on the decline over the past decade in some countries (Della Corte et al., 2020), there has been an increase in consumption of certain types of SSB, specifically, sports drinks (Field et al., 2014; Kit et al., 2013; Larson et al., 2014; Wang et al., 2008). There is evidence that children and adolescents consume sports drinks to enhance performance (McDowall, 2007; Wiens et al., 2014; Zdešar Kotnik et al., 2017) and for hydration (Broughton et al., 2016; Smith et al., 2014; Smith et al., 2019). Although hydration is essential during PA (Desbrow et al., 2014; Purcell et al., 2013; Schneider & Benjamin, 2011), sports drinks are not recommended for children's consumption (Pound et al., 2017). Water is the recommended beverage for children to consume when participating in PA (Ministry of Health., 2012; Pound et al., 2017).

Previous research has largely focused on children's habitual beverage consumption (Drewnowski et al., 2013; Han & Powell, 2013; Tomlin et al., 2013; Vieux et al., 2017) and not consumption in the sporting environment. This lack of information is despite the interest in children's beverage consumption overseas (Della Corte et al., 2020). To date the researchers are only aware of one study that investigated the timing of beverage consumption in relation to sport participation (Manore et al., 2017). Manore et al.'s (2017) research into soccer-playing adolescents' nutrition-related attitudes and behaviours in the sporting environment found that water was the most consumed beverage before, during, and after sport. However, their findings would have provided greater insight into the participants' beverage consumption patterns had they quantified the volume of beverages the participants consumed.

In NZ, there is scant research on children's beverage consumption. Smith et al.'s (2014) research on what beverages NZ children who participate in organised sport associate with sport was the first to elucidate that

half of the 30 beverages the children identified with sport were SSB. The children were asked to photograph beverages in their sporting environment that they associate with sport. Although some of the photographs showed the children consuming the beverages and some of the children noted that they consumed the pictured beverages, Smith et al's (2014) work failed to quantify these beverages. Smith et al (2019) revised their approach by using 24-hour wearable cameras in their subsequent research to investigate the beverages available to, purchased, and consumed by 11–14-year-old children. This research however, placed little focus on the sporting environment but found that SSB were the main beverages available in recreational settings (including sporting venues). Smith et al (2019), neglected to specify which beverages and when the beverages were consumed in sporting venues, and to quantify the volume of beverages consumed.

To our knowledge children's beverage consumption in the NZ sporting environment has yet to be assessed. Given that: NZ children appear to predominantly associate SSB with sport (Smith et al., 2014), SSB are the main beverages available in sporting environments (Smith et al., 2019); and 81% of 5-to-17 year old NZ children participated in organised sport (Smith et al., 2018), participation rates which are comparable to the top 10 countries with high organised sports participation rates in Europe (Aubert et al., 2020), it is imperative to assess what NZ children are consuming in the sporting environment and the motivations behind their beverage choices. Furthermore, peak sport participation rates in NZ children are highest between the ages of 12 and 14 years (Sport New Zealand., 2020), and SSB consumption may also be highest at these ages.

This study therefore aims to assess the beverages NZ children consume before, during, and after organised sport and the influencing factors on beverage choice.

The New Zealand food and nutrition guidelines for children do not currently quantitatively assess beverages consumed by children (Ministry of Health., 2012), therefore, a quantitative approach was used to assess the beverage volumes consumed, and a qualitative lens was used to triangulate comments provided by

participants. This paper focuses on assessing the beverages children consume in sporting environment and may therefore elucidate some of NZ children's beverage consumption patterns.

3.2 Material Methods

3.2.1 Confirming the study approach

A survey was best suited for this study as the research tool needed to be easy to distribute to children at sporting venues, or to share online if researchers were not given permission to be onsite. A survey also best presented a selection of beverages to each participant (with pictures for reference) to select the beverages they consumed. Questionnaires also allow participants to anonymously self-report their beverage intake and mitigate social desirability bias (Gournelos et al., 2019).

3.2.2 Research Design

3.2.2.1 Ethics approval

Ethics approval for this study was provided by the Massey Human Ethics Committee Northern (Application NOR20/47). All survey answers were anonymous, and the questions were of low risk to participants; therefore, parental consent was not required. As data were collected on the day of the sporting competitions while participants' responses were still fresh in their minds, it was impractical to gain the consent of participants before data collection. Therefore, the parents/caregivers, and children were forewarned that the survey would be taking place at their sporting events via the Regional Sport Organisation (RSO) advertising through their media channels. Information sheets were also made available on the study's Facebook page, and at data collection sessions. Participants implied consent by completing the survey.

3.2.2.2 Criteria

Sample size was estimated based on data from Wiens et al., (2014) and using G*Power; n=1450 was required to detect changes in sports drink use between age groups, based on power of 0.80 and alpha of $p<0.05$. The inclusion criteria for this study were:

- aged 11-14 years old
- able to read and write in English
- Played in at least one game of organised sport due to survey queries regarding beverage consumption up to two hours before, during, and up to two hours after sport.

3.2.2.3 Survey

The diet-recall survey was first piloted among players (n=16; 12-13 years old) at a local sports club to determine the time to complete the survey which took approximately 5 minutes to complete. The final survey comprised of three sections. The first section pertained to participants' demographics: age, gender, school of attendance, ethnicity; the sport they played and the level they had competed in that day from a selection of the most popular sporting codes participated in by children in New Zealand (Sport New Zealand., 2012). Also, each participants' school decile was noted (see Appendix 5.1 for a brief discussion regarding this rationale).

Section two assessed beverages consumed before, during, and after their sporting activity from a selection of eight types of beverages (see Supplementary Table 5.1 in Appendices for a list of beverages and size). Participants were asked when they consumed their selected beverage(s), the quantity they consumed, and who provided them with the beverage(s). The quantities consumed were reported to the nearest fraction of the reference size. Participants also had the option to select that they did not consume beverages.

Section three comprised open-ended questions about where they sourced information about what to drink, what beverage they preferred to drink and why.

3.2.3 Data Collection

Participants could choose to complete the survey on tablets provided on the day (iPad Air, Apple Inc., Cupertino, CA), or using hardcopy versions, or use a QR survey code to complete the questionnaire at home.

Participants were recruited by emailing local RSOs to enquire about upcoming sport tournaments or to gain permission to attend their upcoming tournaments advertised on Facebook. The RSOs were emailed if their tournament included the target age group and if the tournament consisted of the top 20 sports that New Zealand children participated in (Sport New Zealand., 2012). These emails contained detailed information about the researchers, the purpose of the study, the target age group, the minimum required sample size, and the method of data collection. An overview of the questions contained within the survey and its anticipated completion time was provided, including a $100 prize draw incentive for participants. The prize draw collected participant information through a link separate to, and independent of, the study survey. Attachments contained within the email provided a participant information sheet and a recruitment advertisement for the RSOs to circulate on behalf of the researchers. After interests were established with RSOs, the researchers attended various tournaments within the greater Auckland area.

The aim was to sample beverage consumption patterns of 11- to 14-year-old children within the upper North Island region who participated in one or more of the top 20 sports played. However, the final sample is a convenience sample of respondents whose regional sporting organisations (RSOs) consented to researchers attending their sporting events. For some of these events, children from various parts of the country took part. Nevertheless, the sample was structured to get the breadth of data from sporting codes played in different seasons by having an extended sampling period. The sampling was undertaken in two tranches. However, it is important to note that Covid-19 may have impacted on data collection and is discussed further below regarding limitations of this study.

Sporting events included school events, club, representative, and national tournaments. The researchers used the draws on the tournament website and/or social media pages to identify the target teams, age groups and the game times to determine when teams would be available to participate in the study. At each tournament, the researchers liaised with the RSO's main contact and then commenced data collection. The research assistants then approached the team coaches or managers between their team's games to obtain permission to circulate the survey among the children on iPads. However, when requested by tournament organisers, alternative arrangements were made, such as the setting up of research stands with posters that invited players to participate in the study.

3.2.4 Statistical and data analysis

Data were analysed using IBM SPSS software (Version 28.0, SPSS Inc, Chicago, IL). Data were treated as parametric due to the large sample size according to the central-limit theorem. Beverage volume consumption was determined (mean ± standard deviation) for each of the eight types of beverages presented. One-way analysis of variance (ANOVA) was used for inferential analysis of the differences between gender, age, and school decile in volume of beverage consumed. Post-hoc analyses were performed using Hochberg and Games-Howell following ANOVA. Cohen's d was used to report effect size using criteria based on (Cohen, 1988), where effects were identified as small r = .1, medium r = .3, and large r = .5. Pearson's Chi Square test (χ^2) was used to determine the association for the timing of beverage consumption, beverage preferences, and sources of nutritional information and Fisher's Exact Test for significance.

The following beverages were categorised as SSB: flavoured water, sports drinks, energy drinks, soft drinks, and fruit juices. Milk, flavoured milk, and milkshakes were categorised together which is further discussed in chapter 4 regarding the limitations of this study. Other beverages included: tea, coffee, iced tea and hot chocolates.

Thematic analysis was undertaken using NVivo 20 for Windows (January 2022 Version, QSR International). The comments which pertained to six of the eight beverages (water, sports drinks, milk, fruit juice, flavoured water, and energy drinks) were grouped into themes exported by combining similar comments and exported to NVivo for open coding. A grounded theory approach was used to extract themes from the comments. Following open coding, all but one of the initial themes ("General Preference") were further collapsed into sub themes under two key themes. Table 5.5 in the Appendices details the descriptions of all the themes. Lastly, through reflective coding the themes were mapped to beverages using Nvivo and queries were compared with participant demographic data. Cross tabulation analysis of gender was carried out against the codes according to literature findings on gender differences in supplement use (Evans et al., 2012; McDowall, 2007; Parnell et al., 2016; Wiens et al., 2014; Zdešar Kotnik et al., 2017). Code maps were used to determine the relationship between beverage categories and the themes identified and word clouds illustrating the most frequently mentioned words were also used to confirm the themes identified.

