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RESEARCH

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'Soft drinks are normal': understanding the lived experiences of Dutch teenagers with respect to sugar-sweetened beverages: a qualitative context-mapping study

Rian Pepping[1,2*], Wilma Waterlander[3], Barbara Groot[2], Sanne Kistemaker[4], Arnoud P. Verhoeff[1], Jacob C. Seidell[2] and Vincent Busch[1]

Abstract

Background Despite continuing efforts to reduce teenagers' consumption of sugar-sweetened beverages (SSBs), intake remains high across the globe. Currently, we lack a holistic understanding that also includes the lived experiences of teenagers in today's online and offline environments regarding the role of SSB's. The aim of the present paper is therefore twofold: (1) to gain a holistic understanding of teenagers' perspectives, beliefs, barriers, contextual triggers and latent needs (that is, their lived experiences) in relation to SSB consumption; and (2) to explore their views about which intervention strategies would be most likely to reduce their SSB consumption.

Methods A qualitative context-mapping approach, including prior sensitising assignments, was used to gain in-depth insights into the lived experiences with regard to SSB consumption of teenagers attending prevocational-level secondary school (VMBO) and living in low socioeconomic position neighbourhoods in Amsterdam, the Netherlands. From March to April 2021, 48 teenagers, aged 12 to 16, took part in the study. Due to COVID-19 restrictions, data were collected partly online and partly in person. All data were coded and analysed using thematic analysis.

Results Four main themes were identified that appeared to influence the teenage SSB consumption: (1) social norms – drinking SSBs is normal; (2) attitudes and beliefs with regard to health versus enjoyment; (3) the easy availability and affordability of SSBs; and (4) intense industry marketing efforts. We additionally explored teenage views about changes most likely to reduce their SSB consumption and found that they would be receptive to population-level interventions such as taxation.

Conclusions The study provides comprehensive insights into teenagers' lived experiences in relation to SSBs. It highlights the prominent roles of strong social norms, conflicting beliefs, and the pervasive marketing, easy availability and low prices of SSBs. This underlines the need for a systems approach, applying combinations of effective, integrated strategies that can be specifically tailored to the perspectives of today's teenagers.

Keywords Teenagers, Sugar-sweetened beverages, Lived experiences, Holistic, Beliefs

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Introduction

Sugar-sweetened beverages (SSBs) are important contributors to the development of overweight and obesity, type 2 diabetes, cardiovascular diseases and tooth decay [1–4]. Despite numerous intervention efforts, the consumption levels of SSBs – defined as regular soft drinks, fruit drinks, sports drinks and sugar-sweetened dairy drinks – remain high across populations [5, 6]. In the Netherlands, teenagers are a primary consumer group, averaging a consumption of 500 millilitres of SSBs per day, with consumption increasing with age throughout adolescence [7, 8]. The consumption is particularly high among adolescents with a low socioeconomic position (SEP), among whom the prevalence of overweight is also disproportionately elevated [8, 9]. Decades of research have found numerous factors to be associated with adolescent SSB consumption, such as extensive availability, intensive product marketing, and the price of SSBs [10–13]. However, it is likely that such factors do not operate in isolation, but are interconnected – and that they shape a complex system with specific system dynamics. A growing body of literature recognises this complexity and calls for a holistic understanding of such determinants and their resulting system dynamics. Integrating such holistic understandings has the potential to lead to the design of more effective preventative intervention strategies to reduce SSB consumption [14, 15]. However, enriching such understandings by examining how these factors and resulting system dynamics impact adolescents' lived experiences in daily practice would further add to future intervention programs be more fitting, implementable, and effective.

Without the integration of such lived experiences, strategies to address the obesogenic environment are less likely to be effective [16, 17]. Whole-of-population strategies currently being recommended include taxing SSBs, restricting the promotion and prominent positioning and/or banning online advertising [18]. While these measures have shown positive effects in the general population, they may profit from taking factors like social norms and peer pressure into account, particularly among teenagers. For example, while there is increasing advocacy to curtail or prohibit the marketing of unhealthy foods and drinks targeted at *children*, such efforts may need to be expanded to include *teenagers*, as they are an especially vulnerable group when it comes to the effects of marketing influences [19]. However, there are currently no studies from European countries that have explored the lived experiences of teenagers, their beliefs and their social norms, that allows for the improvement of current intervention efforts by taking the perspective of teenagers themselves into account. Therefore, the aim of the present paper is therefore twofold. First, to gain a holistic understanding of the beliefs, barriers, contextual triggers and latent needs (that is, their lived experiences) regarding the SSB consumption of prevocational-level secondary school teenagers living in low Socioeconomic Position (SEP) neighbourhoods in Amsterdam, the Netherlands. Secondly, we explore their views about which intervention strategies would be most likely to reduce their SSB consumption.

Method

Design

The research was initiated by the Amsterdam Healthy Weight Approach, a whole systems approach pursued by the City of Amsterdam since 2013 to address the complex local environmental influences on overweight and obesity in children and adolescents [20]. To understand teenagers' lived experiences with regard to the consumption of sugar-sweetened beverages (SSBs), we conducted a qualitative context-mapping study among adolescents aged 12 to 16. Context mapping, introduced by Sleeswijk Visser and colleagues (2005) and grounded in participatory design, is fundamentally based on the principle that 'users are the experts of their own experiences' [21]. The context-mapping method is specifically designed to gain a comprehensive understanding of the lived experiences of a target population by mapping the contextual factors, such as particular behaviours, and then unravelling their underlying, latent, needs and considerations. Individuals are often unaware of their actual needs and considerations, which are difficult to express verbally [21]. Hence, context-mapping, with its generative and participative techniques, is better suited to gathering information on people's latent needs and tacit knowledge than methods that focus primarily on health problems or that rely strongly on cognitive and conscious considerations regarding one's behaviour, such as surveys or focus groups [21]. We adopted an interpretivist approach to enable participants to express their tacit knowledge, latent needs, and considerations with regard to SSBs, and to explore how these meanings have shaped their experiences [22].

