Title: ***"When we were young, it really was a treat; now sugar is just the norm every day"*** **- A qualitative study of parents' and young adults' perceptions and consumption of sugary drinks**

Running title: Sugary drink behaviour and beliefs

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This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/HPJA.257

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Ethics approval and consent to participate: Ethical approval to conduct the study was obtained from the University of South Australia Human Research Ethics Committee (Protocol number: 0000032462). Written consent was obtained from participants before commencing group discussions.

Conflict of interest: The authors declare that they have no competing interests.

Funding: Undertaken with the financial support of Cancer Council's Beat Cancer Project on behalf of its donors and the State Government through the Department of Health (South Australia).

Author contributions: CM designed the study with advice from MW, ABM, DR, KO and KE. KE led the qualitative analysis. CM, KE and JD drafted the manuscript. All authors contributed to and approved the final manuscript.

Acknowledgements: Michael Murphy Research for recruiting participants and moderating focus groups.

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Article type : Long Research Article

"When we were young, it really was a treat; now sugar is just the norm every day" - A qualitative study of parents' and young adults' perceptions and consumption of sugary drinks

Abstract

Issue addressed: Sugar-sweetened beverages (SSB) are the leading source of free sugars in Australian children's and adults' diets. This study explores drivers of consumption among parents and young adults to inform interventions.

Methods: Eight focus groups (n=59) stratified by gender, age/life stage and SES; analysed thematically.

Results: Daily SSB consumption was normalised. Participants drank SSBs to avoid perceived energy/sugar deficits, to treat themselves and as a function of familial influence. Frequent consumption was considered acceptable if 'in moderation' and/or 'balanced' with exercise/diet; however, there was a large disconnect between this language of moderation and actual consumption practices. Participants acknowledged that social norms had changed over time. There was little evidence of accurate knowledge of sugar content for any beverage type. Participants relied heavily on packaging and labelling, much of which conveyed a health-halo effect. While participants could list health effects of excess consumption, they were considered long-term or of low personal relevance. Awareness of health recommendations was low.

Conclusions: Consumers' adoption and use of concepts such as 'treat', 'moderation' and 'balance' reflect both food and beverage industry marketing and public health messaging. However, the disconnect between this language and knowledge and consumption practices is problematic.

So what? SSB consumption is very high with serious implications for health. Curbing consumption among young adults and parents has potential to change the health trajectories for current and future generations. There is a clear need to increase health literacy around SSB consumption. Simple consumption guidelines, clearer sugar content labelling and health warnings offer potential.

Summary: Sugar-sweetened beverages (SSB) consumption is high in Australia with serious implications for public health. Focus group methodology explored consumption practices and knowledge among parents and young adults. Daily consumption was normalised. Awareness of sugar content is poor. There is a need for better sugar content and health warning labelling.

Keywords: health behaviours; nutrition; obesity; qualitative methods

INTRODUCTION

Excess consumption of free sugars contributes to poor diet, overweight and obesity.[1] Free sugars are simple sugars added to foods by the manufacturer or consumer, and are naturally present (or intrinsic) in honey, syrups and fruit juices. Health agency guidelines recommend limiting free or added sugars. They also recommend limiting a major source of these sugars, sugar-sweetened beverages (SSBs).[1, 2] Sugar-sweetened beverages refer to all non-alcoholic water-based beverages with added sugar, including soft drinks, energy drinks, sports drinks and fruit drinks [2]. The World Health Organization recommends limiting free sugars to 10% of daily energy intake (equivalent to approximately 10 tsp).[1] Australia's dietary guidelines simply recommends "limiting" intake without specifying amounts.[2]

Sugar-sweetened beverages are a significant source of free sugar and the leading source in the Australian diet.[2, 3] Furthermore, SSB consumption is a point for public health intervention[1, 2] due to the health risks causally associated with excess consumption, including Type II diabetes, obesity and other metabolic risk factors.[2, 4-8] SSB consumption is high in Australia, as it is in other parts of the world.[3, 9] The Australian Health Survey 2011-12[3] reported that SSBs were consumed by 34% of the population on the day prior to interview, with consumption higher among children aged 2-18 years (47%) than adults (31%). Among those consuming SSBs, median daily consumption was equivalent to a regular can (375ml) containing ~10 teaspoons of sugar.

An important step in developing effective interventions to reduce SSB consumption is acquiring an in-depth understanding about consumption, including the individual and social drivers. To date, studies have quantified levels of SSB consumption and characteristics of consumers or high consumers,[3, 9-17] including: male gender; younger age; residing in areas of lower SES; obesity; being less health conscious; and other dietary factors. Studies have also

found that unhealthy behaviours tend to cluster together, with SSB consumption found to be associated with unhealthy dietary behaviours (i.e., consumption of purchased/fast food or snack foods, low fruit intake), sedentary behaviour and smoking [11, 12, 17]. Systematic review studies[18, 19] support the application of the Theory of Planned Behaviour (TPB)[20] as a framework for exploring consumption of discrete foods, and individual studies have explored TPB constructs and found that attitudes, perceived behavioural control and subjective norms are related to SSB consumption.[21, 22] Other quantitative studies have explored the home environment[23] and parenting styles[24] as drivers of consumption. Thus socio-environmental models, such as TPB, offer a useful framework for understanding this behaviour.

A small number of studies have employed qualitative approaches to explore perceptions, attitudes and behaviour in relation to SSB consumption, with most conducted in the US.[21, 25-29] These studies have predominantly focussed on youth and either consumption of soft drink only,[28] or energy drinks only.[29] For example, Hattersley and colleagues[28] found among Australian undergraduate university students aged 18 to 30 years (n=35) that social and environmental factors (e.g., consuming alcohol, socialising with friends, family, fast food purchases, availability, pricing and promotion), qualities of beverages (taste, sugar and caffeine content) and health beliefs (potential health consequences) appeared to influence the consumption of soft drinks.

