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# Effects of pictorial warnings on parents' purchases and perceptions of sugar-sweetened beverage categories

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## Summary

**Background:** Sugar-sweetened beverage (SSB) consumption remains high among US children. Warning labels on SSBs hold promise for reducing consumption, but their impact may differ by SSB category.

**Objectives:** This study examined the effects of pictorial warnings on parents' beverage purchases and perceptions across SSB categories.

**Methods:** Parents of children ages 2–12 ($n = 326$) visited a convenience store laboratory in North Carolina. Participants were randomly assigned to see SSBs carrying either pictorial warning labels or control labels. Parents purchased a beverage for their child and completed a survey.

**Results:** Responses from parents in the control arm suggest underlying perceptions of flavoured milk (2.8 on scale ranging from 1 to 5), flavoured water (2.6), and fruit-flavoured drinks (2.5) as the most healthful SSB categories. Compared to the control, pictorial warnings led to the largest reductions in purchases of fruit drinks (−61%), soda (−36%) and flavoured milk (−32%). Warnings also lowered the perceived healthfulness of flavoured water ($d = -0.34$), flavoured milk ($d = -0.28$), sports drinks ($d = -0.25$), and a reduction in intentions to give one's child sports drinks ($d = -0.30$), flavoured water ($d = -0.24$) and sweet tea ($d = -0.22$, all $p < 0.05$).

**Conclusions:** Warning labels may have heterogeneous effects across SSB categories. Future research should assess the psychological mechanisms underlying these heterogeneous effects.

KEYWORDS
beverage categories, graphic warnings, health warning labels, pictorial labels, sugar-sweetened beverages, sugary drinks

## 1 | INTRODUCTION

Sugar-sweetened beverage (SSB) consumption has been linked to several health conditions, including obesity, type 2 diabetes, cardiovascular disease and tooth decay.[1–4] In the United States, SSB consumption remains high, accounting for 46% of all added sugars consumed.[5] SSB consumption is particularly concerning among children, since it is associated with increased risk of childhood obesity, which is in turn associated with a higher likelihood of obesity in adulthood,[6] obesity-related comorbidities[7] and tooth decay.[8] Around 63% of US children consume SSBs daily,[9] with fruit-flavoured drinks being the most common among young children (consumed by ~35% of 0–5 year-olds), followed by soft drinks (~30%), and flavoured milk (~14%).[10,11]

Due to the high prevalence of SSB consumption among children in the US, population-level strategies to lower consumption are urgently needed. Mandatory front-of-package labelling, including

  

mandated health warnings, is one promising strategy. In 2022, the White House released the National Strategy on Hunger, Nutrition and Health, which includes the goal of developing a national front-of-package labelling system for packaged foods and beverages.[12] Seven US states and one city (San Francisco) have proposed policies requiring health warning labels on SSB containers, SSB advertisements and at the point of sale.[13] Substantial evidence indicates that warnings reduce SSB purchases.[14–18] However, this effect may not be uniform across SSB categories due to underlying differences in consumers' perceptions and preferences of different categories. For example, a few studies have shown that parents, who influence what children drink,[19] tend to believe that certain types of SSB, such as fruit-flavoured drinks and sports drinks, are healthier options.[20–22] Perceptions such as these may influence how parents use warning labels to inform their choices.

Understanding how the effects of warning labels on purchases may differ across SSB categories can help policy-makers better predict the impact of this type of intervention. However, to date, only one randomized controlled trial has assessed the differential effects of warning labels across SSB categories. That study, which compared the effects of text-only warnings and calorie labels to a no-label control, found that text-only warnings outperformed calorie labels and had their strongest effect on intentions to purchase fruit-flavoured drinks, which were also perceived as the most healthful SSB category.[23] However, no studies with pictorial warnings have disaggregated results by beverage category yet. Pictorial warnings are required on cigarette packs in over 130 countries[24] and there is a strong evidence base indicating that they increase intentions to stop or not start smoking.[25] In the US, pictorial warnings have been passed (although not yet implemented) for cigarette packs, but have not yet been proposed for SSBs.[26]

Using secondary data from a trial with parents in North Carolina, we aimed to understand whether previous findings about the effects of text-only warnings by beverage category extend to: (1) the use of pictorial warning labels and (2) when parents are making real purchase selections. In this study, we analysed parents' underlying perceptions and purchase intentions by SSB category, as well as pictorial warnings' effects on selection, perceptions and intentions across categories.