In this study, the context-mapping process was conducted in collaboration with Muzus, a design agency specialised in retrieving the lived experiences of target populations in relation to complex social issues [23]. The mapping process comprised three steps: (1) preparation and design; (2) sensitising assignments and context-mapping interviews; and (3) analysis and interpretation (see Procedure). Muzus designed the materials, recruited the participants and conducted the interviews.

Recruitment and participants

The inclusion criteria required participants to be: (1) 12 to 16 years of age; (2) attending a prevocational-level secondary school (VMBO); and (3) living in low Socio-economic Postion (SEP) Amsterdam neighbourhoods with a relatively high prevalence of overweight and high consumption of SSBs [9]. To achieve homogeneity, a purposive sampling strategy was used to recruit the required participants [24]. They were recruited from four secondary schools and one youth welfare centre in three appropriate neighbourhoods in Amsterdam.

Drawing on previous recruitment experiences with this target population [17], the recruitment process incorporated five strategies to encourage participation: (1) using recruitment materials that were specifically designed to appeal to teenagers (see Appendix 1); (2) enabling potential participants to register via WhatsApp, to offer a more informal approach to participation; (3) allowing paired interviews for participants who would feel more comfortable alongside a peer; (4) offering the option to participate online rather than at a physical location; and (5) providing monetary compensation of 15 euros per person for participating in both the sensitising assignments and the context-mapping interviews.

Consent

This study was approved by the Research Ethics Review Committee (BETCHIE) of the Faculty of Science of the Vrije Universiteit Amsterdam. All research participants were underage minors (12 to 16 years of age). Informed consent was therefore obtained from both teenagers and parents for the research use of the interviews and photos or videos created by the teenagers during sensitising assignments and interviews, and their publication. The consent form provided two options: permission for internal use only or for both internal and external use.

Procedure

Sensitising

' Sensitising' refers to the process of preparing the participants for an interview by making them more sensitive to or aware of certain experiences, emotions or needs [21]. In this procedure, participants' memories are primed through *self-reflective assignments* during the week preceding the context-mapping interviews. Such assignments provide participants with insights into their personal beliefs, needs and experiences, following three steps from the 'surface' to the 'deep level'. First, at surface level, participants provide insight into the activities they engage in. Second, participants attribute emotions and motivations to those activities. Finally, at the deepest level, participants reflect on their *latent* needs. As a result, engagement in discussions on these topics during the subsequent *context-mapping interview* will be at a deeper level of knowledge and needs, making these easier to talk about.

For our research, participants first received hard-copy sensitising assignments by post, including five *challenges* and eight *mini-challenges*. These assignments focused on each individual teenager and on the interaction between teenagers in pairs. Participants were asked to complete all five challenges, which included the following tasks: (1) My Day – participants created a timeline of a day, including both positive and negative moments; (2) Daily Drinks – participants took photos of the drinks they consumed on that day; (3) Friend Reporter – participants interviewed each other and discussed their perspectives on health; (4) Promo Video – participants created a marketing video about soft drinks and other drinks; (5) On the Road – participants identified on a map places that they frequently visit and specified what they like to purchase or consume at those places (see Fig. 1). The eight optional mini-challenges included tasks such as Parent Reporter, in which teenagers interviewed their parents about beverages at home, and Water Verdict, where they shared their thoughts on all types of water as beverages and discussed their water consumption. More details about all sensitising assignments are provided in Appendices 2 to 4. Sensitising assignments were first piloted among a small group of teenagers, and the materials were refined on the basis of their feedback.

Context-mapping interviews

The purpose of context-mapping interviews is to map the lived experiences of the target group members, the context and contextual factors, and to uncover their motivations and barriers in relation to a specific topic [21]. The sensitising assignments serve as the foundation of the context-mapping interviews. Throughout the interviews, we analysed teenagers' attitudes, motivations, barriers, dilemmas and influencers across various environments that may influence their decisions and beliefs with respect to SSBs. We distilled their perspectives and understandings, identifying factors that appear to shape their choices. Context-mapping interviews were conducted from March to April 2021, some of these online due to the COVID-19 restrictions at the time, and some in person at a youth welfare centre. As online and offline interviews may differ in context and conditions, they can influence how respondents answer. Incorporating both approaches enriches the research process by introducing variation in data collection methods and helps reduce bias stemming from the specific context of each interview format, such as differences in comfort levels or technical barriers in online settings [25]. With the exception of two