Patterns of adult consumption, including parents of young children, are yet to be explored qualitatively in the Australian context. Consumption is very high among young adults. While consumption is somewhat less high among slightly older adults, parents can shape children's consumption; directly for young children and via role modelling and the home environment for older children.[12, 30, 31] Understanding the drivers of consumption among parents and young adults has the potential to inform targeted interventions with intergenerational effects.

The aim of this study was to generate in-depth insights into community knowledge about SSBs, consumption patterns and attitudes towards consumption, awareness of potential health effects, and awareness of health agency recommendations regarding consumption.

METHODS

Design

Eight focus groups were conducted, stratified into homogenous groups by sex, age/life stage (i.e., 21-29 years with no children - "young adults"; adults with children (aged 12 years or younger) at home - "parents"), and socio-demographic status (low-SES; mid-SES). The groups were constructed to capture a diversity of views, and as such, young adults were selected as group in which high personal consumption is prevalent. Parents of younger children (12 years and younger) were also identified as they govern and shape their children's behaviour.[12, 30, 31] Parents aged 35 to 50 years were targeted for recruitment as those likely to have younger children living at home; however, younger parents with younger children living at home were also eligible. Groups were stratified by these attributes, and SES, to obtain a diversity of views, and to encourage members to feel comfortable sharing their experiences, rather than to directly compare differences in perspectives between sub-groups. Ethical approval was obtained from the [blinded for review].

Participants

Michael Murphy Research was commissioned to recruit participants and moderate the focus groups. Inclusion criteria for the young adults included drinking SSBs at least weekly and, for parents, being a household grocery buyer and purchasing SSBs for the family at least weekly. Exclusion criteria included being employed in the beverage manufacturing or marketing industries. Participants were recruited to different SES groups based on area of residence and educational attainment.

Focus groups

Focus groups were held in Melbourne, Victoria during 2014. The moderator asked participants a series of open-ended questions and facilitated a discussion. Each group lasted approximately 90 minutes. Participants were paid an incentive according to current market rates (AUD$80). Participants were made aware that groups were audio and video recorded and these recordings were used to prepare verbatim transcripts, which were de-identified. Participants were informed that no identifying information would be reported or published from the groups.

Analyses

Thematic analysis, as described by Braun and Clarke,[32] was undertaken to identify common themes and subthemes from the data. While the study was exploratory, the analysis involved both inductive and deductive coding, based on a simple framework derived from the topic guide. Three researchers evaluated responses, read and reviewed the group transcripts, and compared notes, to identify patterns. Transcripts were systematically coded line-by-line by one researcher, and these data were collated into potential themes, using NVivo software.[33] The three researchers reviewed coding structures and themes, and discrepancies were resolved through consensus to ensure adequate agreement and refine themes. Data saturation was achieved, such that no new themes or information were being identified. Three main themes were identified: consumption patterns; selections and preferences regarding SSBs; and knowledge of SSBs and health effects.

RESULTS

Participants

Table 1 describes the structure of the eight groups and abbreviations used in the results.

INSERT TABLE 1 ABOUT HERE

Consumption patterns

The range and amount of SSBs consumed by participants varied considerably, from those who drank SSBs several times a day, to weekly (minimum eligibility criterion). Participants who consumed SSBs multiple times per day viewed this as normal and acceptable.

"Yeah so in the morning I'll go to work and I'll stop and I'll buy a V [energy drink]. I'll get to work and have a V, I'll go on working and have a V…. I'll have a couple of bottles of water in between that and then I'll have a couple more V's, I'll probably drink six to seven V's a day." (G5:F;YA;Low-SES)

"I have a juice for breakfast and the evening, but during the day it would be Coke or any kind of fizzy drink*. Lemonade, whatever is there…. probably half a bottle a day, or if I'm really thirsty it could be at least one bottle, a 1.25 [litre], that's thro*ughout the whole day. But drinking moderately*." (G8*:M;Par;Low-SES) [emphasis added]

Similarly, children's consumption (based on parental report) varied, for example, some children consumed SSBs daily, while others were more restricted in their consumption to weekends or special occasions. Reports of children's consumption largely paralleled parents' patterns of consumption, albeit with a more restricted range of SSBs for children.

Drinking to avoid perceived deficits

Many consumed SSBs to meet a perceived physical need, notably avoiding sugar- or energy- 'deficits', but some also mentioned a need to satisfy a perceived SSB-addiction, and to provide caffeine.

"…I drink a glass of juice, just to have that sugar, because I don't really have a lot of sugar in my diet, so I will purposefully just drink juice to get my sugar levels accurate.*"* (G1:F,YA,Mid-SES)[emphasis added]

"…a lot of the time I really just do it for the caffeine part of it"(G1:F;YA;Mid-SES)

Many participants mentioned they consumed SSBs, and specifically sports drinks, during sport or exercise (to replenish energy and/or electrolytes). Drinking to meet a perceived energy deficit was also reflected in children's consumption. Notably, a range of SSBs were given to children to provide energy for physical activity.

"…my kids do a lot of sport and they like having Coke afterwards, I think it's quite refreshing, it gives them that sugar hit…" (G4:M;Par;Mid-SES)

"Or if I do want to give my children sugar, if I want to make a conscious choice to give them *a sugar drink, for energy.… There are times, I mean I have a child that I would give a Powerade to because she's depleted in energy, so it might be on a really hot day and she's done some exercise, and she's fading pretty fast." (G3:F*;Par;Mid-SES)

Treating oneself

Other reasons cited for both personal and children's consumption of SSBs included a sense of treating oneself (social occasions, visitors, birthdays), and as accompaniment to 'treat' food (particularly unhealthy food). These 'treat' occasions occurred frequently, and for some it was a daily occurrence, for example, with dinner.