## 2 | METHODS

This study reports secondary data analyses from a trial of pictorial warnings on SSB containers. The stimuli development process, sample size calculation, participant recruitment, study setting and procedures, which are summarized below, have been described in more detail in a previous publication.[27]

### 2.1 | Participants

From January to March 2020, we recruited participants from Central North Carolina. Due to COVID-19, we paused recruitment and enrollment in March 2020 and resumed recruitment in October 2020 after implementing a COVID-19 safety protocol. Study enrollment was completed in March 2021.

To be eligible, participants had to be at least 18 years of age, the parent or guardian (hereafter 'parent') of at least one child between the ages of 2 and 12 who consumed at least one SSB in the past week, able to read and speak English or Spanish, able to use a tablet or computer to take a survey, and able to attend one in-person study visit. The University of North Carolina Institutional Review Board approved the study (IRB #19-0277). Participants provided written informed consent at the study site before COVID-19 and verbal consent by phone after the implementation of the COVID protocol. All study materials were available in English and Spanish.

### 2.2 | Setting

The study took place at the UNC Mini Mart, a 245-square-foot naturalistic convenience store laboratory in Chapel Hill, NC.[28] The UNC Mini Mart is designed for use in research studies and contains a commercial refrigerator, gondola shelving units and a check-out stand with a point-of-sale system. For this study, we stocked the UNC Mini Mart with 33 types of single-serve beverages, more than 130 types of food items, and 31 household good items. To determine which beverages to stock, we used 2014 Nielsen Homescan Data[29] to examine the top selling beverages, by beverage category, at convenience stores in the US among all households with children aged 2–18. Study staff stocked single-serve drinks in each of six beverage categories: fruit-flavoured drinks, sodas, flavoured milks, sports drinks, flavoured waters and sweet teas. For every SSB sold, there was a comparable non-sugary option displayed side-by-side in the refrigerator. All SSBs and their non-sugary equivalents were sold for the same price, following the approach used in a prior study.[30]

### 2.3 | Procedures

Individuals interested in the study could take an eligibility screener online or (before the implementation of the COVID-19 protocol) verbally with the research staff. To mask the purpose of the study, study materials stated that the study sought to understand the factors that affect consumers' purchasing decisions in a convenience store environment.

This study used a parallel arm study design. Staff randomly assigned participants through simple allocation to one of two trial arms: pictorial warnings or control labels. Staff then prepared the UNC Mini Mart before each participants' arrival based on their assigned trial arm. In the pictorial warning arm, staff applied one of two warning labels (Figure 1) to the front of all SSB containers in the UNC Mini Mart. The two pictorial warnings used in the trial read 'WARNING: Excess consumption of drinks with added sugar contributes to type 2 diabetes' and 'WARNING: Excess consumption of drinks with added sugar contributes to heart damage' and were


**FIGURE 1** Study stimuli, labels applied to sugar-sweetened beverages at UNC Mini Mart during trial.

accompanied by stock photographs representing each of the topics. As reported in a prior paper, we developed these labels through a multiphase process in collaboration with a professional designer and a stakeholder advisory board (comprising nutrition epidemiologists, a weight stigma expert, a public health lawyer and leaders from local and national health organizations). This process included experiments to test different label designs, warning topics and photographs.[18] Approximately half of the SSBs displayed the heart damage warning label, and the other half displayed the type 2 diabetes label. In the control arm, staff applied a barcode label to all SSBs, which is a neutral image used in previous studies to control for the effect of the presence of a label and for the amount of branding obscured by it.[30]

Before participants entered the store, research staff instructed them to select one snack and one beverage for their child, as well as one household item. This three-item shopping task was designed to mask the purpose of the study. Research staff informed the participants that one of the items would be randomly selected at the checkout counter for the participant to take home. Research staff checked out the participant once they finished the shopping task and then took them to a separate room where they completed a survey programmed in Qualtrics on a computer or tablet. Participants received $40 and the selected beverage as compensation for their participation in the study, despite having been previously told that they would randomly receive one of the three selected items.