3.3 Results

Figure 3-1 shows the data processing undertaken. The mean age of the sample was 12.1 (±0.9) years, and the gender distribution was 51.3 % female and 48.7%, male. The remainder of the participants' characteristics are presented in Table 3.1 and the sports played by the participants in Table 3.2.

Most participants played for school (44.7%) and representative level sport (37.3%). Participants were predominantly European (50.0%) and from high decile ranking schools (53.7%). Self-Identified ethnicity was collected during the survey to determine whether our study cohort was representative of the wider NZ population (further details regarding the stratification of ethnicity are presented in the expanded methods). Māori (30.8%) were over-represented in the sample compared to the general New Zealand population of 16.5% (Stats NZ Tatauranga Aotearoa., 2020) which could be linked to Māori children spending the most time per week participating in organised sports (Sport New Zealand., 2020).

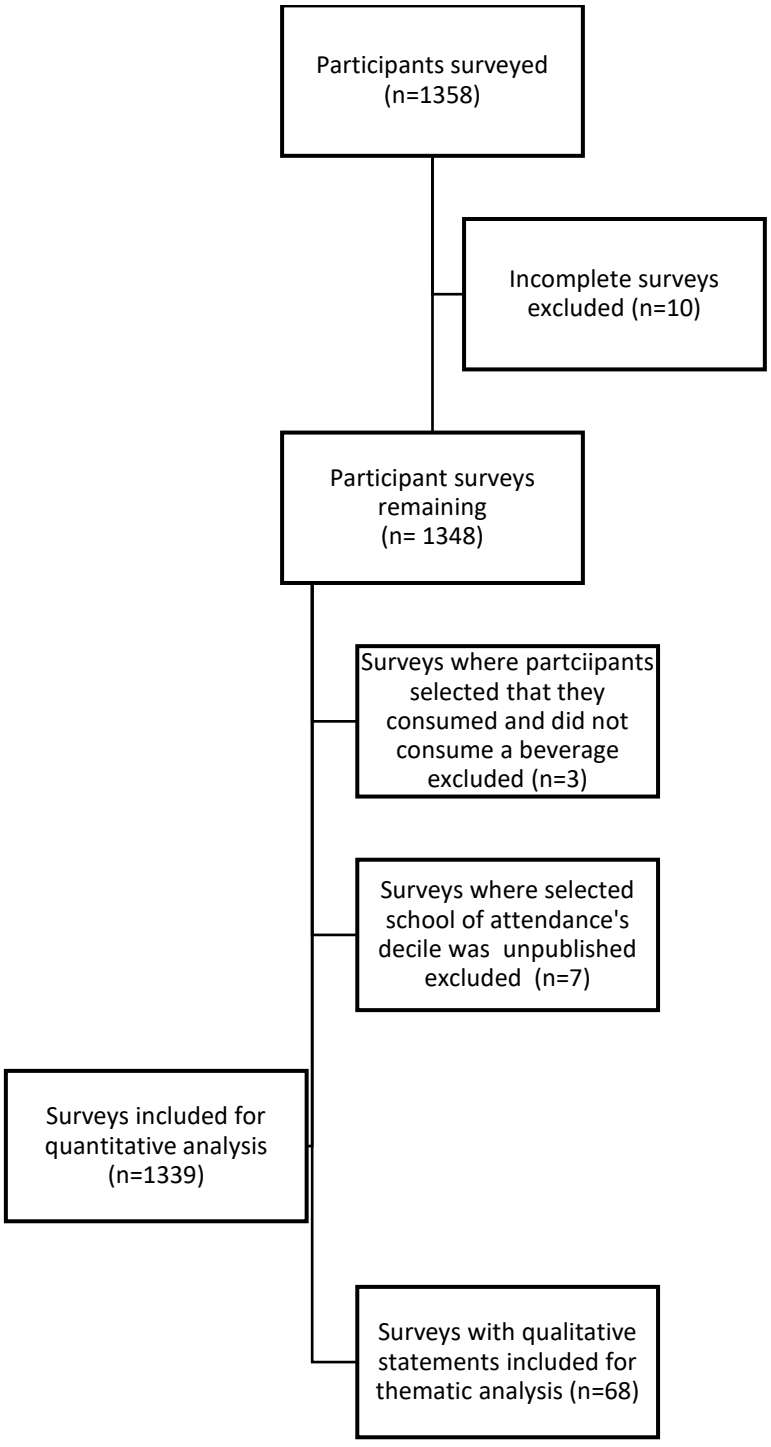


Figure 3-1 Data cleaning process

Table 3.1 Participant characteristics (n=1339)

Participant characteristics		n (%)
Age (mean± SD)	12.1 ±0.9	
Age Groups	11	375 (28.0)
	12	518 (38.7)
	13	334 (24.9)
	14	112 (8.4)
Gender	Male	651 (48.7)
	Female	687 (51.3)
Level of Sport	School	597 (44.7)
	Club	163 (12.2)
	Representative	498 (37.3)
	International	78 (5.8)
Ethnicity	Euro/NZ Euro[1]	669 (50.0)
	Māori	413 (30.8)
	Pacific	133 (9.9)
	Asian	103 (7.7)
	MELAA[2]	13 (1.0)
	Other[3]	7 (0.5)
School Decile by Tertiles	1 – 4 (Low)	284 (21.6)
	5 – 7 (Medium)	325 (24.7)
	8 – 10 (High)	705 (53.7)
Consumed SSB[4]	Yes	557 (41.6)
	No	782 (58.4)

Note.
[1] European/ New Zealand European
[2] Middle Eastern, Latin American, African
[3] Native Canadian, Australian, and "North American"
[4] sugar-sweetened beverages: flavoured water, fruit drinks, energy drinks, soft drinks, and sports drinks

Table 3.2 Sports played by participants

Sport	All n (%)	Males n (%)	Female n (%)
Football (soccer)	141 (10.5)	91 (64.5)	50 (35.5)
Hockey	84 (6.3)	54 (64.3)	30 (35.7)
Netball	221 (16.5)	3 (1.4)	218 (98.6)
Gymnastics	39 (2.9)	14 (35.9)	25 (64.1)
Basketball	54 (4.0)	44 (81.5)	10 (18.5)
Racquet Sports*	167 (12.5)	108 (64.7)	59 (35.3)
Rugby	129 (9.6)	86 (66.7)	43 (33.3)
Touch Rugby	171 (12.8)	84 (49.1)	87 (50.9)
Waterpolo	50 (3.7)	30 (60.0)	20 (40.0)
Softball	151 (11.3)	68 (45.0)	83 (55.0)
Tag Football	77 (5.8)	43 (56.6)	33 (43.4)
Other#	42 (3.1)	21 (50.0)	21 (50.0)
Total	1326 (99.0)	646 (48.8)	679 (51.2)

Note. Missing data: 13 (1.0%)
*Racquet Sports: Tennis, Badminton, Squash
#Other: sports where n < 25 (athletics (track and field), cricket, cycling, indoor bowls, multisport (e.g. triathlon), swimming, table tennis)

3.3.1 Types of beverages consumed

3.3.1.1 Comparative data

3.3.1.1.1 Gender differences

Males consumed more SSB than females (575 ± 464 mL vs 495 ± 361 mL; p = .032; d = 0.19). There was no evidence of significant age differences in mean SSB consumption (*p* = .120) (see Table 3.3. Significant gender differences in water consumption were observed in the volume of beverage consumed by participants (see Table 3.3). Specifically, females consumed more water than males (732 ± 496 mL vs 657 ± 414 mL, p = .004).

Table 3.3 Volume of Beverages Consumed by New Zealand Children at Sport by Gender

Beverage	Gender (n)	Volume (mL) ±SD	p-value	Cohen's d
Soft Drink				
	Male (65)	228.4 (104.9)	.119	-
	Female (36)	194.9 (98.9)		
Sports Drink				
	Male (195)	544.5 (402.3)	.177	-
	Female (149)	492.6 (276.1)		
Water				
	Male (584)	657.0 (414.9)	.004	-.164
	Female (645)	732.4 (496.8)		
Milk				
	Male (185)	181.2 (94.0)	.454	-
	Female (128)	173.2 (90.3)		
Energy Drink				
	Male (36)	189.9 (127.2)	.251	-
	Female (23)	154.9 (86.1)		
Fruit Drink				
	Male (61)	181.3 (128.9)	.984	-
	Female (75)	180.8 (171.2)		
Flavoured Water				
	Male (53)	429.2 (238.3)	.525	-
	Female (46)	31.1 (141.2)		
Other Drinks				
	Male (34)	325.4 (171.2)	.300	-
	Female (37)	287.2 (136.2)		

Equal variances assumed for all
***Cohen's D

3.3.1.1.2 Age differences

Pairwise differences in water consumption were only observed between fourteen-year-olds consumed more water than 12-year-olds (818 ± 610 mL vs 673 ± 416 mL p = .035, r =0.28). Age differences were also evident in participants' milk consumption (p = .008, r =0.46). Thirteen-year-olds consumed less milk compared to 11-year-olds (158 ± 84.9 mL vs 199 ± 93.0 mL, p =.008, r = 0.46).