"The sugary ones I see as a treat... like with dinner you know, I'll have a nice little drink." (G7:F;Par;Low-SES)

"In our house we have soft drinks because if you've got visitors, you've got something to serve." (G3:F;Par;Mid-SES)

Some participants also discussed treats in the context of earning a reward, for example, for physical activity.

"Because it's a treat for them, they've worked hard, they've had a good workout, I guess it's [Coke*'s] a bit of a treat, but I'm not convinced that it's much different to Lemonade or apple* juice or orange juice or even to any of those other things. What do you give them, the only probably good thing is water, which is not really *a treat." (G4:M*;Par;Mid-SES)

Drinking within 'moderation' or 'balance'

Throughout the groups, participants talked about daily SSB consumption being acceptable within the context of it being 'balanced' by other elements of diet or by exercise.

"But I walk, I ride, cycle between train or work if I can on the weekend, like I caught the *train here, so sometimes that kind of burns enough energy off, you can have a Coke"* (G6:M;YA;Low-SES)

"If I've eaten chocolates and I've been eating junk all day, I try to go for a bit of a low… yeah, if I'm eating a large pizza I maybe need to go low on the Coke. (G8:M;Par;Low-SES) (emphasis added)

'Rules' regarding consumption

Participants spoke about their consumption practices and patterns and their provision of SSBs to children, in ways that implied purposeful decision making and control. The reports of moderating or 'balancing' consumption provide examples of this, as does restricting timing of consumption, e.g. to dinner or on weekends. In addition, there were specific 'rules' reportedly in place regarding consumption for children, including: not freely accessing soft drink in the home; some types of drinks being excluded from younger children's

consumption. There was a tendency for more restrictions to be placed on younger children's consumption, and acceptance of greater consumption among older children.

"Privileges that they acquire at certain ages, so like I mentioned Coca-Cola before, so I said *once you get to high school it might be something you can try… and they weren't to have* juices till they were 3 or 4 and it was watered down, and so each of them had that rule *applied to them throughout their life." (G3:F*;Par;Mid-SES)

"It really depends like if it's the weekend or a week day, I think at the start of the week you are more conscious of being healthier and by the end of the week and weekend, it*'s kind of, you know, I wouldn't really worry as much about what I'm having on a weekend." (G1:F*;YA;Mid-SES)

Parental modelling shaping consumption behaviour

Some participants indicated that their consumption reflected parental modelling, following their own parents' consumption.

"My parents gave me Coke since I was five. My dad was addicted to Coke, we buy Coke like *trolley fulls when they are on special, so it's only when I started that reading and looking at someone like my dad, he's got heart problems and stuff, that I kind of clued into it myself."* (G2:M;YA;Mid-SES)

Some parents were concerned that their own consumption would influence their children's consumption, or had already done so.

"…he's [child] been drinking a lot. *We try to stop it because he's* starting to pick up on our *bad habits of drinking soft drinks pretty much every day."* (G8:M;Par;Low-SES)

"Yeah, I think I'm addicted to it. I've got my kids addicted to Coke and I'm addicted to Coke Zero and my wife is really pleased with all of us (sarcas*tically)." (G4:M*;Par;Mid-SES)

Some parents noted that they allowed their child a "special drink" (usually soft drink) when they either consumed alcohol or SSBs themselves.

"I think to myself I don't want to be a hypocrite, I'll sit there and have a beer, and you're not having a soft drink…. And we know and they know, the kids know, that the beer is not that

good for us, and so when we say to kids they can't drink soft drink, well they are probably thinking to themselves, well you are drinking beer. So I go*, go on, have another soft drink"* (G4:M;Par;Mid-SES)

Perceptions of changing social norms

There was widespread recognition among participants that there had been a cultural shift in perception of SSBs as something that had been considered a rare treat in the past, to something that was now commonly consumed weekly or daily.

*"These kids are getting all these ads from the day they a*re born, the minute their parents turn *the TV on, and I don't remember any of that being around. I remember when I was a kid I* would get one can of soft drink for Sunday night dinner, that was it for the rest of the week, that was such a treat, but by the time I was in high school, our top shelf of the fridge had two rows of Coke, one row of Sprite and a row of Diet Coke. Like depending on which family *member liked what." (G5:F*;YA;Low-SES)

"When we were young, it really, really, really was a treat… a birthday party or something. *But it's become so normal now, with all the other foods, sugar is just the norm every day, and it's just an easy hit for kids…" (G7:F*;Par;Low-SES)

Knowledge of sugar content of SSBs and potential health effects

Knowledge of sugar content of SSBs

Participants readily identified that some beverages (soft drinks, sports drinks, energy drinks) were sweetened with added sugar, that others (juice) contained sugars which had not been added, and that water and sparkling water did not contain sugar. Participants perceived many SSBs to be 'high in sugar', most notably Coca-Cola, but also energy drinks, sports drinks and juices. There was acknowledgement that some beverages have a higher sugar content than others, however, there were inconsistent perceptions of relative sugar content of beverages and little evidence of accurate knowledge of sugar content for any beverage type.

Some beverages were considered to be "healthier" due to other attributes of the drink, for example, those that contain fruit or fruit flavouring.

*"I'm almost probably a little bit tricked into, like I'll give [the children] a Solo or something that's a lemon soft drink, over something with red dye in it, over something that that's Coke. Like there's almost a hierarc*hy of evil soft drinks. At least if you are drinking orange or *lemon you think you yeah okay, that's a fruit." (G4: M Par Mid*-SES)

There was also a perception among some that different types of sugar have a greater effect on ill-health, with many perceiving "natural" sugars to be "better-for-you". Natural sugars were discussed in the context of fruit juice. However, there was some confusion over which juices were naturally sweetened and which had added sugars. Some participants believed that juices were healthier as they contained lower levels of sugar than other SSBs and others thought juice had other beneficial nutrients. Sometimes fruit juice was equated to eating fruit.

