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Perceived impact of smaller compared with larger-sized bottles of sugar-sweetened beverages on consumption: A qualitative analysis

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ABSTRACT

Sugar-sweetened beverage (SSB) consumption increases obesity risk and is linked to adverse health consequences. Large packages increase food consumption, but most evidence comes from studies comparing larger with standard packages, resulting in uncertainty regarding the impact of smaller packages. There is also little research on beverages. This qualitative study explores the experiences of consuming cola from smaller compared with larger bottles, to inform intervention strategies.

Sixteen households in Cambridge, England, participating in a feasibility study assessing the impact of bottle size on in-home SSB consumption, received a set amount of cola each week for four weeks in one of four bottle sizes: 1500 ml, 1000 ml, 500 ml, or 250 ml, in random order. At the study end, household representatives were interviewed about their experiences of using each bottle, including perceptions of i) consumption level; ii) consumption-related behaviours; and iii) factors affecting consumption. Interviews were semi-structured and data analysed using the Framework approach. The present analysis focuses specifically on experiences relating to use of the smaller bottles.

The smallest bottles were described as increasing drinking frequency and encouraging consumption of numerous bottles in succession. Factors described as facilitating their consumption were: i) convenience and portability; ii) greater numbers of bottles available, which hindered consumption monitoring and control; iii) perceived insufficient quantity per bottle; and iv) positive attitudes. In a minority of cases the smallest bottles were perceived to have reduced consumption, but this was related to practical issues with the bottles that resulted in dislike.

The perception of greater consumption and qualitative reports of drinking habits associated with the smallest bottles raise the possibility that the 'portion size effect' has a lower threshold, beyond which smaller portions and packages may increase consumption. This reinforces the need for empirical evidence to assess the in-home impact of smaller bottles on SSB consumption.

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1. Introduction

Excess intake of free sugars (i.e. all mono- and disaccharides added to foods by the manufacturer, cook or consumer, plus sugars naturally present in honey, syrup and fruit juices (WHO, 2002)) contributes to the development of non-communicable and dental diseases (Sheiham & James, 2014; Te Morenga, Mallard, & Mann,

2013). Such concerns have led the World Health Organization (WHO) to advise limiting their consumption to less than 10% of total daily energy intake, with reductions below 5% highlighted as having additional health benefits (WHO, 2014) (WHO, 2014). In the UK, the Scientific Advisory Committee on Nutrition has also recommended population intake does not exceed 5% of total energy intake (SACN, 2015). Consumption, however, among both adults and children of developed countries, including the UK, exceeds recommendations (Azaïs-Braesco, Sluik, Maillot, Kok, & Moreno, 2017). The latest data from the National Diet and Nutrition Survey show that in the UK, free sugars contribute on average around 12% of energy intake (12.2% in preschool children, 13.4% in 4–10 year-olds, 15.2% in 11–18 year-olds, 12.3% in adults aged 19–64 years

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and 11.1% in older adults aged 65 years and over) (Public Health England, 2016).

One of larger sources of free sugars in the diet is sugar-sweetened beverages (SSBs) (Azaïs-Braesco et al., 2017; Guthrie & Morton, 2000). SSBs are consumed widely around the world (Singh et al., 2015), including in the UK and USA. In the UK, they contribute approximately 15% of free sugar intake in adults, 16% in children of all ages and as high as 26% in children aged 11–18 years (Public Health England, 2016). A 500 ml bottle of SSB typically contains approximately 55 g (i.e. 13 teaspoons) of sugar and provides approximately 200 calories. SSB consumption increases total daily energy intake (Ng, Ni Mhurchu, Jebb, & Popkin, 2012; Reedy & Krebs-Smith, 2010; Wang, Bleich, & Gortmaker, 2008) and has been linked to weight gain and the development of obesity (Hu & Malik, 2010; Malik, Popkin, Bray, Després, & Hu, 2010; Malik, Schulze, & Hu, 2006), metabolic syndrome and diabetes (Hu & Malik, 2010; Malik, Popkin, Bray, Després, & Hu, 2010; Malik, Popkin, Bray, Després, Willett, et al., 2010) hypertension (Cohen, Curhan, & Forman, 2012), dental diseases (Mishra & Mishra, 2011) and other adverse health consequences. SSB intake may also contribute to observed inequalities in health, given greater consumption amongst the most deprived households (Han & Powell, 2013; Kantar Worldpanel, 2010; Lobstein, 2014; Pabayo, Spence, Cutumisu, Casey, & Storey, 2012).