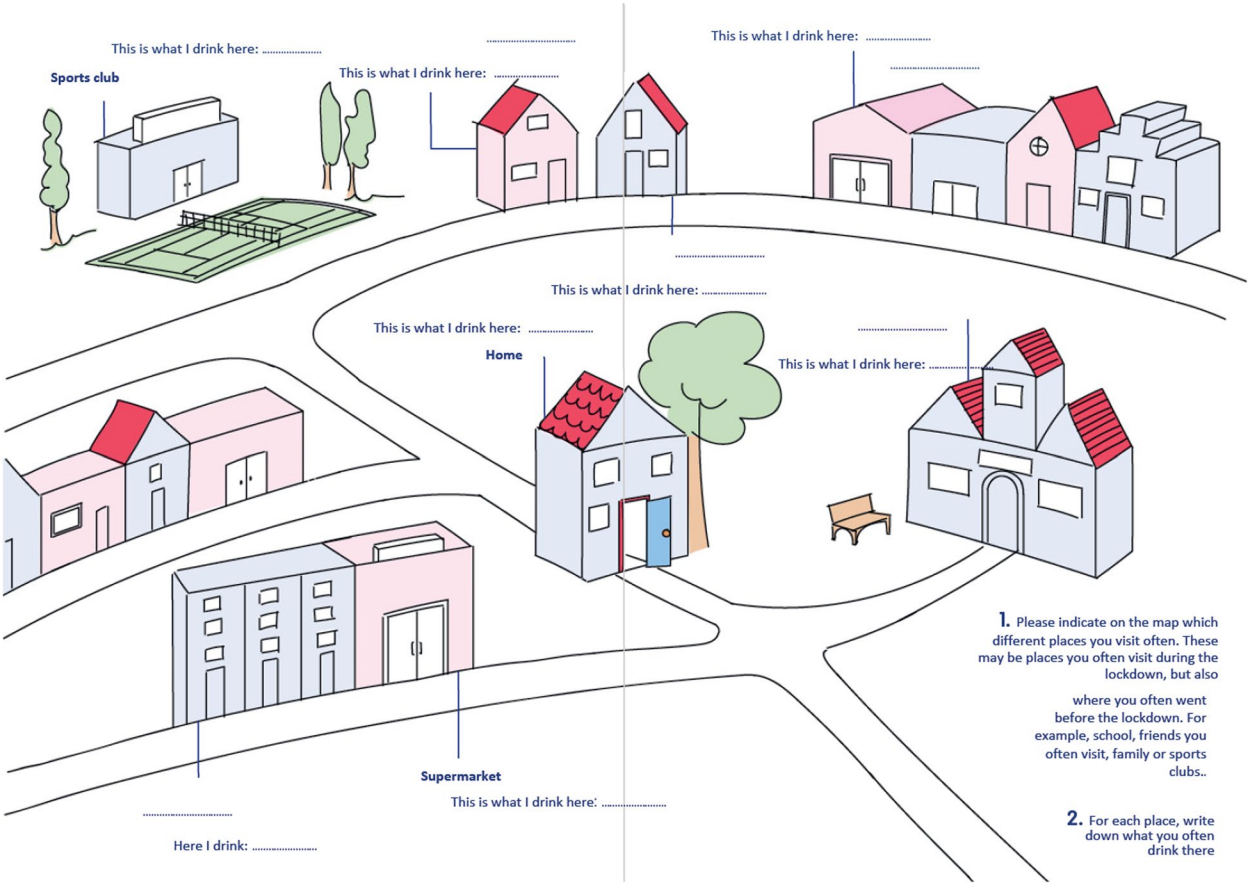

Fig. 1 On the Road assignment: participants marked locations they frequently visit on this map and specified what they like to purchase or consume at those places

interviews, all were conducted in pairs with a friend or in a small group of four to five teenagers. Each interview lasted approximately 60 min.

The semi-structured interview guide included questions based on previous research about SSB consumption and on the content of the sensitising assignments. Additionally, an online session was held beforehand with professionals that work closely with adolescents on a daily basis, which provided the interview guide with a different, yet unique and complementary take on teenage views and behaviours with regard to SSB consumption. Session participants included youth welfare coaches, a secondary school teacher, a soft drinks brand marketing specialist, a municipal lobbyist, a municipal policymaker and public health researchers. The professionals were asked what they would like to know from teenagers with regard to SSB consumption and for what purposes they might use that information. The outcome of that session helped us to refine the interview guide, including the addition of a specific question exploring teenagers' views on policy changes they would make that would most likely *reduce* teenage SSB consumption if they could assume the role of national prime minister. Prior to the interviews, two pilot interviews with teenagers were conducted to test face validity, the comprehensibility of the interview questions, and the interviewees' interpretations of the questions. Online interviews were conducted using Microsoft Teams or Zoom software and were recorded. Interviews at the youth welfare centre were not recorded, due to the setting and the lack of consent from all participants for recording the interviews. Consequently, notes were taken and all photos were anonymised.

Data analysis

Interviews were transcribed verbatim. The young participants' videos and photos were analysed using an observational logbook, focusing on non-verbal communication, emotions, environment and external influences (for example, help from parents in recording the video). All transcripts, observational logbooks and notes were imported into Miro online whiteboard software. To identify and fully understand the meaning of the data, we

used thematic analysis as described by Virginia Braun and Victoria Clarke [26]. In order to identify themes within the data, we performed the six steps of thematic analysis using an inductive approach [26, 27]: (1) reading notes and transcripts to become familiar with the data, (2) generating initial codes, (3) grouping codes into potential overarching themes, (4) evaluating the themes, (5) specifying and describing the themes, and (6) reporting data.

The interviews were carried out by Muzus researchers SK and KV, who did not have backgrounds in the health domain. Steps one to four of the thematic analysis were then performed first by SK and KV and then repeated by RP, with a background in health sciences, in collaboration with the research team and Muzus' researchers. All researchers approached the data analysis from their own perspective. The resulting discussions generated dialogue about the meaning and implications of the patterns identified. Differences in codings and themes were discussed in the research team and were refined as needed, before proceeding to steps 5 and 6. Major themes and contexts are illustrated and linked to direct quotations from participants taken from assignments and interviews. The subheaders are paraphrased quotations from participants.