3.3.1.1.3 Socioeconomic differences

School decile level impacted SSB consumption (p <.001), with those from low decile schools consuming more SSB (652 ±517 mL) than medium (486 ±366 mL; p =.006, d=0.37) and high decile (495 ±372 mL; p = .004, d=0.35) children. Students who attended low decile schools consumed significantly greater volume of soft drinks than students who attended high decile schools (263 ± 98.6 mL vs. 185 ± 101 mL, p= .006, d= 0.78), and other beverages (430.1 ± 220.8 mL vs. 271.4 ± 103.0 mL, p <.001), d= 0.92). Consumption of other beverages among participants who attended low decile schools was also greater than medium decile school attending participants (430.1 ± 220.8 mL vs 254.2 ± 97.8 mL; see supplementary Table 5.3).

3.3.1.2 Regression analysis

The odds ratio of males consuming SSB compared to females were 1.39 (CI = 1092 – 1.775). No significant differences were detected for age (p = .163), school decile (p = .266), or level of sport (p = .050). The odds ratio of consuming water in participants playing in representative level sport compared to school sport were .443 (CI = 201 – 976).

3.3.2 Timing of beverage consumption

3.3.2.1 Beverage consumption before sport

The top three beverages consumed before sport were water (67.3%), milk (18.5%) and sports drinks (11.7%). The following effects of gender on beverage consumption before sport were observed: males were 1.8 times more likely to consume milk before sport (χ^2 (1, N = 248) = 15.9, p < .001), and females were 1.3, times more likely to consume water before sport (χ^2 (1, N = 651) = 4.1, p = .043). Age also influenced beverage consumption before sport as thirteen-year-olds were 2.20 times more likely to consume sports drinks before sport compared to 11-year-olds before (χ^2 (1, N = 81) = 10.7, p = .001) and fourteen-year-olds were more likely to consume energy drinks (p <.001) before sport.

SES effects were observed in that participants who attended low decile schools were 2.3, times more likely to consume sports drinks than participants from high decile schools, before (χ^2 (1, N =116) =s 18. 4, p < .001) sport. Furthermore, participants who attended low decile schools were significantly more likely to consume energy drinks and flavoured water before (χ^2 (1, N =31) = 23.8, p < .001; χ^2 (1, N = 29) = 6.1, p = .021), sport compared to high decile school attending participants. Lastly, participants who attended high decile schools were more likely to consume water before sport (χ^2 (1, N =664) = 25.4, *p* < .001) compared to participants who attended low decile schools.

3.3.2.2 Beverage consumption during sport

During sport water (70.6%), sports drinks (17.0 %) and flavoured water (3.5%) were the top three consumed beverages. Males were 1.4 times more likely to consume sports drinks during sport than females (χ^2 (1, N = 228) = 4.8, p = .027). In addition to consuming a significantly greater volume of water before sport compared to males as previously mentioned, females were also 1.3 times more likely to consume

water during (χ^2 (1, N = 945) = 4.6, p = .033) sport. Age effects, for instance, 13-year-olds were 2.1, times more likely to consume sports drinks compared to 11-year-olds during (χ^2 (1, N = 117) = 13.1, p < .001). Fourteen-year-olds were more likely to consume soft drink (p = .008) during sport compared to 11-year-olds. Participants who attended low decile schools were 1.9 times more likely to consume sports drinks than participants from high decile schools, during (χ^2 (1, N =178) = 13.2, p < .001). Participants who attended low decile schools were significantly more likely to consume energy drinks and flavoured water during (χ^2 (1, N =18) = 9.4, p = .004; χ^2 (1, N =37) = 14.8, p < .001) sport compared to high decile school attending participants. Participants from low decile schools had a significantly greater likelihood of consuming soft drinks during sport (p = .002; Fisher's exact test) than high decile school attending participants.

3.3.2.3 Beverage consumption after sport

Water was also the most consumed beverage after sport (51.1%) followed by sports drinks (11.1 %) and soft drinks (3.7%). Males were also 1.9 times more likely to consume soft drinks (χ^2 (1, N = 49) = 4.3, p = .037), and 2.7 times more likely to consume energy drinks after (χ^2 (1, N = 21) = 4.4, p = .035) sport. Females were 1.4 times more likely to consume water after (χ^2 (1, N = 684) = 8.0, p = .005) sport. Regarding age differences in beverage consumption after sport, 13-year-olds were 1.9 times more likely to consume sports drinks compared to 11-year-olds after sport (χ^2 (1, N = 81) = 7.8, p = .006). Fourteen-year-olds were more likely to consume milk (p = .004) after sport compared to 11-year-olds.

SES effects were observed in beverage consumption after sport. Participants who attended low decile schools were twice as likely to consume sports drinks than participants from high decile schools after sport (χ^2 (1, N =114) = 11.2, p = .001). Participants who attended high decile schools were more likely to consume water after (χ^2 (1, N =510) = 11.8, p < .001) sport compared to participants who attended low decile schools, while participants from medium decile schools were also more likely to consume energy drinks after (p = .046; Fisher's Exact test) sport compared to participants who attended high decile schools. Lastly

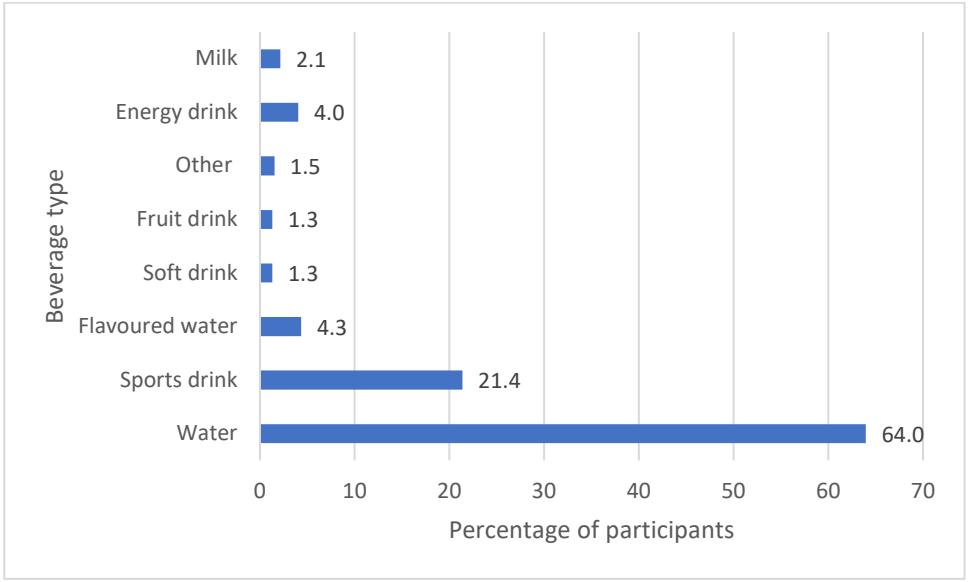
participants from low decile schools were more likely consume milk after (χ^2 (1, N =36) = 6.2, p = .015) sport compared to high decile school attending participants.

3.3.3 Source of beverages

Of the participants who specified where they sourced their beverages from, participants sourced water mainly from home (53.6%) or from their parent or caregivers (24.9%). Sports drinks were provided by parents or guardians (38.2%) or purchased by the participants themselves (25.2%). Milk was sourced from home (42.5%) or provided by parents or guardians (28.7%).

3.3.4 Beverage preferences and motivations

The top four most preferred beverages were water (63.9 %), sports drinks (21.4 %), and flavoured water (4.4 %) and energy drinks (4.0% ;Figure 3-2).



Note. Missing data:29 (2.2%)

Figure 3-2 New Zealand children's preferred beverage to consume at organised sports

The reasons for beverage preferences are presented in Table 3.4. Females were 2.2 times more likely to prefer water than males (χ^2 (1, N = 838) = 47.0, p < .001). Males were 1.9 times more likely to prefer sports drinks compared to females (χ^2 (1, N = 279) = 21.903, p < .001). Although soft drinks (1.3%) and energy drinks (4.0%) were among the least preferred beverages, males were 5.0 and 1.9 more times likely to prefer consuming these beverages respectively (χ^2 (1, N = 17) = 7.9, p = .005; χ^2 (1, N = 53) = 5.4, p = .020). Thirteen-year-olds were 3.8 times more likely to prefer milk compared to 12-year-olds (χ^2 (1, N = 17) = 7.2,

p = .010). Participants from low decile schools were 3.2 times more likely to prefer energy drinks compared to participants from high decile schools χ^2 (1, N = 40) = 14.1, p < .001.