Given the contribution of free sugars, especially from SSBs, to the rise in chronic disease, curbing their intake has been identified as a priority for public health action (Scientific Advisory Committee on Nutrition, 2014; WHO, 2014). Reducing the size of containers in which SSBs are available is one possible intervention. In the USA, a recent attempt to regulate the size of products in order to reduce their consumption comprised a ban on the sale of sugary drinks larger than 16 oz (473 ml) in many out-of-home settings (Hsiao & Wang, 2013). Although the proposal was rejected, simulation studies suggest that such a restriction could have favourable effects on consumption (Elbel, Cantor, & Mijanovich, 2012; Wang & Vine, 2013). In England, there are examples of companies reducing the sugar content and/or portion sizes of sugary drinks as part of their voluntary pledges under the government's Public Health Responsibility Deal (<https://responsibilitydeal.dh.gov.uk/about/>) but the impact of such initiatives on consumption have yet to be systematically evaluated. A recent Cochrane systematic review found that exposure to large portions and packages increases the consumption of food and non-alcoholic drinks (Hollands et al., 2015), a phenomenon termed the 'portion size effect'. This finding implies that smaller packages, including smaller-sized bottles of SSB, could help reduce consumption. The evidence for this effect, however, is based mostly on studies targeting food products and on comparisons between larger and standard packages, rather than smaller and standard packages, resulting in uncertainty regarding the generalisability of findings to beverage consumption and the impact of smaller packages on consumption (Hollands et al., 2015).

Exposure to smaller packages might reduce consumption, potentially by making additional intake of a product more effortful (Hollands et al., 2015) or as a result of individuals' tendency to consume a specific number of product units in any one episode of consumption regardless of unit size, referred to as the 'unit bias heuristic' (Geier, Rozin, & Doros, 2006). If, for example, people always choose one bottle of SSB whether large or small, they should consume less with smaller bottles. It is also possible, however, that the 'portion size' effect has a lower size threshold – currently unknown, due to the aforementioned lack of evidence for comparisons between smaller and standard packages – below which packages might increase rather than decrease consumption (Marteau, Hollands, Shemilt, & Jebb, 2015). This threshold is likely

to depend on perceptions of appropriate portion sizes, which in turn are influenced by individuals' personal and social norms about what constitutes a suitable amount to consume. As larger portions and packages have become more prevalent and normalised, smaller portions might be considered less appropriate (Wansink & Van Ittersum, 2007) and thus increase intake by encouraging consumption of multiple packages during a consumption episode, entice non-consumers to partake, and if offered in bulk, increase the frequency of consumption (Benton, 2015; do Vale, Pieters, & Zeelenberg, 2008; Holden & Zlatevska, 2015; Hollands et al., 2015; Marteau et al., 2015; Scott, Nowlis, Mandel, & Morales, 2008).

From the above, it is clear that the extant evidence does not allow for confident predictions to be made regarding the impact of smaller bottles of sugar-sweetened beverages on consumption. Given this uncertainty, exploratory, qualitative research can help to inform the discussion, by focusing on consumer perceptions, which may identify putative mechanisms that would not necessarily be revealed by quantitative research. The specific aim of the present study is to explore consumers' experiences of drinking cola from small bottles compared with larger bottles, with the aim of informing future intervention strategies.

2. Methods

2.1. Design

This is a qualitative study based on semi-structured interviews. Semi-structured interviews were chosen as they provide a consistent framework to explore known issues, while at the same time allowing flexibility to the interview process and exploration of topical trajectories in the conversation. This results in collection of reliable, comparable in-depth data relating to the personal experiences of each participant (Cohen & Crabtree, 2006). This qualitative study was conducted as part of a study assessing the feasibility and acceptability of the procedures of a planned large-scale randomised controlled trial evaluating the impact of different bottle sizes on in-home consumption of SSBs (Mantzari, Hollands, Pechey, Jebb, & Marteau, 2015; Mantzari, Hollands, Pechey, Jebb, & Marteau, 2017).

2.2. Participants

Sixteen participants completed this qualitative study. They consisted of household representatives of the sixteen households that completed the aforementioned feasibility study. They were recruited to represent their households, by being the main contact for the feasibility study and provide all necessary data. Their mean age was 33 years (range 19–47 years) and 75% were female. The demographic characteristics of the households from which the participants of the present study were recruited can be seen in Table 1.

The households taking part in the feasibility study were randomly selected from a sample of 37 households in Cambridge, England, which:

- purchased at least 2 L of regular (i.e. not low in sugar) cola drinks per week
- had completed a one-week run in period of the feasibility study, during which they received a range of differently sized bottled drinks to store and consume freely
- expressed a willingness to continue participating in the intervention phases of the feasibility study

Table 1
Characteristics of households completing the feasibility study (n = 16).

Single occupancy households	0%
Households with children	67%
Number of household members	
Mean (sd)	3.6 (1.1)
Range	2–6
Total across households	60
Number of children	
Mean (sd)	2 (1.9)
Range	0–3
Mean Adult age (sd)	34 (6.6)
Mean Child age (sd)	9 (3.9)
Gender	
Female	48%
Education level^a	
High (>A levels or equivalent)	69%
Low (<A levels or equivalent)	31%
Annual household income	
Low (<25 K)	71%
High (>25 K)	29%
Area level deprivation^b	
Deprived (4th and 5th IMD quintiles)	56%
Not deprived (1st, 2nd, 3rd IMD quintiles)	44%

^a Assessed by the highest qualification received by anyone in a household.