Results

A total of 48 participants with diverse cultural backgrounds, aged 12 to 16, were interviewed (36 girls and 12 boys). Sixteen participants had completed all five challenges from the sensitising assignments prior to their interview, and some had supplemented these with a few mini-challenges. Others completed some assignments during their interview. Since data collection took place during a period of varying Dutch COVID-19 restrictions, most participants participated online ($n=29$), while others took part at a youth welfare centre ($n=19$). From the collected data, we identified four overarching themes: (1) social norms –drinking SSBs is normal; (2) attitudes and beliefs with regard to health versus enjoyment; (3) the easy availability and affordability of SSBs; and (4) intense industry marketing efforts. Additionally, the 'prime minister question' prompted various intervention suggestions from participants, focusing mostly on price, availability and health education.

Social norms – drinking SSBs is normal

Participants' beliefs about the 'purposes' of specific beverages became apparent from the sensitising assignments Daily Drinks and On the Road – for example, water is for quenching thirst, while soft drinks are tasty and enjoyable. In addition, nearly all participants believed that consuming SSBs is normal, often referring to soft drinks as 'just normal'. This strong social norm became apparent both in sensitising assignments and in interviews, and it appeared to be fostered in particular by family and peers.

Drinking soft drinks is 'part of our household routine'

The presence of SSBs at home was common to most participants. They reported that SSB consumption was stimulated directly by family customs of always having SSBs on the table during meals. It was also indirectly encouraged by the large quantities always in stock, and, in some families, consumption was not restricted by rules or other means. Influenced implicitly by such social eating norms and family role modelling, participants very often perceived drinking SSBs as completely normal, and for some it was normal a habit.

> *Mum, why do we have cola at home so often? (Mother) Umm, because we like cola? And because I've drunk it so much that I think, 'If you eat this or that, you just have to have a Coke with it.' (Girl, age 15, Parent Reporter).*
> *I don't really think about it any more [cola]. Because it's kind of just in my system. My dad is such a big fan of cola. I can't say to my dad, 'Um, sorry, Dad, I don't drink cola any more.'(Girl, age 15).*

Participants were asked whether there were any rules at home to restrict their SSB consumption. More than half were allowed to decide for themselves about the frequency and quantity of SSBs they consumed. The rest reported that they did have such rules at home. Generally these varied from being allowed only a limited amount of SSBs per day, to needing parental permission before having a soft drink, to being allowed SSBs only at weekends. For such families, SSBs were generally seen as a treat, something unique and for special occasions. However, we also observed some inconsistencies as to these rules. For example, two teens were allowed to buy only a certain brand, because it was believed to be 'better for their health' than other soft drinks, despite its equally high sugar content. Additionally, some reported that although restrictive rules did exist at home, SSBs were readily available there and their parents often consumed soft drinks themselves. Some participants also mentioned that the behaviour of other relatives, such as grandparents, aunts, uncles or siblings, influenced their consumption of SSBs.

> *My new favourite drink is Lipton® Peach. I never liked it, and then my uncle said, 'Try it', and I liked it. Now I'm kind of addicted. … My little brother and sister like it too. Suddenly everyone likes it. (Girl, age 12).*

With soft drinks, 'I fit in'

In the sensitising assignment On the Road, many participants indicated that water, tea and fruit syrup drinks were their primary beverage choices to purchase or consume at locations they frequently visit, including supermarkets. However, in the Daily Drinks assignment – where they took pictures of the drinks they had actually consumed – and during the context-mapping interview, they reported SSBs to be their default beverage option. Almost all participating teenagers considered consuming SSBs to be 'normal' and part of everyday life, especially when socialising among friends. Befriended participants doing the sensitising assignment Promo Video often mentioned preferences for the same beverage. Participants attributed great importance to 'fitting in' and adhering to group social eating norms, which prompted them to make these particular purchases. For most participants, a group social eating norm of using sweet drinks to complement the food they bought during school breaks had become common practice and had turned into a habit.

> *Soft drinks just go with food. You're not going to eat a hot chicken sandwich with water, are you? Fanta® just goes with that. (Boy, age 16).*

> *My friends would laugh at me if I suddenly bought water. (Girl, age 16).*

Attitudes and beliefs with regard to health versus enjoyment

'Soft drinks aren't really good for your health, but I don't notice it, and I do enjoy them'

During the interviews, most teenagers indicated they were aware of the amount of sugar present in most SSBs and of the related health consequences. In the Friend Reporter assignment, participants described being healthy in terms of not being ill, not being overweight, engaging in sports, limiting screen time and eating healthy food. Most teenagers also emphasised the importance of being healthy and were generally well aware of what constitutes healthy behaviour. Many explained that water consumption and restricting SSB consumption are 'good for your health'. Most could accurately estimate the amount of sugar in a particular soft drink, because most had been involved in Amsterdam's widely implemented primary school health promotion programme Jump-In [28]. They could easily elaborate on key health consequences of consuming SSBs, such as an increased risk of overweight or diabetes. Moreover, while doing the Rank the Drinks sensitising assignment, most participants effortlessly ranked their beverages in order of sugar content, as shown in Fig. 2.

At the same time, when reflecting on their own actual behaviour, all participating teenagers said they still chose to consume SSBs regardless of those consequences, simply because they enjoyed the 'good taste'. Only a few participants intentionally chose sugar-free beverages to reduce their sugar intake, as one boy explained, that regular sodas were 'not worth the calories'. Many participants, both boys and girls, stated that only personal-appearance-related consequences would prompt them to stop drinking SSBs. However, since they now did not perceive any observable appearance consequences, they all continued consuming the drinks. A boy mentioned decaying teeth, while a girl said she would reconsider her soft drinks consumption if she were to experience skin issues. Some participants considered water no alternative for SSBs, viewing it primarily as a source of hydration, but otherwise as 'boring and lacking satisfaction and taste'.