## 2.4 | Measures

The primary results from the trial are reported in a separate publication.[27] For the current study, the primary outcome was the proportion of participants who purchased each SSB category during the shopping task. Secondary outcomes were healthfulness perceptions of SSBs and intentions to give SSBs to their child, both measured in the post-shopping task survey. To assess secondary outcomes, the survey displayed images of SSBs from each of six categories: regular soda or soft drinks, regular sports drinks, regular flavoured waters, fruit-flavoured drinks (not 100% juice), sweetened pre-packaged teas and flavoured milks. The products displayed the participants' randomly assigned label (pictorial vs. control; participants in the pictorial warnings arm were randomly assigned to view either the heart disease or the diabetes label). For each beverage, participants rated the products' healthfulness on a Likert-style response scale ranging from 1 to 5 (where 1 = *unhealthy*, 5 = *healthy*). Next, they indicated how often they intended to give the product to their child in the next week on a scale between 0 times/week and 3 times/day (0–21 times/week).

## 2.5 | Analyses

First, to explore underlying (i.e., without intervention) healthfulness perceptions and purchase intentions for each SSB category, we computed mean healthfulness and intentions to give to one's child in the control group. We then compared these means to the reference group of soda, deriving *p*-values and 95% confidence intervals using Wilcoxon signed-rank tests. Soda was used as the reference group due to previous evidence that parents consider soda to be the least healthful SSB category.[23]

Next, we examined the effects of pictorial warnings on SSB selection and secondary outcomes. For the selection outcome, we descriptively compared proportions between trial arms, but did not conduct hypothesis testing due to the small cell sizes in some of the categories. For the secondary outcomes, we calculated standardized effect sizes (Cohen's *d*) representing the difference in means between trial arms for each SSB category.[31] Analyses were conducted in Stata/SE version 16.

# 3 | RESULTS

## 3.1 | Participant characteristics

Participant characteristics are reported in Table 1. Parents' mean age was 38, and 77% of them identified as women. Around 45% of

**TABLE 1** Participant characteristics ($n = 325$).

| Characteristics | Control | | Pictorial warnings | |
|---|---|---|---|---|
| | *n* (or mean) | % (or SD) | *n* (or mean) | % (or SD) |
| Sample size | 162 | 50% | 163 | 50% |
| Age, in years | | | | |
| 18–29 | 24 | 15% | 21 | 13% |
| 30–39 | 65 | 40% | 74 | 45% |
| 40–49 | 53 | 33% | 54 | 33% |
| 50+ | 20 | 12% | 14 | 9% |
| Mean (SD) | 38.9 | (8.3) | 37.8 | (7.8) |
| Gender | | | | |
| Man | 41 | 25% | 32 | 20% |
| Woman | 120 | 74% | 130 | 80% |
| Other gender identity | 1 | 1% | 1 | 1% |
| Sexual orientation | | | | |
| Straight or heterosexual | 148 | 94% | 145 | 90% |
| Gay, lesbian, bisexual, or homosexual | 6 | 4% | 14 | 9% |
| Other sexual orientation | 4 | 3% | 3 | 2% |
| Race and ethnicity ($n = 318$) | | | | |
| White (non-Hispanic) | 72 | 46% | 70 | 44% |
| Hispanic (all races) | 31 | 20% | 34 | 21% |
| Black or African American (non-Hispanic) | 46 | 29% | 34 | 22% |
| Asian (non-Hispanic) | 6 | 4% | 7 | 4% |
| Other race (non-Hispanic) | 3 | 2% | 15 | 9% |
| Educational attainment | | | | |
| Less than high school diploma or general educational development (GED) | 11 | 7% | 15 | 9% |
| High school diploma or GED | 55 | 35% | 55 | 34% |
| Four-year college degree | 42 | 27% | 46 | 29% |
| Master's degree, graduate degree, or more | 47 | 30% | 44 | 28% |
| Household income | | | | |
| $0–$24 999 | 49 | 30% | 50 | 32% |
| $25 000–$49 999 | 39 | 24% | 41 | 26% |
| $50 000–$74 999 | 16 | 10% | 18 | 11% |
| $75 000+ | 58 | 36% | 49 | 31% |
| Body Mass Index ($n = 301$) | | | | |
| <18.5 | 6 | 4% | 4 | 3% |
| 18.5–24.9 | 43 | 29% | 43 | 28% |
| 25.0–29.9 | 43 | 29% | 45 | 30% |
| >29.9 | 57 | 38% | 60 | 39% |
| Mean (SD) | 29.7 | (9.9) | 29.3 | (8) |
| Nutrition facts panel use | | | | |
| Never/rarely | 26 | 16% | 25 | 16% |
| Sometimes | 46 | 29% | 49 | 30% |
| Often/all the time | 89 | 55% | 87 | 54% |
| Frequency of needing help reading medical information | | | | |
| Never | 130 | 81% | 132 | 81% |
| Sometimes | 23 | 14% | 18 | 11% |