^b Based on Index of Multiple Deprivation Scores.

2.3. Procedure

The design and methods of the feasibility study, of which the present qualitative study was a component, have been previously published (Mantzari et al., 2015). In brief, households which purchased at least 2 L of regular cola drinks per week and lived in Cambridge, England, received a set amount of cola each week for four weeks, based on their typical weekly purchasing, as determined by till receipts collected during a two-week baseline period, in bottles of one of four sizes: 1500 ml, 1000 ml, 500 ml, or 250 ml, in random order. The study beverages were selected as Coca Cola or Pepsi Cola, as these are the most popular SSBs in the UK (Hussein, 2016) and are available in a range of bottle sizes. One hundred-and-eleven eligible households were approached to determine the proportion interested in actively participating in the study, assessed by completion of a one-week run in period, which functioned to acquaint households with both the idea that a range of bottle sizes is available and that drinks will be delivered to them over the course of the study. During this period, households received a range of differently sized bottled drinks to store in their homes to consume freely. Of those completing the run-in period and expressing a willingness to continue their participation, 16 were randomly chosen to go through the four intervention phases.

Consumption was assessed each week by recording the numbers of empty bottles, which households were requested to retain, and measuring the volume in remaining full and partially full bottles. Bottles were collected at the end of each intervention week by a member of the research team, who also provided the cola for the following week. Households were not fully informed at recruitment of the study's aim, as it was assumed that such knowledge might differentially affect consumption with each bottle size. Instead, household representatives were told that the study involved a consumer research exercise, aiming to determine whether and how different bottles affect people's consumption experiences. At the end of each intervention week, follow-up assessments were conducted with household representatives, during which consumption levels were measured. At a debriefing session at the end of the study, participants were informed about the true aim of the study, were given information about the hypothesis that smaller packages might help reduce SSB consumption and

information about the detrimental health effects of excess sugar consumption. Subsequent to this, household representatives were interviewed about their experiences of taking part in the feasibility study and about the different bottle sizes. More information regarding the procedures of the feasibility study can be found in the published study protocol (Mantzari et al., 2015).

Ethical Approval for this study was granted by the University of Cambridge Psychology Department Research Ethics Committee (reference number Pre.2015.20).

2.4. Interviews

The interviews were carried out by EM as part of the final follow-up assessment, immediately after completion of the final intervention period, between August 2015 and February 2016. Prior to being interviewed, participants gave written informed consent to taking part in the qualitative component of the research and gave permission to be audio recorded. During the consent process, all participants were reassured that anything they said would remain confidential and anonymous. The interviews were conducted in participants' homes but efforts were made to keep disruption to a minimum. They were semi-structured and followed an interview schedule to elicit information on households' experiences of taking part in the study, including their experiences of using the different sized bottles. In line with the guidelines for conducting in-depth interviews, the questions asked were open-ended, to facilitate elicitation of detailed information, without guiding participants' answers (Boyce & Neale, 2006). Questions asked included what people thought of the different bottle sizes, whether they had a preferred bottle size and why; whether and why they thought any specific size influenced their household's consumption both in and outside the home; how they tended to drink with the different sizes, including whether they poured in a glass, drank out of the bottle, and how fast and how often they drank. Prompts and probes were used as necessary to elicit further information and/or to achieve clarity. Leading and yes/no type questions were avoided (Boyce & Neale, 2006). The interview schedule was developed following discussion with experts in the field of behaviour change and public health. This was then piloted with SSB consumers that did not take part in the study. The final version was then reviewed by an expert qualitative researcher in the field of medical anthropology. The interviews lasted an average of 20 min and were audio recorded. Upon their completion, participants were thanked and received £150 in shopping vouchers to compensate for the time spent participating in the feasibility study and completing the interview.

2.5. Data analysis

Interviews were anonymised by using a study assigned code to identify households rather than participant names. Anonymised interviews were independently transcribed verbatim and analysed by the lead author, using the Framework method of analysis (Ritchie, Spencer, Bryman, & Burgess, 1994) with the purpose of identifying the themes emerging in household representatives' accounts of using the smallest (250 ml) relative to the other larger bottles, with regards to their perceived i) consumption level; ii) consumption-related behaviours; and iii) factors affecting consumption.

The Framework method is an increasingly popular approach in medical and health research as it provides a systematic and flexible approach to analysing qualitative data and a method of addressing specific research questions rather than for purely exploratory purposes (Gale, Heath, Cameron, Rashid, & Redwood, 2013). It allows in depth exploration of the data while simultaneously maintaining an

effective and transparent audit trail, in the form of a matrix, which reinforces the rigour of the analytical processes and the credibility of the findings (Spencer, Ritchie, Lewis, & Dillon, 2003).

3. Results

Three main themes, with some sub-themes, emerged in the accounts of household representatives when discussing use of the smallest (250 ml) relative to the larger bottles: I Perceived level of consumption; II Consumption-related behaviours; and III Factors perceived as influencing consumption.