"If you go to Boost Juice, apple, orange, essentially you are eating that fruit, but it's just liquid." (G5:F;YA;Low-SES)

"You feel like the natural sugars are better for you, so if you could have 100% cranberry juice and 100% orange juice, you feel like it's healthier, it's better for you." (G1:F;YA;Mid-SES)

"In the long term it's [sugar from fruit's] not really "sugar" sugar."
(G1:F;YA;Mid-SES)

While many participants perceived "natural" sugar to be healthier than added sugar, some participants viewed juice as being as unhealthy as other SSBs, due to the comparable sugar content.

"People look at natural and they think well that is better, that's coming from the source of whatever I want to eat, it's a natural product, it's got no added anything… so you fall into being a bit deceived like, natur*al orange juice… you sort of think it's better and it's not, all the time, better for you." (G1:F*,YA,Mid-SES)

Perceived adverse health effects of consuming SSBs

Participants named a range of adverse health effects associated with SSB consumption: diabetes, overweight, dental cavities, heart problems, addiction and behavioural problems such as hyperactivity. Participants indicated that such health problems would be dependent

on the amount consumed, and most health problems were considered to be very long-term health effects which might occur in the distant future, and of low personal relevance.

"It's not like one can of Coke once a week is going to give you diabetes. But if you had two cans of Coke a day, then that's different." (G4:M;Par;Mid-SES)

"I think with soft drinks it's more of a long term thing, so if you drink them for like a year or so growing up or whatever, that wouldn't necessarily find any major health problems, but I would say if you were to drink five or six or however many cans per day, over a period of twenty years, then you would see some serious problems, but *it's quite a long process." (G5:F*;YA;Low-SES)

Participants recognised that weight gain was associated with sugar through calorie consumption. However, there was also a belief that this was a matter of balance in terms of the balance between 'energy in' and 'energy out', and that weight gain would only happen for someone who was not doing sufficient activity or drinking to excess. Some justified their consumption of SSBs on this basis, claiming that they were active enough to use up the "calories". Participants used the term calories rather than the Australian unit of measurement of energy kilojoules.

"Yeah if you do a lot of exercise, the calories in, calories out should be okay." (G6:M;YA;Low)

"It's energy input versus output, I mean like if you are drinking three litres of Coke a day and you've got a desk job, you don't go to the gym or anything like that, you just have constant sugar intake and you are not burning it off" (G5:F;YA;Low-SES)

Most participants indicated they were unaware of the mechanisms by which SSBs contribute to ill-health. Explanations included accurate statements: contribution to weight gain; and acidity damaging teeth, as well partially accurate statements such as sugar blocking arteries to the heart (SSB consumption is linked to elevated cardiovascular risk via increased risk of metabolic risk factors); [2, 4-8] and statements not supported by scientific evidence: creating an alkaline environment leading to cancer.

Several participants talked about SSB consumption leading to tooth decay, and for many this was the greatest personal concern. Several parents reported that this was a reason for restricting their children's consumption of soft drinks in particular.

"I worry about [my children's] teeth, the sugar in their teeth, so that's probably not the weight or actual sugar, it's the health of their teeth, so I have them avoid as *much as possible." (G7:F*;Par;Low-SES)

There was a perception among some participants that Coca-Cola was particularly bad for health due to some of its properties, with many parents being particularly wary of giving it to children.

"We'd rather the kids to have, the normal soft drink, a lemonade or a Lift or a Solo, less aim *towards the caffeine, the Cokes and Pepsis… so it's that balance." (G4:M*;Par;Mid-SES)

Awareness of health messages and consumption recommendations

While there was reasonable awareness that too much sugar caused health problems, and that people should avoid over-consuming SSBs, knowledge of what comprised excess was varied and lacking overall. For example, one can per day was considered excessive for one participant, while 2-3 cans per day was suggested by another.

"[Moderator] And excess would be like what? [Participant(P) 1] Two to three cans a day. [P2] Some people say one can is too much though. [P3] Yeah more than two [cans per day] I would say. [P4]: More than one [can per day] [P5:] I think more than three cans a week is *too much"* (G8:M;Par;Low-SES)

Overall, most participants were not aware of health recommendations about SSB consumption. However, a few participants indicated they had heard recommendations not to drink SSBs at all.

Selection of SSBs vs artificially-sweetened beverages

During the focus groups, artificially-sweetened beverages were spontaneously raised by participants on multiple occasions. Some participants preferred beverages with 'natural' or added sugar over artificially sweetened beverages, while others preferred artificially-

sweetened beverages over sugary drinks. Notably, some participants chose to consume SSBs to avoid consuming artificial sweeteners, as they were considered the "healthier" choice. Some participants believed artificially-sweetened beverages were linked to cancer, asthma, infertility and gout. Notably water was rarely raised as an alternative beverage to SSBs.

"I'd like to think that if you are drinking something like a Solo, you are probably drinking loads of sugar but perhaps not the amount of chemicals and unnatural sort of sugar, artificial *replacement things."* (G4:M;Par;Mid-SES)

"I never drink the artificially-sweetened ones, because I've heard they've got carcinogens, in the artificial sweeteners, so I've heard that they are actually worse for you than the sugar ones, even though they've got less calories, so I ju*st go for the sugary ones" (*G2:M,YA,Mid-SES)

Participants who nominated they drink alternatives to SSBs did so due to: health reasons and to avoid consuming high amounts of sugar, taste preference, or as a moderating accompaniment to unhealthy food.