**TABLE 1** (Continued)

| Characteristics | Control | | Pictorial warnings | |
|---|---|---|---|---|
| | *n* (or mean) | % (or SD) | *n* (or mean) | % (or SD) |
| Often/always | 7 | 4% | 12 | 7% |
| Language of survey administration | | | | |
| English | 142 | 88% | 140 | 86% |
| Spanish | 20 | 12% | 23 | 14% |
| English language use | | | | |
| Mostly or only English | 132 | 81% | 130 | 80% |
| Spanish and English equally | 10 | 6% | 14 | 9% |
| Mostly or only Spanish | 20 | 12% | 19 | 12% |
| Number of people in the household (n = 317) | 3.6 | (1.2) | 3.6 | (1.3) |
| Age of child the parent shopped for, in years | | | | |
| 2–5 | 61 | 38% | 63 | 39% |
| 6–12 | 101 | 62% | 100 | 61% |
| Mean (SD) | 7.3 | (3.4) | 7.1 | (3.3) |
| Gender of child the parent shopped for | | | | |
| Boy | 72 | 44% | 75 | 46% |
| Girl | 88 | 54% | 88 | 54% |
| Other gender identity | 2 | 1% | 0 | 0% |
| Time of participation | | | | |
| Pre-pandemic | 64 | 40% | 65 | 40% |
| During pandemic | 98 | 60% | 98 | 60% |

parents identified as non-Hispanic white, 20% as Hispanic (any race) and 25% as non-Hispanic Black. About a third (31%) reported household income below $25 000. Forty-three percent of the sample obtained a high school diploma or less, while 29% had a graduate degree. Most (62%) parents shopped for a child between 6 and 12 years, whereas 38% shopped for a child between 2 and 5 years old.

## 3.2 | Underlying perceptions of different SSB categories (control group only)

Figures 2 and 3 show parents' underlying healthfulness, perceptions of, and intentions to give to their children, different SSB categories. Specifically, parents in the control arm rated soda as the least healthful of the SSB categories included (mean 1.3 on a 5-point scale), and flavoured milk (mean 2.8) as the most healthful. Flavoured water (mean 2.6) and fruit-flavoured drinks (mean 2.5) were also among the SSB categories that received the highest healthfulness ratings. The perceived healthfulness of each SSB category was higher in comparison to soda ($p < 0.05$).

Parents in the control arm intended to give flavoured milk to their child the most often (mean 2.3 times/week) among the SSB categories included, followed by fruit-flavoured drinks (mean 1.9)—in both cases, significantly more often than soda (mean 0.8). On the other hand, they reported intentions to give flavoured water (mean 0.6) and sweet tea (mean 0.7) to their child less often than soda.