Fig. 2 Rank the Drinks in the sensitising assignment during an online interview, with drinks placed in order of sugar content from high to low

We all know it's not healthy, and we still drink them. (Boy, age 16).

'I know my drink contains a lot of sugar, but it's not as bad as some other drinks'

Several teenagers whose knowledge and attitude or beliefs about the unhealthiness of SSBs conflicted with their behaviours still justified their consumption of SSBs. They claimed their preferred soft drink was not as unhealthy as many alternatives, and therefore considered it a relatively healthy choice in terms of sugar content, despite the conflict with health education messages. To illustrate, some participants categorised soft drinks into two groups: 'very unhealthy soft drinks' and 'somewhat unhealthy soft drinks', based on the number of sugar cubes in their drink. Ice Tea, Dubbel Fris®, apple juice, fruit syrup drinks, Sprite® and sweetened dairy beverages were mentioned as healthier alternatives to soft drinks such as cola, Fanta®, Fernandes® and sports drinks.

I like Arizona® and I do think it's healthier than cola. There's a lot of sugar in it but not as much as in cola. (Girl, age 12)
Ice Tea is not such a bad drink, I think. It has sugar in it, but not that much. (Boy, age 15)

Some parents experienced a similar internal conflict, which led them to justify their household rules or choices concerning SSBs. For example, in the teenagers' Parent Reporter assignment, a mother assented that SSBs were not healthy but were still always stocked in the household. She mentioned that they drink 'only two glasses of soft drink during dinner', comparing that to 'other people' who consume a lot more. Other parents justified their consumption by pointing to their limited variety of drinks, for example 'only cola', in comparison to 'other households' with a wider range of soft drinks.

(Mother) Because we don't use other soft drinks, other juices or soft drinks.... If we buy something, it's cola. We really don't drink many soft drinks. (Girl, age 15, Parent Reporter).

The easy availability and affordability of SSBs

'Soft drinks are everywhere I go'

Participating teenagers observed that SSBs are always around and readily available everywhere they go – at home, at social gatherings with family and friends, in vending machines and the school cafeteria, and in supermarkets. Two participants mentioned in their On the Road assignment that water was their go-to drink when playing football, but they also highlighted the presence of convenience stores near their football pitches or playgrounds, enabling quick purchases of soft drinks. Interviewed girls in particular reported that they often 'quickly grab' soft drinks or bubble tea when shopping or hanging out at the mall with their peers. One boy reported that he was allowed to freely choose SSBs during breaks on the job.

I'm allowed to take it for free at Domino's [while working there]. (Boy, age 16).

Yeah, we have a supermarket [near school], we have a vending machine, we have a cafeteria. We have everything. (Boy, age 13).

'Soft drinks are cheap and provide me value for money'

Another commonly mentioned factor influencing teenagers' SSB choice was the price. Most participants did not have part-time jobs and were financially dependent on pocket money from their parents. Nearly all the teenagers could accurately recall the price of their favourite beverage, and many considered it cheap. The school canteen and vending machines were considered too expensive, so teens often bought their beverages at a supermarket close to school. According to several participants, they seek 'value for money', meaning that in spending their scarce money, they wanted to buy something tasty rather than 'boring' water. According to two respondents, the fact that SSBs cost money, unlike free tap water, made the drinks more special. Supermarkets offered more benefits – like the option of buying home-brand drinks much cheaper than premium brands – as well as attractive discounts that also persuaded some teens to buy soft drinks. Some were aware that supermarkets offer such discounts to increase profits, considering it normal for supermarkets to profit from the products. One girl even held that supermarkets also 'need to sell soft drinks'.

At school there's also a soft drinks vending machine with Pepsi®, Fanta® and water. I prefer to go to the supermarket because at school it's really expensive. A can of Pepsi® at school is €1.60 and at the supermarket something like €1.10. (Boy, age 15).
Stores also need to sell soft drinks. Supermarkets need to make a profit and often that's through the soft drinks young people buy. (Girl, age 14).
Cola feels more special than water because you buy it in the supermarket. (Boy, age 16).

Intense industry marketing efforts

'Online ads are annoying, but I like trying new drinks'

Respondents reported they were often exposed to advertisements from well-known SSB brands on platforms like TikTok and Snapchat. Most found online SSB advertising to be a normal part of social media. Many found the adverts annoying, but most believed their behavioural

choices were not affected by them. Nevertheless, almost all participants pointed to specific premium brands as their favourite drinks, rather than home-brand alternatives. Additionally, during the Promo Video assignment, all teenagers referred to specific brands rather than generic types of soft drinks like iced tea or cola. Furthermore, some reported that trying out new SSBs with friends is a regular social activity inspired by posts on social media. Inspiration for which new drink to try next derived mostly from posts by friends. If they encountered such a recommended new drink in a supermarket or vending machine, they 'just had to try it'. Only some respondents were aware of the influence of advertising on teenagers; others viewed it solely as a marketing tool aimed at making profits.

Yes, imagine you arrive at the store. Then you see the new drink [from TikTok]. You have to try it at some point to see if it tastes good – you see what I mean? We call that 'chancing it'. (Boy, age 16).

If someone sends something via Snap[chat] like 'OMG, you really need to try this', then I'm just curious and I'll do it. (Girl, age 15).