Table 3.4 Participants' Reasons for Beverage Preferences

Reason for preference	Water (%)	Sport drinks (%)	Flavoured water (%)	Soft drinks (%)	Fruit drink (%)	Energy drinks (%)	Milk (%)	Other (%)
Performance improvement	**389 (46.6)**	**153 (55.0)**	**21 (37.5)**	3 (17.6)	2 (11.8)	**26 (50.0)**	**15 (53.6)**	3 (15.0)
Better hydration	**753 (89.9)**	**129 (46.1)**	**35 (61.4)**	3 (17.6)	**7 (41.2)**	**23 (43.4)**	6 (21.4)	1 (5.0)
Better for teeth	239 (28.5)	11 (3.9)	3 (5.3)	0 (0.0)	1 (5.9)	8 (15.1)	**7 (25.0)**	1 (5.0)
Less sugar	**390 (46.5)**	22 (7.9)	19 (33.3)	**4 (23.5)**	1 (5.9)	2 (3.8)	6 (21.4)	3 (15.0)
Top athletes drink it	110 (13.1)	114 (40.7)	6 (10.5)	1 (5.9)	1 (5.9)	12 (22.6)	6 (21.4)	3 (15.0)
Tastes good	77 (9.2)	**153 (54.6)**	**32 (56.1)**	**13 (76.5)**	**11 (64.7)**	**22 (41.5)**	**16 (57.1)**	**6 (30.0)**
Friends drink it	16 (1.9)	23 (8.2)	1 (1.8)	3 (17.6)	2 (11.8)	8 (15.1)	4 (14.3)	1 (5.0)
Other	47 (5.6)	14 (5.0)	1 (1.8)	0 (0.0)	1 (5.9)	2 (3.8)	3 (10.7)	2 (10.0)

Note. Where **bolded,** this indicates the top 3 reasons why a beverage is preferred in each column

Qualitative analysis of these comments (n=68) showed that apart from general preference, participants preferred beverages for the qualities attributed to the beverage or based on external advice. The sub-themes of these three main themes and exemplar comments are presented in Table 3.5 (see supplementary Table 5.5 for theme definitions and Appendix 5.4 for all participants' comments). The most cited qualities were related to health and performance enhancement, namely providing energy. Sports drinks and water were recurrently cited as being preferred for performance enhancement, and hydration. Sports drinks were also the only beverage preferred for reasons related to marketing. Water was the only beverage preferred based on coach and parental advice. Participants also commented preferring sports drinks, and energy drinks based on advice from external sources. Female participants (28.6%; 31.4%) preferred beverages for performance enhancing and health qualities compared to 21.2% and 30.3% of male participants respectively.

Table 3.5 Thematic analysis of participants' comments on factors influencing beverage consumption choices

Key Themes	Sub themes	Exemplar comments	Full comment
Beverage qualities	*Costless*	"Is better for you and free" (Respondent 1144)	
	Good taste	"Because it tastes nicer than water…" (Respondent 832)	"Because it tastes nicer than water and I feel that it improves my performance"
	Heath-related	"It's healthy" (Respondents 10 and 469)	
	Hydration	"Relieves my thirst" (Respondent 84)	
	Marketing	"It's a sports drink" (Respondent 401)	
	Performance enhancement	"…I feel that it improves my performance" (Respondent 832)	"Because it tastes nicer than water and I feel that it improves my performance"
	Refreshment	"It's nice and cold" (Respondent 901)	
External advice	*Advice*	"This is what my parents tell me to drink" (Respondent 396)	
	Inquiry informed	"I looked what was the best drink to have before sport and it was chocolate milk" (Respondent 764)	
General preference	*Distaste*	"I don't like anything else" (Respondents 823 and 831)	
	Habit	"Because that's what I always have so I'm used to it" (Respondent 347)	

3.3.5 Source of nutritional information

The top sources of nutritional information were parents or guardians (81.4%), coaches (59.9%), and teammates or friends (29.1%) closely followed by teachers (28.5%) (see Figure 3-3). Males were 1.4 times more likely than females to source information from online advertisements (χ^2 (1, N = 56) = 4.5, p = .034; OR = 1.84) and 2.2 times more likely for traditional media (X^2 (1, N = 61) = 8.8, p = .003; OR = 2.24). Students who attended medium (χ^2 (1, N = 467) = 7.0, p = .009) and high decile (χ^2 (1, N = 807) = 25.3, p < .001) schools were 1.7 times and 2.3 times respectively more likely to obtain nutritional information from parents or guardians compared to participants from low decile schools. High decile school participants

were 3.6 times and 2.0 times more likely to obtain nutritional information from websites than low (χ^2 (1, N = 48) = 8.2, p = .005) and medium (χ^2 (1, N = 53) = 4.2, p = .048) decile school participants respectively. Twelve-year-olds were 1.9 times more likely to source nutritional information from famous sport people than 11-year-olds (χ^2 (1, N = 67) = 5.5, p = .020). Eleven-year-olds were 1.5 and 2.0 times more likely than 13-year-olds (χ^2 (1, N = 207) = 5.7, p = .017) and 14-year-olds (χ^2 (1, N = 146) = 7.4, p = .007) respectively to obtain nutritional information from teachers or school. Fourteen-year-olds were 2.2 and 3.0 times more likely to obtain nutritional information from famous sports people (χ^2 (1, N = 31) = 4.6, p = .045) and online advertisements (χ^2 (1, N = 24) = 7.4, p = .011) respectively than 11-year-olds. Fourteen-year-olds were also 3.2 times more likely to obtain nutritional information from online advertisements than 12-year-olds (χ^2 (1, N = 28) = 9.3, p = .005) and 12-year-olds were 1.7 times more likely to obtain nutritional information from teachers or school than 14-year-olds (χ^2 (1, N = 175) = 4.5, p = .036).

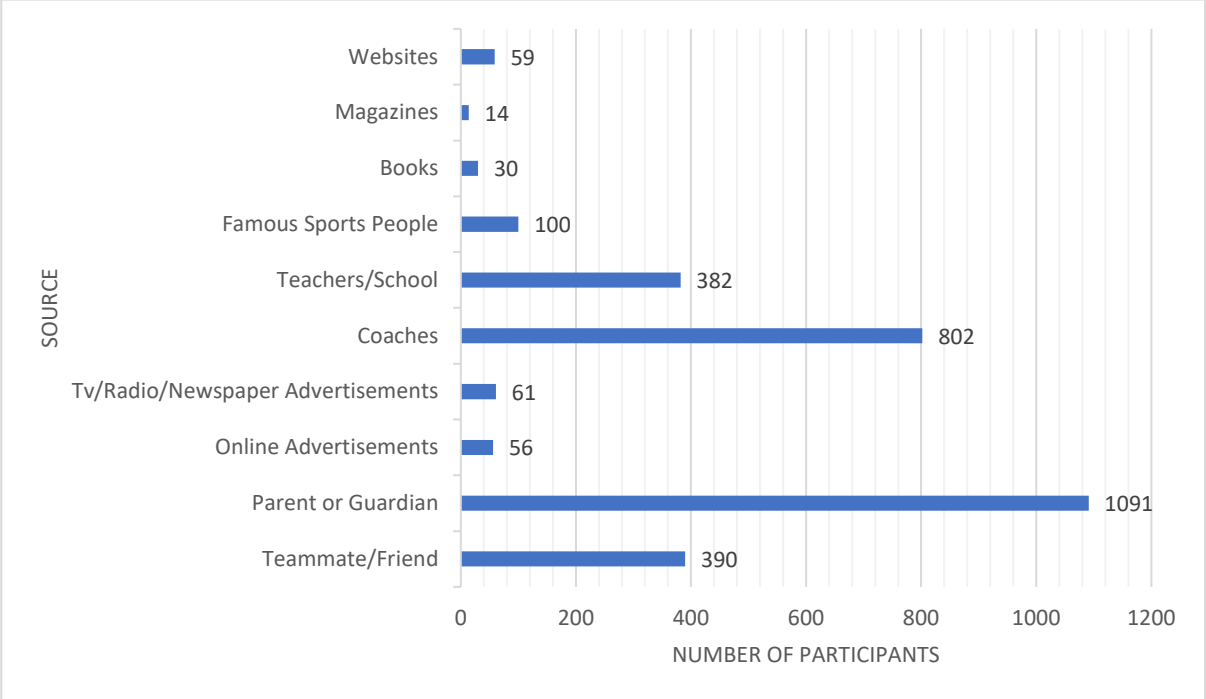


Figure 3-3 Participants' Sources of Nutritional Information

3.4 Discussion

The aim of this research was to investigate the types and quantities of beverages that 11-14-year-old New Zealand children consume before, during, and after organised sport, and the factors influencing their beverage choices. Our results are the first to elucidate the prevalence of SSB consumption in the NZ sporting environment and globally as almost half of the participants consumed SSB (41.6%). Our study is also the first to elucidate that the most consumed beverages for young NZ sportspeople were water, sports drinks, and milk. Children sourced water and milk from home and sports drinks were provided by parents/caregivers. Parents/caregivers were the leading source of nutritional information for participants. Water was the most consumed beverage before, during, and after sport and it was the most preferred beverage. The top three reasons for its preference were: hydration, performance improvement, and the absence of sugar.

Our findings that water was the top beverage consumed before, during, and after sport are in line with the food and nutrition guidelines (Ministry of Health., 2012) and with Manore et al's (2017) findings where adolescent high school soccer players preferred water before (97%), during (80.6%), and after (94%) exercise. However, our results differed to some extent from Manore et al.'s (2017) findings as the proportion of participants consuming water in our study was lower compared to Manore et al.'s participants. It also appears that in our study that the proportion of participants consuming water increased during sport and decreased after sport whereas in the soccer players it decreased during sport and increased after sport. Apart from these discordances, findings from our study and Manore et al's (2017) may point to water being the leading beverage consumed in children's sporting environments.

That water was the leading beverage consumed in the sporting environment was unexpected as previous research by Smith et al., (2019) highlighted the limited availability of core beverages (i.e., beverages recommended for children's consumption such as water) outside of the school and home environments. However, Smith et al., (2019) conceded that a wide availability of beverages does not equate to greater consumption as demonstrated in their observations of greater SSB consumption in the home environment despite core beverages being more available. Our findings thus add that water was a core beverage

consumed in NZ sporting environment, however, this conclusion is limited to the present cohort of young sportspeople.

That water was the preferred beverage was surprising as previous research stated that parents felt children preferred SSB (Spruance et al., 2020). However, parents and coaches may be the driving force behind children's preference of water as exemplified by comments written by some of the participants. One participant commented "this is what my parents tell me to drink" and another commented "because mum said so" and another still "Because my coaches tell me that it is better for you". Some participants stated that they preferred water as they were advised by parents or coaches to drink the beverage.