I. Perceived level of consumption

Consumption rate and amount were generally perceived to be higher with the smallest bottles:

“they (the larger bottles) lasted longer than the smaller bottles ... the small bottles I think they were drunk quite quickly because they were small bottles ... I'd say probably the 250 was probably being drunk faster erm ...” (Male, Household 2; Dual-parent family with three children)

“... we drank so much it's like, we drank it (250ml bottles) so much quicker.” (Female, Household 5; Dual-parent family with two children)

“... we were finding that we were drinking a lot more of those (250ml bottles).” (Female, Household 37; Single-parent family with two children)

This was often discussed in relation to the number of smallest bottles available:

I seem to be drinking a lot of bottles Because ... it felt that you you were opening many bottles ... Yeah ... felt it was more (Female, Household 42; Single-parent family with two children)

II. Consumption-related behaviours

Discussion of consumption-related behaviours associated with using the smallest relative to the larger bottles was grouped under four themes: i) Behaviour towards individual bottles; ii) Choice of drinking receptacle; iii) Behaviour towards available stock; and iv) Minimising intake.

i. Behaviour towards individual bottles

In describing the ways in which they engaged with each smallest bottle, most participants discussed issues relating to their consumption pace and amount. Specifically, the contents of smallest bottles were predominantly reported as being consumed fully and quickly:

“I usually drank, drink one of those (250ml) just in one go ... I would take sips with bigger bottles, rather than this one (250ml) I would drink all the way down probably more (Female, Household 42; Single-parent family with two children)

“... it was just easy to just go in, grab one, couple of sip and they go quick because they're so small.” (Female, Household 16; Single-parent family with two children)

A minority of participants, however, reported pacing themselves:

“I'd take the small ones upstairs, I'd drink some and it'd still be sitting there for a long time ... you take a sip of a drink a few times

an hour ...” (Female, Household 19; Dual-parent family with two adult children)

ii. Choice of drinking receptacle

When consuming from smaller bottles the choice of drinking receptacle was the bottle itself: Beverages were predominantly drunk directly out of bottles rather than being poured into a glass. The latter was the behaviour adopted with larger bottles:

“the smaller bottles the 250ml the small ones ... it was so much easier for the kids to just grab one out of the fridge. And rather than having to go and get a glass and pour it into a glass they just tipped the bottles out the 250ml we drunk from the bottle” (Female, Household 8; Dual-parent family with three children)

“I could just get the bottle and you know I could just have the bottle, I didn't have to pour it into a glass or anything because they were like nice to drink from” (Female, Household 12; Dual-parent family with three children)

“Yeah the small ones (drank) out of the bottle ... obviously with the bigger sizes we poured ...” (Female, Household 4; Dual-parent family with three children).

This appeared related to the size of the bottles, which made participants feel no need to use a glass:

“They're so small I didn't really feel the need to pour it into a glass ...” (Female, Household 40; Single-parent family with two children)

iii. Behaviour towards available stock

Discussion of behaviour toward the available stock of small bottles was grouped under four sub-themes: a) Consumption outside the home; b) Selection of numerous bottles; c) Bottles consumed in succession; and d) Consuming one bottle at a time.

a). *Consumption outside the home.* Because of their size, smaller bottles were often reported as being consumed outside the home:

“I'm constantly out, out and about so I prefer to be able to have like small bottles and pop it in my bag that's what I prefer whereas them bigger bottles they are more at home aren't they?” (Female, Household 30; Single-parent family with two children)

“if I went out anywhere I'd just grab one and stick it in my handbag 'cause they're small enough to do that with” (Female, Household 42; Single-parent family with two children)

The practice of carrying smaller bottles around ensured that cola was available when desired:

“I took three to work this morning because I knew I was going to be there so many hours. I'm there from say 9 'til 1 so I'd rather take more than I need than less but I mean if I was going out shopping I would probably just take the two because I wouldn't want my bag weighed down with the three” (Female, Household 42; Single-parent family with two children)

b). *Selection of numerous bottles.* Selecting numerous bottles at a time was also reported in the context of in-home consumption:

“Two or more because I've got to think when I sit down I think about the programmes right and I like, I'll watch - I don't watch it in

the day but I watch Coronation Street then like Eastenders, I like erm like the Celebrity Get Me Out of Here that's on right so I think I'm going to be sat here and I don't really want to move so yeah I'd probably grab a couple and I'd bring them in ..." (Female, Household 30; Single-parent family with two children)

c). *Bottles consumed in succession.* Participants also reported consuming numerous bottles in succession:

"They (the children) drank and then they'd start another one and it was just they, they (the bottles) were gone (Female, Household 5; Dual-parent family with two children)

"Probably drank loads (bottles one after the other) ... I don't even know because I went through like a whole six pack in I think ... erm from about nine to about lunchtime it would've probably been like six bottles I think" (Female, Household 30; Single-parent family with two children)

Drinking bottles sequentially was often described as happening outside of conscious awareness:

"I would go in with the intention of just having a drink as normal, feeling like that's a cup size but once I'd drank it I'd want to have another one or I would continuously drink them without realising that maybe I'd had three or four before that" (Female, Household 40; Single-parent family with two children)

"Yeah you drink, you know you drink one and it's sort of like oh that one's gone and then you'd just pick up another one" (Female, Household 37; Single-parent family two children)

d). *Consuming one bottle at a time.* Some participants reported consuming only one bottle per drinking occasion:

"I probably drink, I try to hold on until at least sort of lunchtime if I have one and then I would try not to have another one straight after" (Female, Household 16; Single-parent family with two children)

In such instances, however, the presence of smallest bottles was described as increasing the frequency of drinking occasions:

"Erm I just kept going and dipping into them (250s) all of the time" (Female, Household 16; Single-parent family with two children)

"I'll grab one (bottle) at a time ... I'll just grab one, take it upstairs with me then drink, then I might come down and get another one but usually one is quite sufficient to satisfy the feeling that I want, a bit of sugar for about two to three hours unless I was going to bed and then I wouldn't want another one but no if I was sat down, if I had one about six o'clock maybe half past eight I might grab another one" (Female, Household 42; Single-parent family with two children)

iv. Minimising intake

With consumption perceived to be higher with the smallest bottles, participants felt the need to minimise sugar intake and described the attempts they made to do so. Two sub-themes emerged in participants' accounts of trying to minimise intake: a) Applying control; and b) Engaging in compensatory behaviours.

a). *Applying control.* Often participants discussed applying control to limit consumption:

"I'd tend to sort of try and hold out to the evening ... I don't tend to have one and then another one straight away because then I just think it's so bad" (Female, Household 16; Single-parent family with two children)

This was especially true when children were involved:

"I'm seeing the empties I did feel like I had to monitor because you know they (the children) go out of control otherwise" (Female, Household 40; Single-parent family with two children)

b). *Engaging in compensatory behaviours.* Participants also described engaging in compensatory behaviours to offset the perceived increase in sugar intake with the smallest bottles. For example, some reported not consuming other types of sugary drinks:

"But with the small bottles no (did not drink any other fizzy drinks) ... I thought it was just coke and that's all it has been" (Female, Household 42; Single-parent family with two children)

or purchasing and consuming less cola out of the home:

"But actually we drunk less you know we didn't buy drinks out ... we'd most probably buy about two or three litres (typically outside the house) a week. Erm in the weeks that we had the, the smaller sizes zero was bought outside of the house ..." (Female, Household 37; Single-parent family with two children)

III. Factors perceived as influencing consumption

Participants talked about the factors relating to the smallest bottles they perceived as i) Facilitating consumption; and ii) Inhibiting consumption.

i. Perceived facilitators

The factors that were perceived as facilitating consumption were grouped under five sub-themes: a) Convenience; b) Loss of control; c) Number of available bottles; d) Perceptions of quantity; and e) Positive attitudes.

a). *Convenience.* The smallest bottles were perceived to be more convenient than larger bottles sizes:

"they're more convenient to be fair I think that's what it is" (Female, Household 30; Single-parent family with two children)

Their convenience was predominantly discussed in relation to the reduced consumption effort associated with the lack of need to use a glass and their portability, both of which were discussed as making consumption easier:

"with the smaller bottles you know it was easier just to grab it and you know didn't have to worry about pouring it out ... I think that's probably just what made us drink more" (Female, Household 12; Dual-parent family with three children)

"when the bottles got bigger kids were reluctant to get it out of the fridge because they knew they had to get a cup and a glass and pour it and they're lazy" (Female, Household 8; Dual-parent family with three children)

"I drank more when it was the small bottles because it was easy to carry around and even when I was doing the housework ..." (Female, Household 23; Dual-parent family with two children)

Apart from reducing effort, consuming directly from the bottle was considered beneficial as the beverage retained its fizziness, rendering the smallest bottles more practical and therefore convenient:

"The smallest ones 'cause they were really handy ... you're not ending up opening a big bottle and then leaving it and having you know them go flat. Because the bigger the bottles I found that they were you know going flat a lot quicker. They (250ml bottles) were really easy to sort of drink ... they're so handy. In the size they're not going flat. So it was a lot easier with those" (Female, Household 37; Single-parent family with two children)

b). *Loss of Control.* Although some participants reported making attempts to control the amount of cola they consumed with the smallest bottles, their use was generally perceived to have inhibited control. Drinking from the smallest bottles was associated with a reduced awareness of the amount consumed:

"because they are smaller it meant that we were actually drinking more of them ... I think more the fact that because they were smaller you'd just drink you know you, it didn't seem like you were. So you'd end up drinking more because they were smaller" (Female, Household 37; Single-parent family with two children)

"the smallest ones ... you'd just go through them without realising how much you're drinking because it was such a small amount erm" (Female, Household 40; Single-parent family with two children)

The number of smallest bottles available also made it difficult to monitor children's consumption:

"they're so tiny they (the children) drank and then they'd start another one and it was just they, they were gone I can keep an eye on the bigger bottles because they're beside the fridge and they don't take them to their rooms thankfully ... didn't realise they (the small bottles) were taken because there are so many" (Female, Household 5; Dual-parent family with two children)

"They just go without me noticing and they'll say 'I've got one, I've got one' and I'll say 'did you take another?', 'no, it's still the same one I had' when quite obviously it isn't. Because they're disappearing so yeah. there were so many of the bottles you couldn't really keep track" (Female, Household 8; Dual-parent family with three children)

c). *Number of bottles.* The large number of small bottles also appeared to have altered participants' perceptions of the amount of cola available, making them believe there was more to consume:

"because there was so many small bottles as opposed to a couple of big ones it just felt like there was more even though there technically wasn't because it's the same amount. It looked like more ... So I was just taking it, taking it. I felt like I had so much coke on tap ..." (Female, Household 16; Single-parent family with two children)

Perceptions of increased amount of cola available led participants to consume more:

"Because they (the small bottles) were there I think if they weren't there I wouldn't have drunk them so much but because they were there I was like 'oooh' and had to drink it" (Female Household 30; Single-parent family with two children)

d). *Perception of quantity per bottle.* Perceptions of insufficient quantity of beverage in each smallest bottle was described as an additional factor influencing consumption, by encouraging drinking of multiple bottles:

"... it wasn't quenching my thirst as much as maybe what a full glass would or erm what I was used to consuming ... I'd drink it and think 'I'm not satisfied I'll go for another one'" (Female, Household 40; Single-parent family with two children)

"when I got through the first one I thought that's not bad because they're small so it's fine because I used to think two bottles of them (250ml) equivalent to one bottle of that (500ml) so like it's not that bad really is it? but then because they're smaller and they, you drink them quicker it's like you go for more do you know what I mean?" (Female, Household 30; Single-parent family with two children)

"the smaller bottles for me that was just like, like a half a glass of coke really ... So I'd just bring them up to bed with me and bring a few bottles up ... because they're tiny the 250's really it's kind of that's what, like I say it's a couple of mouthfuls that is really" (Female, Household 23; Dual-parent family with two children)

e). *Positive attitudes.* Participants also expressed positive attitudes towards the smallest bottles, which appeared to have made them more inclined to consume them. These attitudes were related to perceptions of the superior taste of beverages in smallest bottles:

"Yeah I loved them because they don't go flat quick like they stay cold like longer" (Female, Household 30; Single-parent family with two children)

as well as the perceived bottle attractiveness:

"I think the children enjoyed the small size bottles ... my smallest child enjoyed the little 250 size ... they're dinky bottles" (Male, Household 2; Dual-parent family with three children)

"they were probably my favourite bottles was the dinky ones ... And I think they were the kids' favourites as well in all fairness" (Female, Household 23; Dual-parent family with two children)

ii. *Perceived inhibitors*

In a minority of cases the smallest bottles were perceived to have reduced consumption levels:

"Erm actually we drunk less with the smaller bottles." (Female, Household 24; Single-parent family with two children)

The factors perceived as inhibiting consumption were grouped under three sub-themes: a) Practical issues; b) Altered thought processes; c) Number of bottles;

a). *Practical issues.* Perceptions of decreased consumption were predominantly discussed in relation to practical issues with the smallest bottles, which resulted in dislike and therefore less engagement with the product. These included issues with the

physical properties of the bottles:

“the 250 ml bottles because it was such a rigid plastic it would not be easy to drink out the bottle because there’s not enough pressure to compress” (Male, Household 7; Dual-parent family with two adult children)

Another practical issue discussed was the taste of beverages in the smallest bottles, which was perceived to be inferior:

“I just felt it tasted erm I don’t really know what the flavour was it just didn’t taste right to me. I don’t think it was any fizzier, I don’t think it was anything to do with the, the erm ... the carbonate I think it, I don’t know whether it ... I don’t know, it just had like a tang to it.” (Female, Household 24; Single-parent family with two children)

as well as the perceived insufficient amount of beverage:

“The smaller size bottles were the ones (drank less), the really small 250ml size bottle was the one that I just really couldn’t be bothered with ... it was a mouthful at best so it was pretty.. pointless ... Frustrating having to get up and get another one ...” (Male, Household 3; Flat-share accommodation)

b). *Altered thought processes.* A minority of participants described consuming less with the smallest bottles as a result of a change in their perceptions of portion size and the amount of beverage needed:

“Yeah I think it’s because you drink it because it’s there and with the small ones you know when you finish it you probably think that’s the end of that I don’t need any more coke because I’ve finished my bottle, my portion of coke ... I think personally in my head I probably don’t end up getting another one b- in my head I’m thinking I’ve finished that, that’s mine done if you have more you think ‘I’ve had four bottles of coke’ ... instead of thinking I’ve had this whole litre of coke” (Female, Household 19; Dual-parent family with two adult children)