Teenagers' proposed strategies to reduce SSB consumption

Towards the end of the interview, all participants were asked: 'If you were prime minister of the country, what would you do to reduce soft drink consumption by teenagers?'.

'Make soft drinks more expensive and healthy drinks cheaper'

The price of SSBs was by far the most frequently cited factor as a possible solution towards reducing teenage SSB consumption. Respondents emphasised that soft drinks are currently very cheap, with some cans priced at only 50 cents. Most respondents believed that a substantial price increase (up to 4 euros) would be needed to deter them from buying SSBs. Some participants also suggested there should be more interesting, healthy alternatives that would diminish their desire to consume SSBs. A few participants added that the prices of healthy drinks should be lowered.

Same tax on soft drinks as on cigarettes. (Boy, age 15).

I would make soft drinks more expensive and make healthy things cheaper. Water maybe 10 cents and Red Bull® 4 euros or so. (Girl, age 16).

'Provide health education and restrict sale of soft drinks'

Participants believed that health education could be an appropriate intervention to reduce SSB consumption. At the same time, they highlighted the inconsistency between such educational content and actual practice at school. In other words, they found it a bizarre, conflicting message to be taught in class how bad SSBs are for their health, while the same school tries to sell them those very SSBs after that class. They felt that health education ought to be complemented by a ban on SSBs at school. Some respondents felt the same applied to other public places they visited, such as swimming pools. Another proposed solution to reduce SSB consumption was to install more water fountains in school and playgrounds. However, that 'solution' encountered some doubt as to its effectiveness; one girl argued that water fountains are only useful if there are no SSBs nearby.

I learned [the Dutch healthy eating programme] in school. At school there are lot of overweight people, and there are quite a lot of unhealthy things on offer there. And then I think, 'Why do you bother trying to help us with the "healthy eating programme"?' (Girl, age 14).

The school puts up soft drink vending machines. They should take them down. (Boy, age 12).

Discussion

This study aimed to provide a holistic understanding of the lived experiences of Dutch teenagers, living in Amsterdam in relatively low SEP neighbourhoods and attending a prevocational-level secondary school, regarding the consumption of sugar-sweetened beverages (SSBs). The findings revealed that consuming SSBs is completely normal among these selected groups of teenagers. Four main themes appeared to account for this finding: (1) social norms – drinking SSBs is normal; (2) attitudes and beliefs with regard to health versus enjoyment; (3) the easy availability and affordability of SSBs; and (4) intense industry marketing efforts. We additionally explored teenage views about changes most likely to reduce their SSB consumption and found that they would be receptive to population-level interventions such as taxation. Overall, the four themes help to explain the tenacious belief that drinking SSBs is normal. Our study demonstrates that personal and social determinants, such as attitudes and automatic behaviours, are important factors influencing teenage SSB consumption. However, environmental factors such as intensive marketing, price and the widespread, constant availability of SSBs seem to reinforce those personal and social determinants.

Focusing now on the first theme of social norms, we found that it encompasses influences from both parents and peers. Previous evidence has shown that the very presence of SSBs in homes is linked to higher consumption of those beverages [29–31]. Our study offers a more detailed, richer image of teenagers' SSB consumption in their daily lives, providing insights into the interplay of factors within the home environment. This includes a deeper understanding of the mutual influencing and reinforcement mechanisms at play – for example, availability of SSBs at home, consumption rules (or lack thereof) and family habits. Many parents considered it normal to consume SSBs with family meals, stemming from strong underlying beliefs. These beliefs seem mainly reinforced by long-standing family customs that fostered positive attitudes and automatic behaviours in children with respect to soft drinks. An explanation for this can potentially be found in Bandura's Social Learning Theory [32], which posits that adolescent behavior is influenced by attention, motivation, observation, and reproduction of behaviors seen from models such as parents or peers. It highlights the strong influence of the home environment and parent modelling which was also found in other studies [7, 29]; i.e. if parents were high consumers of SSBs, had high SSB availability at home and held positive attitudes towards SSBs, their adolescents consumed more SSBs [29]. Moreover, in this study, we found that teenagers are aware of the health risks but prioritize following the norms established at home. Similarly, previous research has shown that adolescent SSB intake is associated with parent intake rather than knowledge of potential health risks [33]. This further underscores the complex interplay between established family habits and teenagers' consumption patterns.

While the home environment influences teenagers' perceptions of SSBs, the impact of peer norms appears even more significant during adolescence [34]. Their stage of life [35]—characterized by a desire for autonomy, weaker impulse control, and a growing reliance on peer approval—might make adolescents more likely to consume SSBs. Many teenagers in our study associated drinking SSBs with a sense of 'fitting in' among peers. They considered it an integral part of social (online) interactions, and hence a vital component of friendships. Such patterns have also found in social eating norms, where shared meals play a significant role in building and reinforcing friendships [36], and where social judgments may depend on whether or not a norm is followed; that makes social eating norms powerful and hard to alter [37]. Hence, SSBs currently confer social status upon teens, and this points to the need for SSB reduction strategies to address core beliefs about SSBs.

Our second theme concerns the attitudes and beliefs that became apparent from the assignment On the Road in comparison with the teenagers' interview responses. Whereas, in the assignment, teens had predominantly identified water as their preferred beverage, the interviews revealed that SSBs were favoured after all. A possible explanation for such inconsistency could lie in beliefs conflicting with their behaviour—in understanding the potential health consequences of consuming SSBs as opposed to personal preferences, short-term benefits and social eating norms (among both peers and family members). This phenomenon of cognitive dissonance was also observed in recent focus group study that examined adolescents' perspectives on soft drinks [38]. Adolescents were found to devise categories that portrayed their own beverages as being 'less bad' than other 'really bad' beverages. Also in line with our study, Jones reported that most adolescents had sufficient knowledge of SSBs and the potential health consequences, but that such knowledge did not influence their behaviour, as adolescents continued to favour soft drinks. This demonstrates that teens do comprehend the health education provided. However, in our current food environment, SSBs remain readily accessible and well marketed in places where teenagers live, go to school, work and play. We would argue that such continuous exposure to SSBs has influence on their beliefs and attitudes, and that this ultimately fosters the formation of personal habits and powerful social norms.