Although sports drinks consistently featured among the top three beverages consumed before, during, and after sport, in similar pattern to Manore et al's (2017) findings, their ranking differed depending on the timing of consumption in relation to sport participation. This difference in ranking of sports drink consumption may indicate that after water, children may prefer or view consumption of sports drinks as being more suited for during and after sport participation than before sport participation. This could be due to the perceived benefits of sports drinks in improving sports performance as participants outlined in their reasons for beverage preference that they preferred sports drinks for performance improvement. Although there is limited research regarding children's consumption of sports drinks as supplements (Manore et al., 2017; McDowall, 2007; Parnell et al., 2016; Wiens et al., 2014), our findings are in line with evidence that children use sports drinks for performance enhancement (McDowall, 2007; Wiens et al., 2014; Zdešar Kotnik et al., 2017). The drinks' perceived provision of energy was a recurring comment by participants in line with O'Dea et al's (2003) findings on the motivations behind sports and energy drink consumption. However, in contrast to previous findings that it is primarily males whose consumption is motivated by performance enhancement (McDowall, 2007; Parnell et al., 2016; Wiens et al., 2014; Zdešar Kotnik et al., 2017), our thematic analysis of the reasons participants preferred beverages showed that more female participants preferred beverages for performance enhancing qualities than males (28.6% vs 21.2%). However, our results also share similarities with (McDowall, 2007; Wiens et al., 2014; Zdešar Kotnik et al.,

2017) in that more females preferred beverages for their health-providing attributes than males (31.4% vs 30.3%).

Our analysis of participants' comments on motivations appears to confirm that sports drink consumption may partly be influenced by the marketing of sports drinks as established in previous research (Batty et al., 2016; Batty & Gee, 2019; Carter et al., 2013),. In addition to sports drinks preference for performance enhancement and hydration, participants commented that they preferred sports drinks because they were marketed as being "for sports". However, the benefits of sports drinks have only been demonstrated in adults performing prolonged vigorous physical activity (Pound et al., 2017; Simulescu et al., 2018). Given that "average children and teenagers are not performing high-intensity physical activity" (Simulescu et al., 2018) and that only 7% of NZ children participated in moderate-to-vigorous- physical activity (MVPA) in 2018 (Oliver et al., 2018), it is concerning that our study shows that sports drinks may be the second most consumed beverages in the sporting environment after water.

While sports drinks were the second most consumed beverage in Manore' et al.'s (2017) participants, milk was the second most consumed beverage before sport and the third most consumed beverage overall in the present cohort as displayed in Figure 3-4. This milk consumption was likely due to our participants being younger than Manore et al.'s (2017) adolescent participants, as shown by our 13-year-old participants consuming less milk than 11-year-olds participants and evidence that SSB replace milk consumption in adolescents (Özen et al., 2015; Vieux et al., 2017). The higher consumption in milk in our participants may also be a cultural influence as milk is a crucial component of New Zealand culture (Fusté-Forné, 2016). On the other hand, the higher consumption of SSB in older children explains why apart from water, Manore et al.'s (2017) participants had SSB among the top three beverages consumed before, during, and after sport.

Females consumed more water than males - before, during and after sport - which is in agreement with gender differences in water consumption observed in some (Cockburn et al., 2018) but not all (Özen et al., 2015; Vieux et al., 2017) previous studies. Females were also significantly more likely to consume water before, during, and after sport and were also more likely to prefer water than males This maybe because males are more likely to drink SSB (Ranjit et al., 2010). Moreover, females' weight concerns are greater among those who participate in sports thus females may be consuming water to reduce caloric intake (Dortch et al., 2014).

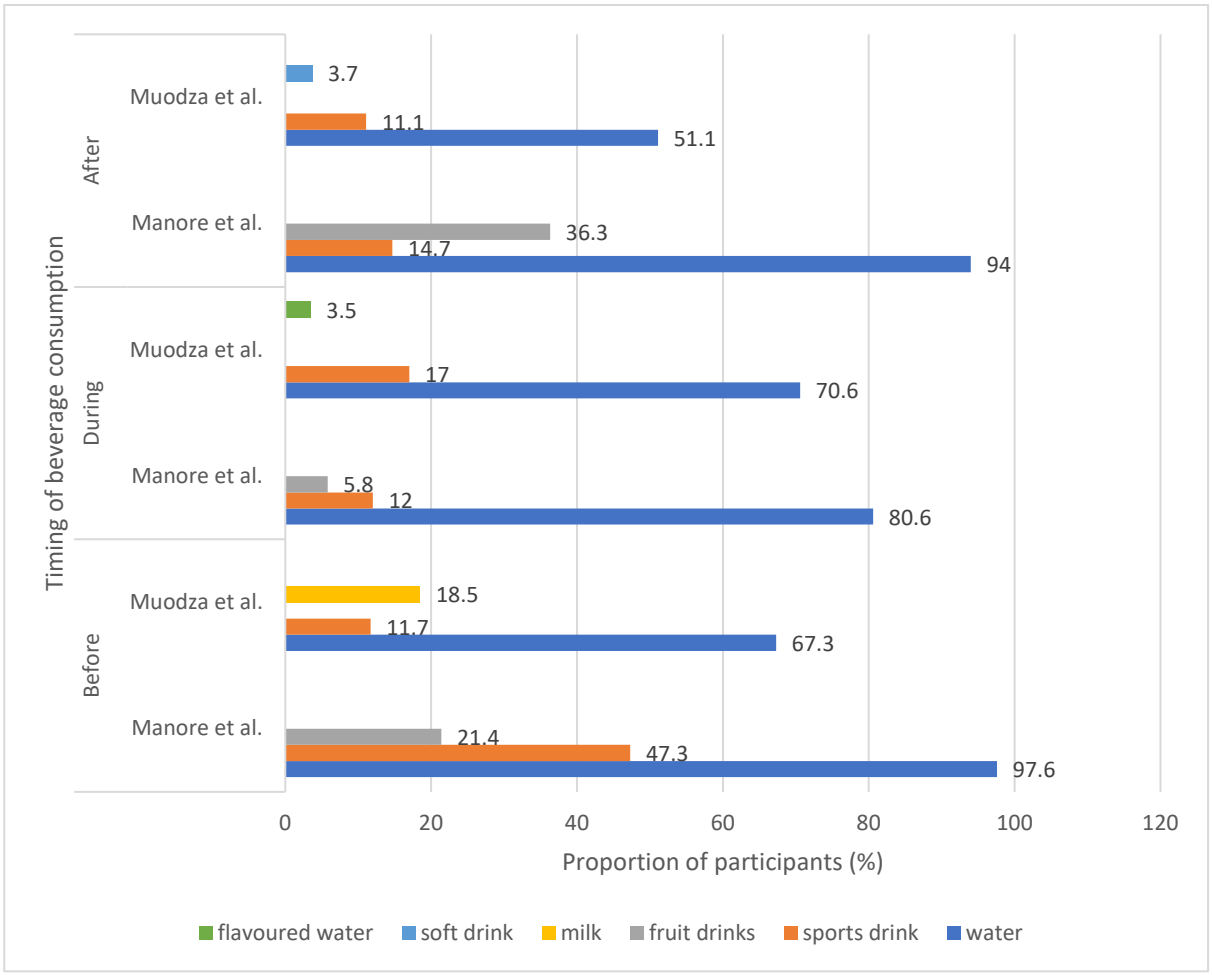


Figure 3-4 Comparison of Manore et al. (2017) and our study's findings on the top 3 beverages consumed before, during, and after sport

Gender had a significant but small effect on SSB consumption as males consumed significantly more SSB than females. Furthermore, males were observed to be significantly more likely to consume milk before

sport, soft drinks, and energy drinks after sport. Males were more likely to source nutritional information from online advertisements and due to the nature in which sports marketing appeals to males (Larson et al., 2014) may influence consumption of SSB. Our findings were in accordance with the literature which points to males having a greater likelihood of consuming milk (Brener et al., 2011), soft drinks (Brener et al., 2011) and energy drinks (Brener et al., 2011; Frayon et al., 2019). However, as far as we are aware, our study is the first to provide additional insight into the timing of the consumption of these beverages in the sporting context.

We did not find differences in milk consumption in 14-year-olds compared to younger children despite observing that 13-year-olds consumed less milk than 11-year-olds. The lack of differences was unexpected as the literature highlighting that milk consumption decreases with age (Baird et al., 2012; Dror & Allen, 2014; Maillot et al., 2018; Nelson et al., 2009; Vieux et al., 2017). This may be due to our smaller sample size of 14-year-olds as sport participation in NZ decreases with age (Sport New Zealand., 2020). That water consumption in 14-year-olds was higher than 12-year-olds was unexpected. This difference, although applicable to all beverages, may be attributed to fluid requirements increasing with body weight which increases with age and based on recommendation (Rowland, 2011). However, the differences in water consumption were not observed in 13-year-olds when compared with younger children.

Participants who attended low decile schools consumed more SSB than participants from medium and high decile schools. These findings are in good agreement with data from the NZ 2020/2021 Health Survey (Ministry of Health., 2021) which suggests children living in the lowest socioeconomic areas are significantly more likely to consume carbonated SSB than children living in the highest socioeconomic areas. That participants from low SES consume more SSB was not surprising as previous research (Han & Powell, 2013; Jensen et al., 2012; Cockburn et al., 2018) has also identified greater consumption of SSB in children from low SES backgrounds. This difference in SSB consumption by low SES is further exemplified in that school decile had a large effect on soft drink consumption as students who attended low decile schools also consumed a greater volume of soft drinks than students who attended high decile schools. Furthermore,

low decile school attending participants consumed a greater volume of other beverages compared to participants who attended medium decile schools.