## 3.3 | Impact of pictorial warnings on parents' beverage purchases for their children

As previously reported,[27] among parents in the pictorial warnings arm, 28.2% bought an SSB for their child, compared to 45.1% of parents in the control arm ($p < 0.001$, Figure 4). In this study, we found that the pictorial warnings had the largest effect on the selection of a fruit-flavoured drink. Pictorial warnings led to a 61% relative reduction in the likelihood of selecting a fruit-flavoured drink, from 17.3% in the control arm to 6.7% in the pictorial warnings arm (−10.6 percentage points). The next largest reductions were in purchases of soda (36.1% reduction, −3.1 percentage points, from 8.6% in the control arm to 5.5% in the pictorial warnings arm), flavoured milk (32% reduction, −3.8 percentage points, from 11.7% in the control arm to 8.0% in the pictorial warnings arm), and sports drinks (22.7% reduction, −1.3 percentage points, from 5.6% in the control arm to 4.3% in the pictorial warnings arm).

## 3.4 | Impact of pictorial warnings on parents' perceptions of different SSB categories

As previously reported in the main trial paper,[27] the overall perceived healthfulness of SSBs (averaged across categories) was significantly lower in the pictorial warnings arm compared to the

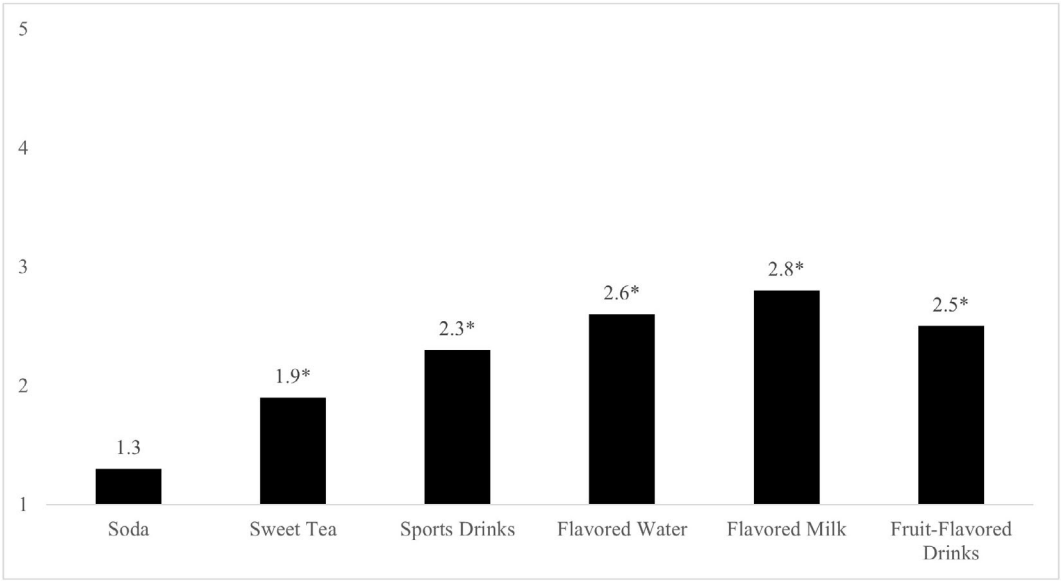


**FIGURE 2** Perceived product healthfulness in the control group by sugar-sweetened beverage category (means, $n = 322$).