"I take the risk, I drink them [artificially-sweetened drinks]. *If I'm craving a soft drink I'd* rather have that than a bucket of sugar*."* (G3:F;Par;Mid-SES)

"You don't feel too guilty drinking these other ones with less sugar, when you are having a junky or a bad meal anyway, like KFC*."* (G8:M;Par;Low-SES)

During discussions of different versions of drinks (added sugar sweetened, artificially-sweetened or naturally sweetened) some participants noted that it is usually apparent whether a beverage is a sugar-free version from the front of packaging, or the entire packaging.

*"*The colours are different, we all know Coke Zero is black, Coke is red, sugar Red Bull is *dark blue, it's light blue if it's light, you sort of get to know by just colour, so you can* instantly go and pick out what yo*u want."(*G1:F;YA;Mid-SES)

"Usually it will say if it's sugar free, it will be pretty clear." (G1:F;YA;Mid-SES)

While the distinction between regular and artificially-sweetened soft drinks was readily apparent, this was not the case for juices and other beverages.

"So I sometimes fall into that, oh there's no added sugar, but there's sugar in it, it's not sugar free, but they haven't added any extra, which sometimes fools me at times, when I read it really quickly." (G1:F;YA;Mid-SES)

"I was getting bottle of Ribena, I really wanted my Ribena and I was reading it, it has no artificial sweeteners, no artificial colours, and no added sugar… and I was really excited to drink it." (G1:F;YA;Mid-SES)

Very few participants reported looking at labels on the back of packaging (i.e. Nutritional Information Panels (NIPs)). Even participants who did look at NIPs only did so occasionally. In particular, participants commonly responded that they would not read the NIP when they were buying a drink at a convenience store or in a bar or café.

"Yeah I look whether its sugar-free but never read each ingredient on the back… if it said sugar-*free I'd probably trust that it doesn't have sugar in it, I would never go into the detail on the back." (G1:F;YA;Mid*-SES)

DISCUSSION

This qualitative study offers a range of in-depth insights into SSB consumption practices and beliefs. While participants were superficially aware that sugary drinks – in particular cola – were 'unhealthy', daily consumption was common and normalised. There was widespread acknowledgement that SSB consumption ought to be limited, and SSB consumption was acceptable 'in moderation'. The language employed by both the food and beverage industry and health agencies such as 'limit', 'treat', 'moderation' and 'balance' was used widely by participants, however these terms were used to describe levels of consumption which were well in excess of international guidelines.[1] Furthermore, there was very limited knowledge of the sugar content of any sugar-containing beverage and almost no awareness of health agency recommendations around consumption of free sugars or SSBs. There was also an awareness that 'excess' consumption increased health risks but there was little understanding of what constituted excess consumption, superficial understanding of documented health risks,[2, 4-8] and a perception among young adults in particular that health effects were neither proximal nor relevant. These findings are consistent with quantitative studies conducted in Australia and the US which indicate regular consumption of SSBs, but low awareness of health risks and sugar content.[17, 34, 35]

Participants reported that SSBs were often consumed as a 'treat' and as an accompaniment to other unhealthy foods, liberally on weekends, and/or at social gatherings. These findings are consistent with studies that indicate a greater consumption of 'treat' foods on weekends as opposed to week days[36] and that unhealthy behaviours may cluster together.[11-13] This clustering presents a compounded risk of over-consumption of energy-dense food and drinks. There was acknowledgement by participants that the frequency of such 'treats' had changed substantially over their lifetimes, from something considered special and consumed occasionally to something consumed every day. While the historically acquired understanding that a 'treat' was special was retained; the rarity associated with treat occasions had diminished and sugary drink consumption had become more normalised and part of everyday life. The frequency of 'treats' and participants' perceptions of 'moderate' consumption, highlight the need for Australian dietary guidelines to specify consumption limits, replacing the less tangible behavioural message to "limit" consumption.[2]

Another common theme for young adults and parents was the functional role of SSBs in filling a perceived energy deficit, for both children and adults. This perceived deficit was filled through the provision of sugar, caffeine, and/or electrolytes (in the case of sports drinks). The 'deficit' could occur at a low point of energy or concentration during the day, or more prominently, with physical activity. Given the examples of physical activity offered by participants (e.g., children's sport training) rarely equated to the calories reportedly consumed to 'compensate' (e.g., bottle of sports drink), it was apparent that participants did not understand the amount of physical activity required to use the calories contained in many popular SSBs. This reasoning is consistent with the beverage industry's focus on physical activity as a response to obesity. The finding is also concerning given that less than half of adults (43%) and only 19% of children consistently meet respective physical activity recommendations,[37] much less exercise enough to offset high SSB consumption.

The implications of these perceived "physiological deficits" are worthy of further investigation. As acknowledged by Cohen et al.,[38] a whole 'science' of hydration is now heavily marketed by sports drinks companies, and is consistent with the observed misperception that there is a need for such a product (other than water) for hydration. Furthermore, energy drinks are also marketed as improving overall performance (e.g., "Red bull gives you wings"). The marketing of functional benefits may have been extrapolated to

other SSBs including soft drinks. Indeed, SSBs were thought to meet the a perceived need to keep sugar or energy levels "balanced" in both adults and children.

Similarly, participants reported consuming SSBs in a "balanced" way with other elements of their diet. However, it was apparent from the examples provided that the "balancing" of volume of SSBs and other foods e.g., cake and pizza, would most likely result in personal over-consumption, consistent with population level data about dietary intake for Australia, where one-third (35%) of total energy consumed was from 'discretionary foods', and trends in overweight and obesity.[39, 40] Again, this highlights the presence of a superficial awareness without the requisite concrete understanding of total energy needs, energy consumed or expended or accurate application to achieve actual caloric balance. Many food and beverage labelling initiatives (e.g., menu labelling, NIPs, daily intake guides) are predicated on a knowledge base or an element of health literacy among consumers that this study indicates is largely absent.