Our results also showed that socioeconomic status influenced the likelihood of consumption of SSB. Low decile school participants were more likely to consume sports drinks than high decile school students. Participants from low decile schools were more likely to prefer energy drinks and to consume energy drinks and flavoured water before and during sport. In contrast to the evidence that participants who attended low decile school are more likely to consume and to prefer consuming SSB, participants from high decile schools were more likely to consume water before, and after sport. This finding is in keeping with evidence (Drewnowski et al., 2013; Vieux et al., 2017) that children from high SES consume more water than children from low SES backgrounds. However, given that (53.7%) of our participants were from high decile ranking schools may have influenced our findings.

3.5 Limitations and future directions

While our study has been the first to show that females were greater water consumers, further research is required as the literature is not conclusive on where gender differences lie in water consumption in habitual beverage consumption (Özen et al., 2015; Vieux et al., 2017) much less in the sporting environment. The reader should keep in mind that the differences in consumption by gender found are only generalisable to this cohort of young sportspeople as Guelinckx et al., (2015) have previously sounded that findings regarding gender differences in beverage consumption should only be generalised to the country of research.

Future research should explore beverage consumption in the sporting environment in a wider age group and larger sample size to obtain more data on where beverages are sourced from and to compare the differences in beverage consumption by sport.

3.6 Conclusion

In summary, water was the most consumed beverage before, during, and after sport in this cohort of young sportspeople. Water was also the most preferred beverage due to perceptions regarding better hydration, better performance improvement, and containing less sugar. Females consumed significantly more water than males and were more likely to prefer water than males, whereas males consumed significantly more SSB than females and were more likely to prefer SSB. Older participants consumed more water and less milk than younger participants. Participants who attended low deciles schools consumed significantly more SSB than participants who attended medium and high decile schools. Participants from low decile schools were also more likely to consume SSB before, during, and after sport than participants from high decile schools wile participants from high decile schools were more likely to consume water than participants from low decile schools. Although the data was limited, participants indicated that the top three beverages they consumed were sourced from home, provided by parents and caregivers, or purchased by the participants. The participants also indicated that their primary sources of nutritional information were their parents, coaches, and teammates or friends. Together these results provide primary insights into sport participating NZ children's beverage consumption, of which, this study is the first to demonstrate these specific findings within the NZ context.

4 General Summary

4.1 Summary

This study is the first step in understanding NZ children's beverage consumption patterns in the sporting environment. The aim of the study was to determine 11-14-year-old NZ children's beverage consumption before, during, and after sport with the objective of assessing the type and quantity of the beverages consumed and determining the most preferred beverages, the reason for their preference and the source of children's beverages and dietary information. It is the first study to show water was the most consumed beverage before, during, and after sport and the most preferred beverage in this cohort of young sportspeople. Water was preferred for hydration, improving performance, and its absence of sugar. Participants sourced water from home and their nutrition information primarily from parents and coaches.

4.2 Limitations

There were some limitations associated with our study. The reader should bear in mind that the participants' responses were self-reported using an online survey. A disadvantage of this study is the survey is yet to be validated due to the novelty of this study. However, the survey was pilot tested with players at a local sports club (n=16, aged 12-13 years). Furthermore, the use of surveys is an acceptable data collection method in dietary assessment (Grummon et al., 2018) and there is evidence that the target age group is capable of accurately self-reporting dietary intakes (Adamson & Baranowski, 2014). Moreover, as participants self-reported their beverage consumption, the participants may have provided data that reflects their usual beverage consumption patterns contributing to the reliability of the data. Allowing the participants to self-report their beverage consumptions may have also mitigated social desirability bias (Gournelos et al., 2019) and thus lend our data to providing an accurate picture of NZ children's beverage consumption patterns in the sport environment. Furthermore, recall bias was mitigated by surveying the

participants on the day of their sporting event regarding beverages consumed two hours before or after sport.

A source of uncertainty is the use of a limited list of beverage categories on the survey. Participants were presented with a limited categories of beverages to choose from and not an open-ended list. However, an "other" category was included for participants to input other beverage options not shown on the list. Thus, the participants had the opportunity to include other beverages. One type of beverage that would fall under the "other" category that the researchers observed participants consuming were ice blocks. Although the researchers observed the participants consuming these frozen beverages, we cannot comment on whether the children would have included these ice blocks as beverages in their responses as it is unclear if the children would have recognised them as drinks given that they were frozen.

Furthermore, the list of beverage categories presented to participants in the survey included a milk category. However, this category did not distinguish between flavoured and unflavoured milk. Consequently, the participants may have inadvertently reported their consumption of flavoured milks which are classified as SSB (World Health Organization., 2016a) in the milk category thus leading to an overreporting of milk consumption. However, the study is still the first to show that milk is among the top three beverages consumed overall before, during, and after sport in NZ.

Another disadvantage of our methodology relates to our sampling strategy. As data were collected in two tranches, the data regarding who provided the children with the beverages has a smaller sample size (n = 910) as this data was only collected in the final tranche of data collection. Another limitation is that more than half of the participants (53.7%) attended high decile ranking schools. School decile was used as crude measure of socioeconomic status (SES) therefore, that half the participants where from high SES may have influenced our findings.

The scope of this study was limited to NZ children's beverage consumption in the sporting environment and a cross-sectional approach was chosen for pragmatic reasons. Furthermore, data collection was limited to Auckland and Tauranga due to financial constraints, however participants travelled from all over the North

Island to attend sports tournaments at the venues that researchers surveyed participants in the cities. Additionally, although, ethnicity of the participants was collected, this data was not used to assess beverage intake by ethnicity as ethics approval was granted to collect ethnicity data for the sole purpose of describing the sample data. Establishing the availability of SSB in sporting environments is beyond the scope of this study.

We were unable to carry out relative analysis of the relationship between the volume of beverage consumed and where participants sourced the information from, who provided them with the beverage or their beverage preferences. This analysis could not be carried out because the data on participants' beverage preferences, source of nutritional information and beverages was nominal and therefore could only be assessed using Pearson's Chi-Square test (χ^2). Nevertheless, this study is the first to elucidate children's beverage consumption practices when participating in organised sport.

4.3 Future directions

While our results have been the first to show beverage consumption patterns in the sporting environment, future research should obtain a larger sample size with equal sample sizes to represent each sport. A larger sample size with an equal sample size to represent each sport will enable researchers to compare the volume of beverages consumed across different sports codes to determine differences in beverage consumption by the type of sport i.e., indoor vs outdoor sport, team vs individual sports, duration of the sport, intensity of the sport, or season in which the sport is played. Future research should also focus on obtaining a sufficient sample size to determine where children source their beverages from.

We also recommend for future research to assess body weight as body weight is a factor in calculating sport playing children's fluid requirements (Purcell et al., 2013). Assessing body weight may, therefore, enable researchers to investigate whether water consumption relative to body weight increases with age and if body weight is the driver of the increase in water intake with age observed in our study.

Future research should also investigate how marketing influences children's sports drink consumption as our thematic analysis of participants' motivations for beverage preferences suggest that sports drink

marketing may influence children's preference of sports drinks. Investigating the influence of marketing on children's beverage consumption practices in the sporting environment will enable policy makers such as the NZBGP to make targeted recommendations regarding marketing of SSB such as sports drinks to children.

4.4 Practical applications

Findings from this study have the following implications for research into beverage consumption and children's SSB consumption.

This work has highlighted that parents and coaches were primarily cited as the main source of nutritional information and that parents and coaches advised children to consume water. These findings should encourage these apparent influencers, parents and coaches of this cohort, to continue to advise children who participate in organised sport to consume water when participating in sport according to the MoH's recommendations (Ministry of Health., 2012). Moreover, our findings that sports drinks were the second most consumed and preferred beverage may warrant for parents and coaches as the main sources of nutritional information to advise children that sports drinks are not recommended except when participating in prolonged MVPA that is, physical activity longer than 60 minutes (Desbrow et al., 2014; Ministry of Health., 2012; Pound et al., 2017; Schneider & Benjamin, 2011), which may influence children's consumption of sports drinks when participating in organised sport. This messaging could be targeted towards males as males were greater consumers of SSB.

5 Appendices

5.1 Expanded Methods

A commonly used strategy for assessing beverage consumption patterns in children are questionnaires (Grummon et al., 2018). Questionnaires are advantageous as they can be web-based, making them easily accessible and efficient for data collation (Gournelos et al., 2019; Storey, 2015).

Although there are pre-existing validated questionnaires to assess beverage intake in children, these questionnaires do not focus on beverage consumption in the sporting environment but instead focus on habitual intake (Biltoft-Jensen et al., 2014; Hedrick et al., 2012; Hill et al., 2017; Storey, 2015).

The children were the primary respondents as there is evidence that our participants' age group can accurately recall dietary intake in the time required (Grummon et al., 2018).

Reference pictures were displayed of each drink category based on the 31 beverages identified as being associated with sport by children aged 10 to 12 in New Zealand (Smith et al., 2014). See appendix 5.4 for the questionnaire.

5.1.1 School decile

As mentioned in the Materials and Methods section, each participants' school decile was recorded to provide a crude measure of socio-economic status. In short, this system gave an indication of the wealth of a particular school area. The former New Zealand school decile system gave a school a calculated ranking between one to ten (New Zealand Ministry of Education., 2021). "For example, decile 1 schools are the 10% of schools with the highest proportion of students from low socio-economic communities, whereas decile 10 schools are the 10% of schools with the lowest proportion of these students" (New Zealand Ministry of Education., 2021). The school decile system was replaced by the Equity Index in January 2023.