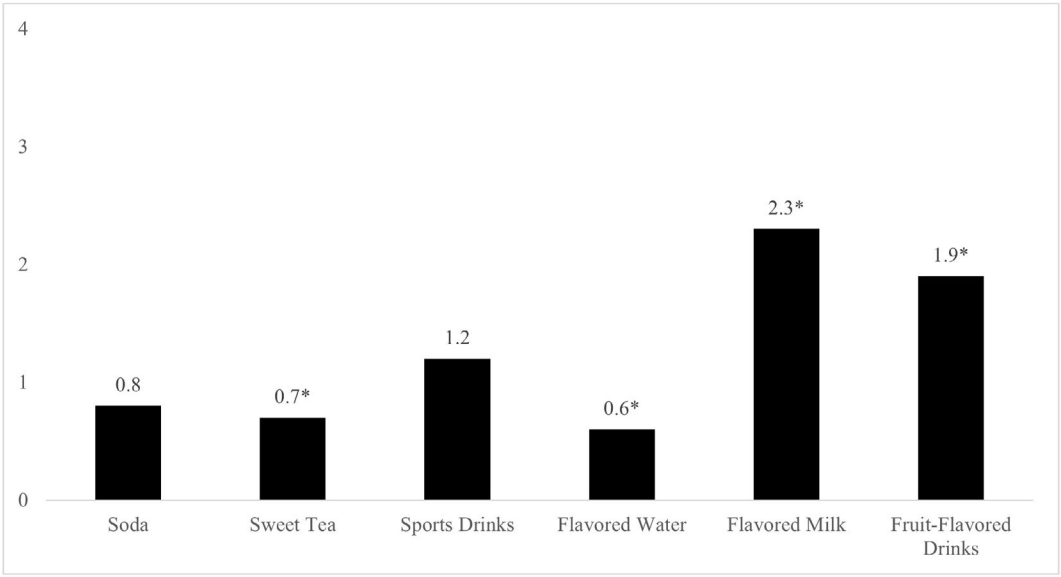


**FIGURE 3** Intention to give product to one's child over the next week in the control group by sugar-sweetened beverage category (means, times per week, $n = 322$).

control arm ($d = -0.32$, $p < 0.05$). As reported in Table 2, within specific SSB categories, this study found that pictorial warnings led to the largest reductions in the perceived healthfulness of flavoured water ($d = -0.34$), flavoured milks ($d = -0.28$) and sports drinks ($d = -0.25$) relative to the control arm (all $p < 0.05$). Warnings led to smaller, non-significant changes on participants' healthfulness perceptions of fruit-flavoured drinks ($d = -0.20$), sweet tea ($d = -0.18$), and soda ($d = -0.04$) compared to the control arm (all $p > 0.05$).

Finally, as reported in the main trial paper,[27] parents' overall intentions to give SSBs to their child (averaged across categories) were also significantly lower in the pictorial warnings arm compared to the control arm ($d = -0.26$, $p < 0.05$). As also reported in Table 2, we found that exposure to pictorial warning labels led to significantly lower intentions to give sports drinks ($d = -0.30$), flavoured water ($d = -0.24$) and sweet teas ($d = -0.22$) to children compared to the control arm (all $p < 0.05$). Pictorial warnings had smaller, non-significant effects on participants' intentions to give sodas ($d = -0.17$), fruit-flavoured drinks ($d = -0.14$) and flavoured milks ($d = -0.07$) to children compared to the control arm (all $p > 0.05$). Supplementary Table 1 further details the results for each SSB category and trial arm.