“I only need this (amount) which I found out by drinking these (250ml bottles)” (Female, Household 42; Single-parent family with two children)

c). *Number of bottles.* Decreased consumption was also discussed in relation to the number of smallest bottles available. Specifically, in some instances where children were involved, having knowledge that many bottles were available were described as reducing the likelihood that bottle contents were finished off, as fresh bottles were acquired instead:

“I noticed that they (the children) drunk a little bit less because there was more bottles rather than having the big one and finishing a glass before pouring another they’d just leave it about or it’s more convenient just to grab another one if they can’t find ... they just left it because they were like ‘erm no I’ll get a new one” (Female, Household 4; Dual-parent family with three children)

In other instances, knowledge of the availability of numerous bottles may have reduced the usual perceptions that stocks won’t last and thus the urgency to consume:

“But it’s a psychological thing isn’t it, you’ve got so many bottles of it and it’s just like ‘oh god there’s loads’ whereas I think with

children as well drinking it, it’s this thing they’ve got to drink it before it goes kind of thing but there was too many there for them to drink” (Female, Household 23; Dual-parent family with two children)

4. Discussion

The present qualitative study aimed to explore consumers’ experiences of cola provided in small-sized bottles, relative to larger bottles, with the aim of informing future intervention strategies to reduce SSB consumption. Consumption rate and amount were generally perceived to be higher with the smallest bottles, exposure to which was reported to have increased the frequency of drinking occasions and led to consumption of numerous bottles in succession. Factors reported as facilitating consumption were: i) the convenience of the smallest bottles, which permitted their consumption both in and out of the home; ii) the number of smallest bottles available, which hindered monitoring and control of consumption and created perceptions of an increased supply; iii) perceptions of insufficient quantity in each bottle; and iv) positive attitudes towards the smallest bottles. In a minority of cases the smallest bottles were perceived to have reduced consumption, but this was often described in relation to dislike and therefore less engagement with the bottles.

Exposure to larger packages increases the consumption of food and non-alcoholic beverages (Hollands et al., 2015), leading to the prediction that small packages, including small-sized bottles of SSB, could help reduce consumption. This finding is based mainly on studies comparing standard portions and packages against larger rather than small ones, resulting in uncertainty regarding the impact of the latter. It is possible that the ‘portion size effect’ has a lower size threshold, below which packages might increase rather than decrease consumption (Marteau et al., 2015). If in the present study, participants’ accounts of drinking faster and in greater quantities when offered the smallest bottles represent true intake levels, this would support this possibility. In line with previously raised concerns, the findings specifically suggest that smaller bottles might increase intake, by leading to consumption of numerous bottles in succession and increasing the frequency of consumption occasions (Benton, 2015; Hollands et al., 2015; Marteau et al., 2015).

Participants’ accounts suggest a number of factors and mechanisms by which the smallest bottles might result in these consumption-related behaviours. First, the larger number of smaller compared to larger bottles appears to have led to perceptions of an increased supply of cola with the smallest bottles. This is consistent with findings showing that sub-dividing a fixed portion of a food into smaller pieces affects perceptions of quantity (Scisco, Blades, Zielinski, & Muth, 2012). The greater the supply of a product— or perceived supply — the lower the perceived costs of using it (e.g. fear of running out), the greater the willingness to use more volume (Lynn, 1992; Worchel, Lee, & Adewole, 1975). These perceptions of increased supply could be explained in terms of product salience resulting from stockpiling, which is particularly pertinent to high-convenience products, such as those in single-serving packaging (e.g. small cola bottles), and can trigger a higher incidence of consumption (Chandon & Wansink, 2002; Neslin & Van Heerde, 2009). Product convenience also enables impulsive eating (Wansink, 1994) and affects perceptions of appropriateness of consumption frequency (Gomez, Schneid, & Delaere, 2015). Accordingly, in the present study, the convenience of smaller bottles in reducing the consumption effort inherent in glass use and related to their portability were discussed as

important facilitators to consumption.

Consumption of numerous smallest bottles in succession in this study was often planned: participants described consciously selecting more than one bottle to consume during each drinking occasion. As pre-meal planning is an important predictor of the amount consumed (Fay et al., 2011), once selected, the obtained bottles were likely to be consumed. The amount served - in the case of SSB bottles, the number of bottles selected—is likely determined by perceptions of appropriateness regarding amounts to consume (Benton, 2015; De Castro, 1996), which can be particularly hard to judge for some items, such as liquids and products made up of multiple units (Kral, Roe, & Rolls, 2004; Wansink, 1996; Yuhas, Bolland, & Bolland, 1989). The number of bottles chosen to consume in the present study, could have, therefore, been influenced by a distorted perception of appropriate portion size with the smallest bottles.