Social norms and family role modelling were perceived to influence participants' consumption and parental provision of SSBs to children, consistent with other research,[24, 28] and reinforcing that familial influences last well into adulthood. Furthermore, many parents also recognised that children's consumption paralleled their own consumption of either SSBs or alcohol (children were allowed a special beverage when parents had one). Home environments and parents are known to be significant in influencing health behaviours,[12, 30, 31] and preventing obesity in children and youth is a priority.[41] Therefore, comprehensive strategies to reduce over-consumption of unhealthy food and beverages need to recognise the influence of parents, home environments and social norms. Targeting adult consumption of unhealthy food and beverages is important in its own right, but also a means to influence children's consumption.

While the presence or absence of sugar in soft drinks was unambiguous, there was uncertainty about the amount of free sugar in other beverages, and in particular juice. This is consistent with a US quantitative study which found confusion in identifying beverages with added sugar or other sugars.[42] "No added sugar" labelling caused much confusion.

Among both parents and young adult participants, there appeared to be a perception of a healthiness hierarchy of drinks, ranging from those perceived as having little to offer besides sugars and artificial colourings, to those offering some nutritional value (juice, vitamin water,

fruit flavoured mineral waters), and sports drinks (containing electrolytes). Within this hierarchy, there were misperceptions about sugar content and other attributes of drinks which made them 'healthier' to consumers. Juice was perceived to be at the top of the hierarchy for many participants, with some participants viewing juices as liquefied equivalents of fruit. All fruit-based and fruit-flavoured beverages were somewhat elevated, even fruit-flavoured soft drinks e.g. Solo (lemon-flavoured) and lemonade. These perceptions suggest a 'health halo' effect from fruit labelling. 'Health halo' effects have been reported in many dietary contexts, whereby a front-of-package nutritional claim may lead a consumer to interpret a product as healthier on a number of attributes not included in the claim.[43] Some health advocates have cautioned against the use of nutritional claims, and suggest that consumers may interpret them in inaccurate and unhealthy ways.[44] The apparent effect of providing a 'health halo' for beverages through the association with fruit warrants further investigation as a prevalent feature of SSBs.[45]

Artificially-sweetened soft drinks were repeatedly raised as a comparison and alternative beverage to SSBs. Views among participants were very mixed: some participants preferred them because of the absence of sugar, while other participants were sceptical about their artificial nature, reportedly preferring 'natural' sugar in soft drinks. Water was rarely mentioned. Although the evidence regarding artificial sweeteners and associated health risks is less developed than the evidence surrounding SSBs, systematic reviews have found relationships between artificially sweetened beverage consumption and both weight gain and type II diabetes.[46, 47] The evidence that exists indicates that artificially-sweetened beverages are not a healthy substitute for SSBs from a public health perspective. Findings in this study indicate that people's top-of-mind choice was between sugar-sweetened and artificially-sweetened beverages reinforcing the need to promote water as the primary beverage choice for health and hydration.

The Theory of Planned Behaviour (TPB) is widely applied in health promotion practice and research, including examining of consumption of discrete foods and beverages.[18, 19] While this study did not aim to apply the TPB, many of the constructs of the theory are supported by the findings, notably behavioural beliefs, outcome expectations, attitudes towards the behaviour and subjective norms, consistent with previous studies.[18, 19] This study offer insights into participants' beliefs about consuming SSBs, their perceptions of personal risk from consuming SSBs and the social norms surrounding their SSB consumption behaviour.

These findings indicate health promotion efforts should focus on shifting these attitudes, beliefs and risk perceptions to better align them with the scientific evidence.

There are limitations associated with qualitative methodology. Due to the size and selection of the sample, findings are not representative of all young adults or parents of young children, and accordingly, comparisons could not be made between perspectives based on group attributes. However, we gained a range of responses and reached saturation after eight groups. Social desirability and norms may have influenced responses, although the moderator used a non-judgmental approach and assured participants at the start that all views were of equal interest.

Overall, the study provides one of the first in-depth, explorations of patterns of SSB consumption and knowledge of health effects of excess consumption of SSBs, specifically among young adults and parents. These findings provide a foundation for population studies and to guide interventions aimed at changing consumption of SSBs.

CONCLUSION

Consumers use language consistent with messages used in marketing discretionary food and beverages, and to a lesser extent public health sources, when talking about SSBs. SSBs are viewed as a 'treat' to be consumed in 'moderation' and/or as part of a 'balance' between food and physical activity. This study indicates there is a substantial disconnect between this language and actual consumption practices. While consumers can articulate that SSBs, especially soft drinks, should not be consumed to excess, there is limited tangible knowledge of what constitutes excess. There is a need for clear, concrete consumption guidelines for SSBs and juice for adults and children, and these guidelines need to be communicated widely. Likewise, there is a need for clearer communication regarding sugar content of beverages and potential health effects of excess consumption of SSBs, including weight gain, type II diabetes. Simple, front-of-pack information about free sugar content, would be beneficial, to help make this information more readily available to consumers. There is evidence that such labels have the potential to influence SSB consumption.[48, 49] Information is important but SSB consumption, like all health behaviours, in influenced by individual, social and environmental factors. Package labels are only one initiative that would contribute to a comprehensive approach to reducing population excess consumption of SSBs. Other potential initiatives include taxation of SSBs, reducing children's exposure to marketing of

SSBS, restricting sale of SSBs in children's settings and in health settings, and increasing easy access to fluoridated tap water.[50]

Abbreviations

SSB: Sugar-sweetened beverage

NIP: Nutrition Information Panel

HREC: Human Research Ethics Committee

TBP: Theory of Planned Behaviour

REFERENCES

1. World Health Organization. Guideline: Sugars intake for adult and children. Geneva: WHO, 2015.

2. National Health and Medical Research Council. Australian Dietary Guidelines. Canberra: NHMRC, 2013.

3. Australian Bureau of Statistics. Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011-12. Consumption of sweetened beverages. Canberra. Report No: 4364.0.55.007: ABS, 2015.