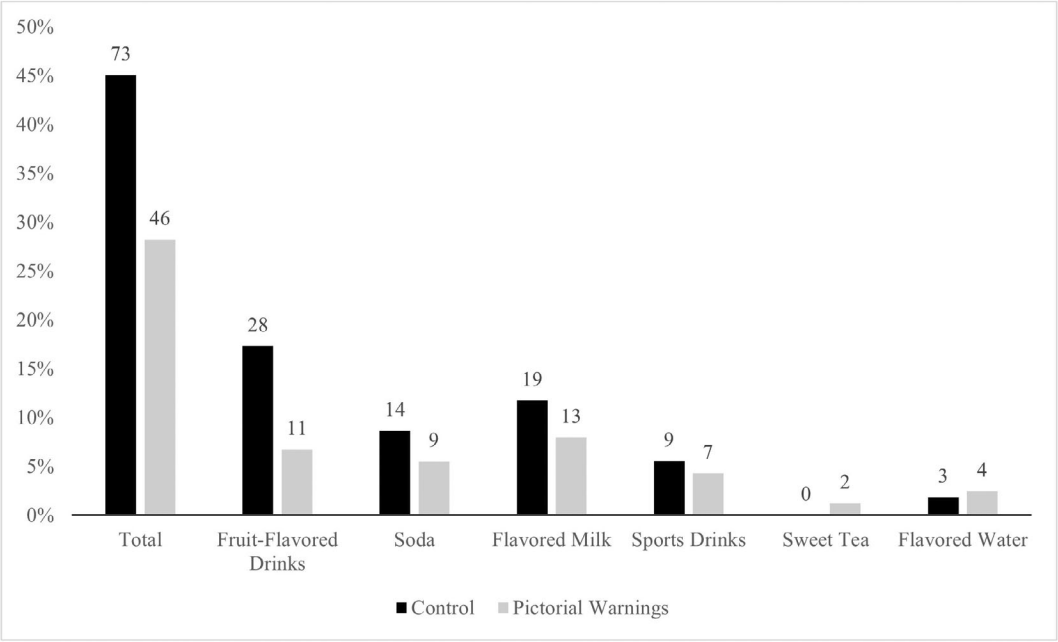


**FIGURE 4** Parents who purchased a sugar-sweetened beverage, by drink category and study arm (percentages and numbers in each group listed above each bar, $n = 325$).

**TABLE 2** Impact of pictorial warnings on sugar-sweetened beverage perceptions, by beverage category.

| | Perceived healthfulness | | Intention to give to one's child | |
|---|---|---|---|---|
| **Drink category** | **Cohen's *d*** | **95% CI** | **Cohen's *d*** | **95% CI** |
| Soda | −0.04 | −0.26, 0.18 | −0.17 | −0.39, 0.04 |
| Sweet tea | −0.18 | −0.40, 0.04 | −0.22[a] | −0.44, 0.00 |
| Sports drinks | −0.25[a] | −0.47, −0.03 | −0.3[a] | −0.52, −0.08 |
| Flavoured water | −0.34[a] | −0.56, −0.12 | −0.24[a] | −0.46, −0.02 |
| Flavoured milk | −0.28[a] | −0.5, −0.06 | −0.07 | −0.29, 0.15 |
| Fruit-flavoured drinks | −0.20 | −0.42, 0.02 | −0.14 | −0.36, 0.08 |
| Average | −0.32[a] | −0.54, −0.10 | −0.26[a] | −0.48, −0.04 |

[a]Statistically significant at the 95% confidence level.

## 4 | DISCUSSION

In the current study, we examined perceptions of SSB categories among US parents of children ages 2–12, as well as how the impact of pictorial warnings on purchases varied by category. We found underlying perceptions of flavoured milk as the most healthful SSB category among parents in the control group, followed by flavoured water, fruit-flavoured drinks and sports drinks. In terms of trial outcomes, as previously reported,[27] displaying pictorial health warnings about heart disease and type 2 diabetes on SSBs led to a reduction in parents' purchases of SSBs for their children compared to the control arm. In the current study, we examined how this impact differed across different SSB categories, and found that pictorial warnings led to the largest relative reductions in parents' purchases of fruit-flavoured drinks, followed by soda, flavoured milk and sports drinks. In addition, exposure to pictorial warnings led to the largest reductions in the perceived healthfulness of flavoured water, flavoured milks and sports drinks compared to control labels. Last, warnings led to the largest reductions in parents' intentions to give sports drinks, flavoured water and sweet teas to their children compared to control labels.

Our findings among parents in the control arm are in line with previous studies that have also found fruit-flavoured drinks and flavoured milks to be perceived as healthier than certain other types of SSBs.[20,23] These perceptions may be explained by 'health halo' effects, in which people extrapolate their perception of a positive attribute of a product that is highlighted and form a positive perception of the product as a whole.[32–40] For example, a previous content analysis has found that 97% of the fruit-flavoured drinks purchased by households with young children in the US contain at least one nutrition-related claim,[41] and an experimental study has shown that these types of claims increased the perceived healthfulness of fruit-flavoured drinks.[42] Similar claims and health halo effects have also been documented for sugar-sweetened dairy products, such as yogurts.[43,44]