In relation to SSB availability and the impact of online SSB advertising – our third and fourth themes – our findings were consistent with existing evidence that unhealthy food marketing exerts significant influence on teenagers, shaping social norms related to food and eating and fuelling their preference for ultra-processed foods [39]. The results of our study show how both teenage preferences and social norms are influenced by the constant availability, discount prices and other forms of (online) marketing of SSBs. Junk food companies strategically target young people early to build lifelong brand loyalty, exploiting adolescents' still-developing cognitive abilities, which leave them less equipped to resist the influence of such marketing [40, 41]. While teenagers in our study indicate that their behavioural choices are not influenced by online advertisements, the prevalence of online advertisements likely reinforces the robust normative beliefs about SSBs identified in our study. Indeed, a recent systemic review and meta-analysis by Packer and colleagues (2022) has shown that although adolescents can recognise that an advertisement aims to sell a product, they may not discern its further intention of altering their attitudes and behaviours. Nor did such an awareness of advertising, or even the inclusion of sponsorship disclosures, as on Instagram, serve to protect adolescents

from the influence of advertising [19]. Moreover, supporting our findings, Murphy et al. (2020) found that adolescents paid more attention to food and beverage posts from peers on social media than to those from celebrities or companies [42]. Other research indicates that adolescents utilize branded social media to experiment with new identities and share these explorations with their peer network [43]. The food industry capitalizes on this by marketing products in ways that evoke feelings of togetherness, joy, and particular lifestyle, as exemplified by slogans such as 'Fanta, welcome to the real fun' [44]. This underlines the need to restrict the marketing of unhealthy products to children, as repeatedly advocated by the WHO and UNICEF [39, 45]. Moreover, the age limits in such restrictions should be raised to also protect teenagers during their vulnerable developmental stages [19, 40].

Teenagers' proposed solutions for reducing their SSB consumption

Teenagers in our study argued that current efforts to reduce SSB consumption, like health education, are insufficient to impact their behaviour, and that interventions targeting price and availability should be combined with such efforts. This concurs with literature showing that education can have modest effects on SSB consumption only when SSBs are also completely removed from school [11, 46, 47]. However, most teens in our study bought their beverages in supermarkets close to school; therefore we would suggest implementing rules on the sale of SSBs within a specified radius surrounding schools. Regarding price, teenagers believed that it should be at least tripled in one go before they would stop buying SSBs. Significant evidence for health benefits through a price increase via a 'sugar tax' continues to accumulate [48–50]. UK adolescents have also been found to favor population-level interventions, like the teenagers in our study, such as price measures via a sugar tax [38]. However, to date, population-level interventions have not been fully utilized to their potential.

Based on our findings relating to the strong formation of social norms, reinforced by the four identified themes in this study, we argue that no single intervention alone can solve the complex problem of SSB consumption. While there is evidence to suggest that environmental interventions have considerable potential to reduce SSB consumption [11], such interventions – including marketing bans or sugar taxes – are currently hardly applied to their fullest possible extent [50]. Moreover, for truly developing effective preventative strategies, these interventions should be combined in complex adaptive system approaches, as argued in the most recent report of the World Health Organization [51], which concluded that there is no silver bullet to reduce SSB consumption. Therefore the WHO advocates for more interventions in a broader systemic approach [51], whereby core system goals and beliefs will also be targeted for change [52]. So far, efforts have focused mostly on the levels of *events* (such as education at school about SSBs), *structures* (such as sugar taxes or bans on SSB marketing) or *goals* (such as reduced sugar content in products) [52]. However, efforts like these often encounter resistance, precisely because they *contradict the beliefs of the system.* This central conviction – that drinking SSBs is normal – is strengthened by various factors such as marketing, cultural integration, and convenience-driven consumption habits, which have evolved over decades and can be observed globally [39, 53]. It is therefore crucial to approach the formulation of strategies to reduce SSB consumption from a systemic perspective, which will enable a broader overview and a deeper understanding of the larger context, including a focus on the deeply ingrained beliefs that resist change [51]. Such a systems approach, which addresses entrenched beliefs and shifts away from placing responsibility solely on individuals, is also applied in areas like alcohol [54] and tobacco control [55], where strong system dynamics operate across multiple levels. Actions in these domains target various system levels, including lobbying, taxation, and marketing, to effectively drive change and challenge deeply rooted social norms. Also with regards to obesity prevention such systems approaches have recently been designed, implemented and evaluated [56, 57]. Therefore, altering a deeply rooted universal social norm surrounding SSBs is complex, and approaches must be comprised of multiple aspects – also addressing issues such as the integration of SSBs into our culture, online and offline marketing, or the acceptance of profiting from health-harmful products. Also, to date, suggestions from teenagers have not been adequately put to work, despite evidence that the effectiveness of interventions is enhanced when they are aligned with the target group's lived experiences [16, 58]. This insight warrants greater attention. Therefore, to reduce teenagers' consumption of SSBs, it is essential to gain deeper insights into adolescents by collecting additional data and exploring different contexts, while also understanding the dynamics of the system itself. As demonstrated in the whole systems approaches used in local contexts in England [57], both the target population and system dynamics must be thoroughly mapped out before implementing actions that can lead to meaningful change. We therefore recommend that future research to develop policies for reducing adolescent SSB consumption should adopt an adaptive systems approach – incorporating the lived experiences of teenagers in order to identify effective ways to intervene in this complex

system. Ideally, such systems approaches will integrate policy measures with a focus on price, product promotion, product availability, product formulation alongside targeting socio-cognitive determinants and other personal behavioral determinants targeting teenagers, their families and other social environment [18, 39, 50, 59, 60].