5.1.2 Ethnicity prioritisation

Where children identified and selected multiple ethnicities, they were stratified as one ethnicity according to the Statistics NZ research approach i.e. preferential ranking. The ranking order was as follows: 1. Maori 2. Pacifica 3. Asian 4. MELAA 5. Other ethnicity 6. Pakehā (Ministry of Education., 2021).

5.2 Supplementary Tables

Table 5.1 Beverage List

Beverage	Reference size
Water,	750 mL bottle
Flavoured water	750 mL bottle
Milk (including flavoured milk and milkshakes),	250 mL glass or 250 mL carton or 350 mL carton
Sports drinks,	750 mL bottle
Energy drinks	250 mL can
Soft drinks	330 mL can or 600 mL bottle
Fruit juices	250 mL glass
Other drinks	250 mL cup
(i.e., tea, coffee, ice teas, or hot chocolates)	

Table 5.2 Differences in Volume of SSB Consumed by Age Group

Age group	**n**	Volume (mL) (±SD)	p-value	Effect size
11	124	488.0 (388.6)		
12	187	515.3 (354.1)		
13	151	581.8 (517.1)	.120**	-
14	55	617.0 (406.2)		
Total	517	207.5 (371.5)		

**Hochberg

Table 5.3 Volumes of Beverages Consumed at Organised Sport by School Decile

Beverage	Decile (n)	Volume mL (±SD)	p-value	Effect Size – cohen's d
Soft Drink				
	Low (31)	263.5 (98.6)		
	Medium (32)	208.9 (98.3)	.006*	0.78
	High$ (37)	185.1 (101.8)		
Sports Drink				
	Low (109)	566.5 (439.6)		
	Medium (80)	481.8 (295.0)	.235**	-
	High (153)	510.9 (311.4)		
Water				
	Low (257)	722.4 (464.8)		
	Medium (296)	669.5 (496.8)	.390**	-
	High (653)	702.4 (446.9)		
Milk				
	Low (73)	176.2 (95.9)		
	Medium (72)	189.4 (90.6)	.530**	-
	High (163)	174.9 (93.0)		
Energy Drink				
	Low (31)	167.3 (72.9)		
	Medium (13)	225.0 (182.7)	.199**	-
	High (15)	152.5 (101.7)		
Fruit Drink				
	Low (41)	161.6 (154.3)		
	Medium (32)	201.2 (163.2)	.512**	-
	Decile (61)	174.2 (131.1)		
Flavoured Water				
	Low (34)	457.7 (236.2)		
	Medium (20)	440.6 (252.8)	.923**	-
	Decile (43)	433.1 (317.3)		
Other Drinks				
	Low (17)	430.1 (220.8)		
	Medium$ (15)	254.2 (98.7)	<.001*	1.03
	High$ (38)	271.4 (103.0)		0.92

$ Differ from low decile ($p<0.05$)
*Games-Howell
**Hochberg

Table 5.4 Chi-Square Analysis of Type of Beverage Consumed by Gender

Types of Beverage Consumed	Before Sport				During Sport				After Sport			
	(*N*)	χ^2	p-value	df	(*N*)	χ^2	p-value	df	(*N*)	χ^2	p-value	df
Soft Drink	(35)	1.852	.174	1	(17)	3.316	.069	1	(49)	4.346	.037	1
Sports Drink	(156)	1.489	.222	1	(228)	4.861	.027	1	(148)	3.071	.080	1
Water	(651)	4.108	.043	1	(945)	4.563	.033	1	(684)	7.968	.005	1
Milk	(248)	15.909	<.001	1	(39)	.433	.510	1	(48)	.036	.849	1
Energy Drink	(37)	2.779	.096	1	(23)	2.570	.109	1	(21)	4.429	**.035**	1
Fruit Drink	(87)	.922	.337	1	(33)	1.162	.281	1	(35)	.124	.724	1
Flavoured Water	(60)	1.012	.314	1	(47)	2.325	.127	1	(37)	.111	.739	1
Other	(63)	.367	.544	1	(8)		.727*		(6)		.687*	

*Fisher's Exact Test

Significant difference between male and female

5.3 Qualitative Analysis Code Book

Table 5.5 Definitions of Key Themes which Emerged from Qualitative Analysis of Participants Comments on their Preferred Beverage

Name	Description	Files	References
Beverage qualities	Beverage is preferred for the qualities attributed to the beverage	0	0
Costless	Beverage preferred due to being free of charge	1	1
Good taste	Beverage preferred for having a favourable taste	3	4
Health	Beverage preferred for having (perceived) benefits for well-being	1	1
Beliefs	Participant's comment asserts an opinion about the beverage related to well-being	1	9
Perceptions	Comment indicates participant perceiving the beverage to have health-related properties	1	12
Hydration	Participant comments indicate beverage being preferred for providing hydration	2	6
Marketing	Participant's preference relates to the purpose according to which the beverage is marketed for	1	2
Performance enhancement	Participant's comment relates to the beverage providing perceived improvement to their sport performance	2	5
Comfort	Participant's comment relates to the beverage not causing discomfort	1	5
Energy	Participant's comment relates to the beverage providing energy	2	13
Refreshment	Participant's comment relates to beverage's qualities to provide refreshment	1	2

Name	Description	Files	References
External source advice	Beverage is preferred based on advice from external sources	0	0
Advice	Participant instructed to consume beverage	3	3
Coach advice	Participant instructed to consume beverage by coach	1	1
Parental advice	Participant instructed to consume beverage by parent/guardian	1	2
Research informed	Participant sourced information to inform their choice of beverage	1	1
General preference	Participant's comment indicates general preference of beverage	2	2
Distaste	Preference attributed to dislike of other beverages	1	2
Habit	Participant indicates beverage being participant's usual intake	1	2
Unclear	Researchers unable to interpret the reason for beverage preference due to participant's comment having insufficient context	3	5

5.4 Participants' comments on factors influencing beverage consumption choices

Name: Coding Query - Results Preview
Male
<Files\\Survey responses\\Energy Drink Comments> - § 2 references coded [21.84% Coverage]

Reference 1 - 3.45% Coverage

ENERGY DRINK	*Tastes good*	"Yum"

Reference 2 - 18.39% Coverage

	Advice	"Told to drink it"

<Files\\Survey responses\\Flavoured Water Comments> - § 1 reference coded [36.47% Coverage]

Reference 1 - 36.47% Coverage

FLAVOURED WATER	*Other*	"I believe it is the best for me"

<Files\\Survey responses\\Fruit drink Comments> - § 1 reference coded [29.85% Coverage]

Reference 1 - 29.85% Coverage

FRUIT DRINK	*Other*	" Sugar type (natural)"

<Files\\Survey responses\\Milk Comments> - § 3 references coded [53.93% Coverage]

Reference 1 - 44.38% Coverage

	Other	"I looked what was the best drink to have before sport and it was chocolate milk" "Satisfaction" "Fruit" (smoothie)

Reference 2 - 6.74% Coverage

	Other	"I looked what was the best drink to have before sport and it was chocolate milk" "Satisfaction" "Fruit" (smoothie)

Reference 3 - 2.81% Coverage

	Other	"I looked what was the best drink to have before sport and it was chocolate milk" "Satisfaction"

		"Fruit" (smoothie)

<Files\\Survey responses\\Sports drink Comments> - § 6 references coded [34.74% Coverage]

Reference 1 - 3.26% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 2 - 2.11% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 3 - 1.34% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 4 - 7.49% Coverage

	Other	"Because of replenishing my electrolytes" "Cause [sic] I think it's great" "Because it tastes nicer than water and I feel that it improves my performance" "These drinks a: taste good b:are for sports c: make me drink it and d:help me when doing sport"

Reference 5 - 5.76% Coverage

	Other	"Because of replenishing my electrolytes" "Cause [sic] I think it's great" "Because it tastes nicer than water and I feel that it improves my performance" "These drinks a: taste good b:are for sports c: make me drink it and d:help me when doing sport"

Reference 6 - 14.78% Coverage

	Other	"Because of replenishing my electrolytes" "Cause [sic] I think it's great" "Because it tastes nicer than water and I feel that it improves my performance" "These drinks a: taste good b:are for sports c: make me drink it and d:help me when doing sport"

<Files\\Survey responses\\Water Comments> - § 20 references coded [31.33% Coverage]

Reference 1 - 2.83% Coverage

WATER	*Advice*	"This is what my parents tell me to drink" "Because my coaches tell me that it is better for you" "I'm told too" "Because mum says so"

Reference 2 - 0.85% Coverage

WATER	*Advice*	"This is what my parents tell me to drink" "Because my coaches tell me that it is better for you" "I'm told too" "Because mum says so"

Reference 3 - 1.63% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "...it keeps me energetic" "More energy" "It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 4 - 0.78% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "...it keeps me energetic" "More energy"

		"It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 5 – 1.06% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "…it keeps me energetic" "More energy" "It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 6 – 1.49% Coverage

	Hydration	"I was thirsty as well" "Doesn't make me thirsty anymore, it keeps me energetic" "Relieves my thirst"

Reference 7 – 0.85% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy" "Healthy" "It is healthy" "Stay healthy" "It's natural and healthy" "It's good for you" "It's good for you"

Reference 8 – 0.64% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy"

		“Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 9 – 1.41% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 10 – 1.20% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 11 – 1.84% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy”

		“It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 12 – 1.70% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 13 – 1.77% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding”

		“Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 14 - 2.12% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 15 - 1.98% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good”

		“If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 16 – 1.77% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 17 – 1.84% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold”

		“Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 18 - 2.12% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 19 - 1.84% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else”

		"It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Reference 20 - 1.63% Coverage

	Other	"I like I [sic] better" "Get stitch if drink something else" "Give me what I lost when playing sport" "Cools me down" "I don't get a sugar rush" "It's what I usually drink" "No option" "Because that's what I always have so I'm used to it" "No bad nutritional information" "Refreshing" "The others make me feel sick" "It's a good drink before." "I don't like anything else" "I don't like anything else" "It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Name: Coding Query - Results Preview
Female
‹Files\\Survey responses\\Milk Comments› - § 1 reference coded [5.62% Coverage]

Reference 1 - 5.62% Coverage

MILK	*Tastes good*	"Yummy milk"

‹Files\\Survey responses\\Sports drink Comments› - § 7 references coded [38.96% Coverage]

Reference 1 - 2.88% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy"

		"Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 2 – 2.88% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 3 – 2.11% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 4 – 2.30% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run" "Energy,"

Reference 5 – 5.95% Coverage

SPORTS DRINK	*Performance improvement*	"Gives you a boost" "Gives me energy" "Gives me energy" "More energy" "Good energy" "Gives energy" "Gives me a lot of energy to run"

		"Energy,"

Reference 6 - 4.80% Coverage

	Marketing	"Its [sic] a sports drink."