Perceptions of appropriate portion sizes are also influenced by personal and social norms (Wansink & Van Ittersum, 2007). At the time of the study, the 250 ml bottles were just being introduced in some supermarkets across England, and participants had likely never been exposed to this size. Perceptions of insufficient amounts in these bottles imply that this size was considered too small, leading to dissatisfaction, or expected dissatisfaction, and encouraging consumption of numerous bottles per drinking occasion. Indeed, expected satiety is an important predictor of chosen portion size (Brunstrom & Rogers, 2009). Reduced satiety with the smallest bottles was also reported to have increased the frequency of consumption occasions: drinking a small bottle would on occasion result in satisfaction, which, however, lasted a reduced amount of time, leading to further drinking occasions. Consistent with the suggestion that smaller portions could be used to justify additional consumption (Benton, 2015), these further drinking occasions were likely considered as permitted due to perceptions of less than normal amounts in each smallest bottle.

Although often planned, consumption of numerous bottles in succession was also described as occurring outside of conscious awareness. Some participants described having the intention of drinking only one bottle but ended up consumed multiple bottles in succession without realising. In contrast to suggestions that smaller packages are perceived to be helpful in exerting self-control (Wansink & Park, 2001), this finding implies that smaller bottles might hinder self-monitoring and self-regulatory processes. This is in line with results showing that small packages can encourage lapses in self-control, resulting in increased levels of consumption (do Vale et al., 2008; Holden & Zlatevska, 2015; Scott et al., 2008). Attempts to control and monitor consumption, especially that of children, were also inhibited by the number of smallest bottles: there were too many bottles to keep track of how many had been consumed.

Consumption in the present study was also described as facilitated by positive attitudes towards the smallest bottles, which were often discussed as being participants' preferred bottle size. This is consistent with findings showing that packaging influences consumers' evaluations of products (Deliza & MacFie, 1996), with products in smaller packages rated more favourably than those in larger packages (Yan, Sengupta, & Wyer, 2014). It is also consistent with findings linking liking of a product to purchase intent and consumption (Lähteenmäki & Tuorila, 1995; Mueller & Szolnoki, 2010). A minority of participants reported negative attitudes towards the smallest bottles, which appear to have helped reduce consumption, but did so through less engagement with the product. These negative attitudes, might have been related to participants not being used to the smallest bottles. As exposure can influence thinking, and the positive evaluation of events (Isen,

1999, 2000; Weiss, Nicholas, & Daus, 1999), as well as attitude formation (Kim, Lim, & Bhargava, 1998), it is arguably reasonable to assume that in time, attitudes could become more positive.

One of the strengths of the present study is that it is one of only a few studies comparing smaller with larger packages; to date most studies have focused on the impact of larger portion and packages on purchasing or consumption (Hollands et al., 2015). It is also one of the only known studies focusing on the impact of package size on beverage consumption (Hollands et al., 2015). Furthermore, focusing on the experiences of regular rather than occasional SSB drinkers increased the likelihood that identified issues are relevant to the consumption of SSBs among those who require intervention the most. The study also has certain limitations that should be noted. First, the qualitative, exploratory nature of the study does not allow for causal relationships to be inferred. Second, as interviews were conducted after household representatives had been debriefed on the previously withheld study aim, it is possible that responses might have been influenced by a social desirability bias. Such a bias, however, would not appear to account for the main findings here, since participants largely reported increased consumption with the smaller bottles, despite being aware that the hypothesis was that smaller bottles would decrease consumption. Third it is not possible to establish whether the perceived effect of smallest bottles on consumption levels and related behaviours accurately reflect actual intake. Discrepancies often exist between self-reported consumption and actual intake (Basiotis, Lino, & Dinkins, 2002; Schoeller et al., 2013). Interventions that rely on altering the physical environment, such as those involving changes in the size of portions and packages, often work outside of conscious awareness (Hollands, Marteau, & Fletcher, 2016; Hollands et al., 2013), raising the possibility that the smallest bottles might have had effects on consumption that differed from those perceived. This possibility is reinforced by the finding that perceptions of consumption were related to the number of bottles: the act of opening many small bottles in comparison to fewer larger ones might have given participants the impression of drinking more. Results from the feasibility study (Mantzari et al., 2017), of which this qualitative component is a part, do not allow conclusions to be drawn about consumption with the smallest bottles. Without such knowledge, it is not possible to determine with certainty the importance of the factors associated with the smallest bottles identified as influencing consumption. This uncertainty reinforces the need for further empirical research on the impact of smaller bottles on in-home consumption of SSBs.

In conclusion, the perception of greater consumption with the smallest compared to the larger bottles in the present qualitative study raises the possibility that there is a lower threshold to the observed 'portion size effect', below which smaller portions and packages may increase rather than decrease consumption. The findings specifically suggest that smaller bottles might lead to consumption of numerous packages in succession and increase the frequency of consumption occasions, thus potentially increasing the total quantity consumed. The findings also highlight the behavioural responses which might underpin these effects and reinforce the need for empirical evidence to assess the in-home impact of smaller bottles on actual consumption of SSBs.

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Ethics approval

Ethical approval was obtained by the University of Cambridge Psychology Department Research Ethics Committee (reference number Pre.2015.20).

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

All authors collaborated in designing the study. The data were analysed by EM, who also drafted the manuscript with substantial contributions from GJH, RP, SJ and TMM. All authors read and approved the final manuscript.

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