4. Te Morenga L, Mallard S, Mann J. Dietary sugars and body weight: systematic review and meta-analyses of randomised controlled trials and cohort studies. BMJ. 2012;346:e7492.

5. Vartanian LR, Schwartz MB, Brownell KD. Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis. Am J Public Health. 2007;97(4):667-75.

6. Sohn W, Burt BA, Sowers MR. Carbonated soft drinks and dental caries in the primary dentition. J Dent Res. 2006;85(3):262-6.

7. Te Morenga LA, Howatson AJ, Jones RM, Mann J. Dietary sugars and cardiometabolic risk: systematic review and meta-analyses of randomized controlled trials of the effects on blood pressure and lipids. Am J Clin Nutr. 2014;100:65-79.

8. Malik VS, Popkin BM, Bray GA, Despres JP, Willett WC, Hu FB. Sugar-sweetened beverages and risk of metabolic syndrome and type 2 diabetes: a meta-analysis. Diabetes Care. 2010;33(11):2477-83.

9. Singh GM, Micha R, Khatibzadeh S, Shi P, Lim S, Andrews KG, et al. Global, regional, and national consumption of sugar-sweetened beverages, fruit juices, and milk: A systematic assessment of beverage intake in 187 countries. PLoS One. 2015;10(8):e0124845.

10. Harray AJ, Boushey CJ, Pollard CM, Panizza CE, Delp EJ, Dhaliwal SS, et al. Perception v. actual intakes of junk food and sugar-sweetened beverages in Australian young adults: assessed using the mobile food record. Public Health Nutr. 2017;20(13):1-8.

11. Pollard CM, Meng X, Hendrie GA, Hendrie D, Sullivan D, Pratt IS, et al. Obesity, socio-demographic and attitudinal factors associated with sugar-sweetened beverage consumption: Australian evidence. Aust N Z J Public Health. 2016 Feb;40(1):71-7.

12. Scully M, Morley B, Niven P, Crawford D, Pratt IS. Factors associated with high consumption of soft drinks among Australian secondary-school students. Public Health Nutr. 2017;20(13):2340-8.

13. French S, Rosenberg M, Wood L, Maitland C, Shilton T, Pratt IS, et al. Soft drink consumption patterns among Western Australians. J Nutr Educ Behav. 2013;45(6):525-32. English.

14. Barrett P, Imamura F, Brage S, Griffin SJ, Wareham NJ, Forouhi NG. Sociodemographic, lifestyle and behavioural factors associated with consumption of sweetened beverages among adults in Cambridgeshire, UK: the Fenland Study. Public Health Nutr. 2017;20(15):2766-77.

15. Yon BA, Johnson RK. Dietary patterns and sugar-sweetened beverage consumption among adolescents and adults. Curr Nutr Rep. 2014;3(1):43-50.

16. Park S, Pan L, Sherry B, Blanck HM. Consumption of sugar-sweetened beverages among US adults in 6 states: Behavioral risk factor surveillance system, 2011. Prev Chronic Dis. 2014;11:E65.

17. Miller C, Wakefield M, Braunack-Mayer A, Roder D, O'Dea K, Ettridge K, et al. Who drinks sugar sweetened beverages and juice? An Australian population study of behaviour, awareness and attitudes. BMC Obes. 2019;6(1).

18. McDermott MS, Oliver M, Svenson A, Simnadis T, Beck EJ, Coltman T, et al. The theory of planned behaviour and discrete food choices: a systematic review and meta-analysis. Int J Behav Nutr Phys Act. 2015;12(1):1-11.

19. Riebl SK, Estabrooks PA, Dunsmore JC, Savla J, Frisard MI, Dietrich AM, et al. A systematic literature review and meta-analysis: The Theory of Planned Behavior's application to understand and predict nutrition-related behaviors in youth. Eat Behav. 2015;18:160-78.

20. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. J Appl Psychol. 2002;32(4):665-83.

21. Zoellner J, Krzeski E, Harden S, Cook E, Allen K, Estabrooks PA. Qualitative application of the theory of planned behavior to understand beverage consumption behaviors among adults. J Acad Nutr Diet. 2012;112(11):1774-84.

22. De Bruijn G-J, Van den Putte B. Adolescent soft drink consumption, television viewing and habit strength. Investigating clustering effects in the Theory of Planned Behaviour. Appetite. 2009;53(1):66-75.

23. Ranjit N, Wilkinson AV, Lytle LM, Evans AE, Saxton D, Hoelscher DM. Socioeconomic inequalities in children's diet: the role of the home food environment. Int J Behav Nutr Phys Act. 2015;12(1):S4.

24. Van der Horst K, Kremers S, Ferreira I, Singh A, Oenema A, Brug J. Perceived parenting style and practices and the consumption of sugar-sweetened beverages by adolescents. Health Educ Res. 2007;22(2):295-304.

25. Block JP, Gillman MW, Linakis SK, Goldman RE. "If it tastes good, I'm drinking it": qualitative study of beverage consumption among college students. J Adolesc Health. 2013;52(6):702-6.

26. Bogart LM, Cowgill BO, Sharma AJ, Uyeda K, Sticklor LA, Alijewicz KE, et al. Parental and home environmental facilitators of sugar-sweetened beverage consumption among overweight and obese Latino youth. Acad Pediatr. 2013;13(4):348-55.