Our trial results revealed that that pictorial warning labels had the largest effect on reducing the selection of fruit-flavoured drinks, which was also the case in a previous experiment that disaggregated the effects of text-only warnings on beverage selection by SSB category.[23] Our replication of this effect is important for informing policy efforts, given that fruit-flavoured drinks are the most consumed SSB category among US children.[11] In other words, pictorial warning labels appear to be an especially promising approach for reducing selection of sugary fruit-flavoured drinks, and are thus worth exploring as the White House seeks strategies to reduce intake of added sugars.[12] Despite this promise of pictorial warnings, it is worth noting that the experience with cigarette pack warnings suggests that this type of intervention could face legal challenges in the US context.[45] It is also worth highlighting that we did not find a significant reduction in parents' perceived healthfulness of fruit-flavoured drinks as a result of the warnings, suggesting that pictorial warnings can influence parents' behaviour without necessarily changing their healthfulness perceptions. However, healthfulness perceptions were a secondary outcome (not the one for which the study was powered), and warnings' impact on healthfulness perceptions of fruit drinks was still in the expected direction and similar in magnitude to the other SSB categories. Further research could unpack the mechanisms through which pictorial warnings affect purchasing behaviour by exploring what psychological factors mediate these effects, both overall and within SSB categories.

In the opposite direction, evidence suggests that sweet tea and flavoured water are not particularly popular choices for children,[20,46] which aligns with the low levels we observed of parents' purchases and intentions to give these beverages to their children. These beverages' lack of popularity might have meant that there was little room for warnings to further discourage purchases of these products, which could thus explain why warnings did not have a large effect on purchases of these categories. Future studies should explore possible non-nutritional factors, such as taste or branding, that influence the popularity of different types of beverages among children to better understand how they may interact with warning labels. It is also worth noting that sweet tea and flavoured water observed the smallest effects on purchases across SSB categories but the largest effects on parents' self-reported intention to give these beverages to their children. Given that naturalistic settings tend to elicit more realistic behaviours from participants,[19] this discrepancy highlights the importance of using naturalistic store laboratories for enhancing the external validity of findings.

Finally, our study was the first to evaluate the effects of warning labels on flavoured milks. Given that flavoured milks were rated as the most healthful beverage category among participants in the control group, warnings' impacts on selection of these beverages and intention to give these beverages to their children are noteworthy. Flavoured milks have been a controversial target for public health interventions,[47] and are often exempt from SSB policies (e.g., taxes) despite their added sugar contents.[48] However, we found flavoured milk purchases to be considerably responsive to warning labels in this study. This finding, coupled with the fact that most children who consume flavoured milk have been found to also consume plain milk,[49] suggests that warnings could be a useful policy approach for shifting children towards plain milk consumption.

Strengths of this study include the use of a naturalistic convenience store laboratory in which participants were able to purchase real products; the recruitment of a diverse sample of participants in terms of socioeconomic status, race, and ethnicity; random assignment into trial arms; and the use of professionally designed and pretested stimuli. An important limitation is that we were not able to conduct statistical testing on our selection outcome due to small cell sizes. We are also not able to assess the effects of pictorial warnings when selecting larger volume beverages from a wider range of choices or over time. In addition, the stimuli only referenced two specific health problems, and thus did not cover the full range of consequences that participants may link to the consumption of different types of beverages. Last, we cannot rule out the possibility that participants did not act as they normally would due to their perceptions of the purpose of the study. However, all participants received the same instructions to select a drink, a food, and a household item, with the goal of masking the purpose of the study.

## 5 | CONCLUSION

Existing evidence indicates that pictorial warning labels could be an effective strategy for reducing SSB consumption. Our study suggests that the effectiveness of such labels may vary across different types of beverages. Warning labels may have larger impacts on parents' purchasing behaviour for fruit-flavoured drinks compared to other SSB categories. Future research should assess the differential effects of warnings and the psychological mechanisms of how SSB warnings change behaviour across categories.

### AUTHOR CONTRIBUTIONS

Marissa G. Hall, Lindsey Smith Taillie, Anna H. Grummon, and Aline D'Angelo Campos conceptualized the study. Isabella C. A. Higgins coordinated the study and data collection. Aline D'Angelo Campos and Isabella C. A. Higgins performed the data analyses. Aline D'Angelo Campos and Marissa G. Hall drafted the manuscript, which all authors then reviewed. All authors approved the final manuscript.

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## CONFLICT OF INTEREST STATEMENT

No conflict of interest was declared.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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