Reference 7 - 18.04% Coverage

	Other	"Because of replenishing my electrolytes" "Cause [sic] I think it's great" "Because it tastes nicer than water and I feel that it improves my performance" "These drinks a: taste good b:are for sports c: make me drink it and d:help me when doing sport"

<Files\\Survey responses\\Water Comments> - § 28 references coded [44.41% Coverage]

Reference 1 - 3.68% Coverage

WATER	*Advice*	"This is what my parents tell me to drink" "Because my coaches tell me that it is better for you" "I'm told too" "Because mum says so"

Reference 2 - 1.34% Coverage

WATER	*Advice*	"This is what my parents tell me to drink" "Because my coaches tell me that it is better for you" "I'm told too" "Because mum says so"

Reference 3 - 0.85% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "...it keeps me energetic" "More energy" "It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 4 - 1.91% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "...it keeps me energetic" "More energy"

		"It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 5 – 1.91% Coverage

	Performance improvement	"Gives energy" "Makes my more energetic" "…it keeps me energetic" "More energy" "It's light and helps me run" "Gives me energy" "Makes me hype and energized"

Reference 6 – 3.82% Coverage

	Hydration	"I was thirsty as well" "Doesn't make me thirsty anymore, it keeps me energetic" "Relieves my thirst"

Reference 7 – 1.27% Coverage

	Hydration	"I was thirsty as well" "Doesn't make me thirsty anymore, it keeps me energetic" "Relieves my thirst"

Reference 8 – 0.85% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy" "Healthy" "It is healthy" "Stay healthy" "It's natural and healthy" "It's good for you" "It's good for you"

Reference 9 – 1.70% Coverage

	Health	"It's healthy" "It's healthy"

		“Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 10 – 0.50% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 11 – 0.50% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 12 – 0.92% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy" "Healthy" "It is healthy" "Stay healthy" "It's natural and healthy" "It's good for you" "It's good for you"

Reference 13 – 0.85% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy" "Healthy" "It is healthy" "Stay healthy" "It's natural and healthy" "It's good for you" "It's good for you"

Reference 14 – 1.20% Coverage

	Health	"It's healthy" "It's healthy" "Healthier" "Others are unhealthy" "It's good for you" "It makes me feel healthy" "Healthy no added Chemicals" "Healthy" "Healthy" "It is healthy" "Stay healthy" "It's natural and healthy"

		“It's good for you” “It’s good for you”

Reference 15 – 1.20% Coverage

	Health	“It’s healthy” “It’s healthy” “Healthier” “Others are unhealthy” “It’s good for you” “It makes me feel healthy” “Healthy no added Chemicals” “Healthy” “Healthy” “It is healthy” “Stay healthy” “It's natural and healthy” “It's good for you” “It’s good for you”

Reference 16 – 1.49% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 17 – 2.40% Coverage

	Other	“I like I [sic] better”

		"Get stitch if drink something else" "Give me what I lost when playing sport" "Cools me down" "I don't get a sugar rush" "It's what I usually drink" "No option" "Because that's what I always have so I'm used to it" "No bad nutritional information" "Refreshing" "The others make me feel sick" "It's a good drink before." "I don't like anything else" "I don't like anything else" "It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Reference 18 - 2.69% Coverage

	Other	"I like I [sic] better" "Get stitch if drink something else" "Give me what I lost when playing sport" "Cools me down" "I don't get a sugar rush" "It's what I usually drink" "No option" "Because that's what I always have so I'm used to it" "No bad nutritional information" "Refreshing" "The others make me feel sick" "It's a good drink before." "I don't like anything else" "I don't like anything else" "It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Reference 19 - 0.92% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 20 - 1.70% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 21 - 0.64% Coverage

	Other	"I like I [sic] better" "Get stitch if drink something else" "Give me what I lost when playing sport" "Cools me down" "I don't get a sugar rush" "It's what I usually drink" "No option" "Because that's what I always have so I'm used to it" "No bad nutritional information" "Refreshing" "The others make me feel sick" "It's a good drink before." "I don't like anything else" "I don't like anything else" "It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Reference 22 - 3.68% Coverage

	Other	"I like I [sic] better" "Get stitch if drink something else" "Give me what I lost when playing sport" "Cools me down" "I don't get a sugar rush" "It's what I usually drink" "No option" "Because that's what I always have so I'm used to it" "No bad nutritional information" "Refreshing" "The others make me feel sick" "It's a good drink before." "I don't like anything else" "I don't like anything else" "It's nice and cold" "Good" "If I don't I will get a hiding" "Cause [sic] it helps me be healthier" "Is better for you and free" "Better for you in general" "So I don't get a stitch"

Reference 23 - 0.71% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 24 - 1.84% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 25 - 1.27% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 26 - 0.28% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 27 - 2.55% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

Reference 28 - 1.77% Coverage

	Other	“I like I [sic] better” “Get stitch if drink something else” “Give me what I lost when playing sport” “Cools me down” “I don’t get a sugar rush” “It’s what I usually drink” “No option” “Because that's what I always have so I'm used to it” “No bad nutritional information” “Refreshing” “The others make me feel sick” “It's a good drink before.” “I don't like anything else” “I don’t like anything else” “It’s nice and cold” “Good” “If I don’t I will get a hiding” “Cause [sic] it helps me be healthier” “Is better for you and free” “Better for you in general” “So I don’t get a stitch”

5.5 Questionnaire

MASSEY UNIVERSITY
TE KUNENGA KI PŪREHUROA
UNIVERSITY OF NEW ZEALAND

Drinks Research in Kids Sport: Survey Instructions

Thank you for volunteering to participate. Please read this section before beginning.

There are 3 sections to answer in this survey. Please make sure you answer all three. To help you answer as accurately as possible, take a moment to think about the answers to these questions before beginning the survey.

1. Questions about **you.**
   - Your age, gender, ethnicity and school
   - sport played today

2. Questions about **what you had to drink today.**
   - When did you drink it?
   - How much did you drink?
   - Where did you get it from?

3. Questions about **how you decide what to drink** when at sport.

Section 1: Demographics

AGE: ☐11 ☐12 ☐13 ☐14 GENDER: ☐ Male ☐ Female

ETHNICITY (please tick those which apply to you):

☐ European /NZ European ☐ Maori ☐ Pacific Peoples ☐ Asian

☐ Middle Eastern/Latin American/African ☐Other _____

SCHOOL:_____

SPORT PLAYED TODAY:_____

LEVEL OF SPORT YOU COMPETED AT TODAY:

☐School ☐Club ☐Representative ☐National

Section 2: Beverages

What did you drink? (please write)		
When?	**How much? (tick)**	**Who provided it? (tick)**
(tick as many as apply)	**Bottle (750mL):**	☐ Parent/caregiver
☐ Before	☐ Whole bottle	☐ I got it from home
	☐ 3/4 bottle	☐ I bought it
☐ During	☐ 1/2 bottle	☐ My coach gave it to me
	☐ less than 1/2 bottle	☐ Teammate/friend gave it to me
☐ After	☐ less than 1/4 bottle	☐ Other _____
	☐ one glass	
	☐ Other:_____	

What did you drink? (please write)		
When?	**How much? (tick)**	**Who provided it? (tick)**
(tick as many as apply)	**Bottle (750mL):**	☐ Parent/caregiver
☐ Before	☐ Whole bottle	☐ I got it from home
	☐ 3/4 bottle	☐ I bought it
☐ During	☐ 1/2 bottle	☐ My coach gave it to me
	☐ less than 1/2 bottle	☐ Teammate/friend gave it to me
☐ After	☐ less than 1/4 bottle	☐ Other _____
	☐ one glass	
	☐ Other:_____	

Section 3: Your Views

Where do you get information about what to drink before/during/after sport?

Please tick your TOP 3

- ☐ Teammate/friend
- ☐ Parent/guardian
- ☐ Online advertisements
- ☐ TV/radio/newspaper advertisements
- ☐ Coaches
- ☐ Teachers/School
- ☐ Famous sportspeople
- ☐ Books
- ☐ Magazine (e.g. Runner's World, NZ Rugby World)
- ☐ Websites (e.g. NZ Football website)

If any drink was available to you, what would you choose to drink when at sport?

Please write:_____

Why?

- ☐ Improve my performance
- ☐ Better hydration
- ☐ Better for my teeth
- ☐ Less sugar
- ☐ Top athletes drink it
- ☐ It tastes good
- ☐ Friends drink it
- ☐ Other (please write) _____

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