27. Bunting H, Baggett A, Grigor J. Adolescent and young adult perceptions of caffeinated energy drinks: a qualitative approach. Appetite. 2013 Jun;65(1):132-8.

28. Hattersley L, Irwin M, ing L, Allman-Farinelli M. Determinants and patterns of soft drink consumption in young adults: a qualitative analysis. Public Health Nutr. 2009;12(10):1816-22.

29. Costa BM, Hayley A, Miller P. Young adolescents' perceptions, patterns, and contexts of energy drink use: a focus group study. Appetite. 2014;80(1):183-9.

30. Pettigrew S, Jongenelis M, Chapman K, Miller C. Factors influencing the frequency of children's consumption of soft drinks. Appetite. 2015;91:393-8.

31. Giammattei J, Blix G, Marshak H, Wollitzer A, Pettitt DJ. Television watching and soft drink consumption: Associations with obesity in 11- to 13-year-old schoolchildren. Arch Pediatr Adolesc Med 2003;157(9):882-6.

32. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77-101.

33. QSR International Pty Ltd. NVivo Qualitative Data Analysis Software. Version 11. 2015.

34. Gase LN, Robles B, Barragan NC, Kuo T. Relationship between nutritional knowledge and the amount of sugar-sweetened beverages consumed in Los Angeles County. Health Educ Behav. 2014;41(4):431-9.

35. Park S, Onufrak S, Sherry B, Blanck HM. The relationship between health-related knowledge and sugar-sweetened beverage intake among US adults. J Acad Nutr Diet. 2014;114(7):1059-66.

36. Grimes CA, Riddell LJ, Nowson CA. Nutrient and core and non-core food intake of Australian schoolchildren differs on school days compared to non-school days. Appetite. 2014;83:104-11.

37. Australian Bureau of Statistics. Australian Health Survey: Physical Activity, 2011-12. Canberra: 2012 Contract No.: 4364.0.55.004.

38. Cohen D. The truth about sports drinks. BMJ. 2012;345:e:4737.

39. Australian Bureau of Statistics. Australian Health Survey: Nutrition First Results - Foods and Nutrients, 2011-12. Canberra: 2014.

40. Australian Institute of Health and Welfare. A picture of overweight and obesity in Australia 2017. Cat. no.PHE 216. Canberra: AIHW, 2017.

41. Swinburn B, Gill T, Kumanyika S. Obesity prevention: a proposed framework for translating evidence into action. Obes Rev. 2005;6:23-33.

42. Rampersaud GC, Kim H, Gao Z, House LA. Knowledge, perceptions, and behaviors of adults concerning nonalcoholic beverages suggest some lack of comprehension related to sugars. Nutr Res. 2014;34(2):134-42.

43. Hawley KL, Roberto CA, Bragg MA, Liu PJ, Schwartz MB, Brownell KD. The science on front-of-package food labels. Public Health Nutr. 2013;16(3):430-9.

44. Brownell KD, Koplan JP. Front-of-package nutrition labeling - An abuse of trust by the food industry. N Engl J Med. 2011;364(25):2374-5.

45. Brownbill AL, Miller CL, Braunack-Mayer AJ. Industry use of 'better-for-you' features on labels of sugar-containing beverages. Public Health Nutr. 2018:Published online: 10 October 2018.

46. Imamura F, O'Connor L, Ye Z, Mursu J, Hayashino Y, Bhupathiraju SN, et al. Consumption of sugar sweetened beverages, artificially sweetened beverages, and fruit juice and incidence of type 2 diabetes: systematic review, meta-analysis, and estimation of population attributable fraction. BMJ. 2015;351:h3576.

47. Mandrioli D, Kearns CE, Bero LA. Relationship between research outcomes and risk of bias, study sponsorship, and author financial conflicts of interest in reviews of the effects of artificially sweetened beverages on weight outcomes: A Systematic Review of Reviews. PLoS One. 2016;11(9):e0162198.

48. Mantzari E, Vasiljevic M, Turney I, Pilling M, Marteau T. Impact of warning labels on sugar-sweetened beverages on parental selection: An online experimental study. Prev Med Rep. 2018;12:259-67.

49. Billich N, Blake MR, Backholer K, Cobcroft M, Li V, Peeters A. The effect of sugar-sweetened beverage front-of-pack labels on drink selection, health knowledge and awareness: An online randomised controlled trial. Appetite. 2018;128:233-41.

50. Obesity Policy Coalition. A comprehensive policy program to reduce consumption of sugar-sweetened beverages in Australia. Policy Brief 2018 [cited 2018 September]. Available from: http://www.opc.org.au/downloads/policy-briefs/reduce-sugary-drinks-in-australia.pdf.

Table 1: Group characteristics

	Mid-High SES (Mid-Ses)		Low SES		Participant characteristics[i]
Life Stage	Women (F)	Men (M)	Women	Men	
Young adult: 21-29 years, No children (YA)	Group 1 (G1) n=7	Group 2 (G2) n=7	Group 5 (G5) n=7	Group 6 (G6) n=6	n=27 Age range=20-30 years Mean Age (SD)=25.8 (2.7)
Parents: At least one child aged 12 years and under living at home (Par)	Group 3 (G3) n=7	Group 4 (G4) n=8	Group 7 (G7) n=8	Group 8 (G8) n=7	n=30 Age range=27-53 years Mean Age (SD)= 42.0 (8.0) Range in number of children living at home=1-3 Age range of children=3 weeks to 12 years Mean age of children (SD)=7.9 (3.3)

[i] Participant characteristics obtained from focus group discussions. Two participants did not volunteer their personal age during the group discussion, and one participant did not volunteer the age of their child(ren) during the group discussion.