Strengths and limitations

The key strength of this research is the qualitative context-mapping approach. Through the use of creative sensitising assignments to prepare respondents beforehand for the context-mapping interviews, the interviewers were able to uncover teenagers' lived experiences with respect to issues such as a powerful social norm and their conflicting beliefs and needs concerning SSB consumption. We went to great lengths to obtain the teenage perspectives, with an emphasis on thick descriptions and emic perspectives as quality criteria [25]. Teenagers reported having enjoyed the sensitising assignments, and this was also reflected in the videos they created. Interviews held online provided an even deeper glimpse into the teenagers' lives, as most of these were situated in their own rooms, enabling us to observe phenomena like an extensive collection of soft drink cans displayed in a bedroom. Additionally, an advantage of the online format is that the recordings could be rewatched. There are, however, some limitations to this study. Due to COVID-19 measures, over half of the interviews were conducted online, possibly making them less suitable for identifying non-verbal communication. Furthermore, the way the assignments were executed—whether in person or online—could have led to different dynamics in the interviews, which may have influenced the findings, for example because non-verbal cues may have been missed (or interpreted differently) during the online interviews, potentially leading to differences in the interpretation of nuances and subtle contextual information. We also acknowledge that our purposive sampling strategy, which aimed to ensure to especially include teenagers from disadvantaged neighbourhoods, due to their generally higher SSB consumption, could potentially limit the generalizability of our findings to the general population of Dutch teenagers. Therefore, future studies should further explore variations in lived experiences of teenagers with regards to SSB consumption from across a wider range of different socio-economic and cultural contexts. Similarly, the overrepresentation of girls in our study sample could have led to different findings than were the sample more well-balanced, yet in what way and to what extent is impossible to say. We as researchers, did not noticed any differences between what boys generally stated versus what girls did. Moreover, the lockdown influenced the participants' daily routines and possibly also their SSB consumption. For example, respondents would mention that they used to go to Dunkin' Donuts or McDonalds for food and drinks, but that such retail outlets were closed due to full or partial lockdowns. Therefore, our findings about teenage perspectives on sales locations may be narrower than they would be under usual circumstances. Correspondingly, the home context might have exerted an even greater influence on teenage SSB consumption than otherwise.

Conclusion

This study offers comprehensive insights into teenagers' lived experiences in relation to sugar-sweetened beverages (SSBs). It highlights the prominent roles of social norms and conflicting beliefs, as well as of the pervasive marketing, easy availability and low price of SSBs. This holistic view of teenagers' SSB consumption from their own perspectives should enrich the current evidence in the literature by providing insights into the part that SSBs actually play in their daily lives. Furthermore, the results again expose the belief that drinking SSBs is normal, a deeply rooted social norm reinforced by the four identified themes in this study. A systems approach can help address these ingrained beliefs that resist change, enabling the implementation of more effective, integrated strategies tailored to the perspectives of today's teenagers. The findings underscore the importance for future research to gain a deeper understanding of adolescents' SSB consumption through additional data collection and exploration of different contexts, as well as understanding the dynamics of the system itself, to develop a systems approach that effectively tackles SSB consumption.

Abbreviations

SSBs	Sugar-sweetened beverages
SEP	Socioeconomic Position
WHO	World Health Organization

Supplementary Information

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Additional file 1: Appendix 1: Recruitment materials

Additional file 2: Appendix 2: Sensitising assignments, challenge card

Additional file 3: Appendix 3: Sensitising assignments, challenge number 1, 3, 5

Additional file 4: Appendix 4: Sensitising assignments, challenge number 2, 4

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Authors' contributions
Author contribution RP co-conceptualised the study, analysed and interpreted the data and led the writing of this manuscript. WW assisted with data analysis and interpretation and critically reviewed and edited the manuscript. SK co-conceptualised the study, collected data, analysed and interpreted the data, and critically reviewed and edited the manuscript. BG assisted with data analysis and interpretation and critically reviewed the manuscript. AV and JS critically reviewed and edited the manuscript. VB co-conceptualised the study, analysed and interpreted the data, and critically reviewed and edited the manuscript. All authors approved the final manuscript.

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Data availability
The datasets generated and/or analysed during the current study are not publicly available due to privacy regulations, but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Research Ethics Review Committee (BETCHIE) of the Faculty of Science at the Vrije Universiteit Amsterdam. Consent number 23–021. All research participants were underage minors (12 to 16 years of age). Written informed consent was therefore obtained from both teenagers and parents for the research use of the interviews and photos or videos created by the teenagers during sensitising assignments and interviews. Participants were informed about the purpose of the study, their right to withdraw at any time without consequence, and how their data would be used and protected. The consent form provided two options: permission for internal use only or for both internal and external use.

Consent for publication
Written informed consent for the publication of clinical details and/or clinical images was obtained from the parents or legal guardians of all participants. This consent included permission for the publication of materials such as interviews, photos, and videos created by the participants during the study.

Competing interests
The authors declare no competing interests.

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