ORIGINAL RESEARCH

CURRENT DEVELOPMENTS IN NUTRITION

Food and Nutrition Policy

Caregivers' Understanding of Ingredients in Drinks Served to Young Children: Opportunities for Nutrition Education and Improved Labeling

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ABSTRACT

Background: Against expert recommendations, sugar-sweetened beverages, especially fruit drinks, are consumed by young children. Misperceptions about drink ingredients and healthfulness can contribute to caregivers' provision.

Objectives: To assess caregivers' reasons for serving sweetened fruit-flavored drinks and unsweetened juices to their young children (1–5 y) and perceptions of product healthfulness and drink ingredients.

Methods: A cross-sectional online survey assessed participants' ($n = 1614$) perceptions of sweetened fruit-flavored drinks (fruit drinks and flavored water) and unsweetened juices (100% juice and water/juice blends) provided to their child in the past month, including product healthfulness, reasons for providing, and knowledge of product ingredients [added sugar, nonnutritive sweeteners (NNSs), percentage juice]. One-factor ANOVA compared perceived healthfulness of drink categories and types of sugar and NNSs, and differences between participants who could compared with those who could not accurately identify drink ingredients.

Results: Participants' top reasons for providing sweetened drinks included child liking it, being inexpensive, child asking for it, and being a special treat. Participants perceived 100% juice as healthiest, followed by juice/water blends, flavored waters, and, lastly, fruit drinks ($P < 0.05$). Many participants inaccurately believed the fruit drink or flavored water they served their child most often did not contain NNSs (59.0% and 64.9%) and/or added sugars (20.1% and 42.2%), when in fact they did, and 81.3–91.1% overestimated the percentage juice in the drink. Perceived healthfulness of fruit drinks was associated with caregivers' belief that the drink contained added sugar ($P < 0.05$), but not with their belief that it contained NNS; increased accuracy was associated with decreased perceived healthfulness ($P < 0.05$).

Conclusions: Inaccurate understanding of added sugar, NNSs, and percentage juice in drinks served to young children was common and could contribute to sugary drink provision. Public health efforts should seek to improve labeling practices and revise nutrition education messages.

Curr Dev Nutr 2022;6:nzab151.

Keywords: fruit-flavored drink, sugar-sweetened beverage, added sugars, nonnutritive sweeteners, food labeling

Manuscript received October 27, 2021. Initial review completed December 10, 2021. Revision accepted December 15, 2021. Published online December 22, 2021.
This work was supported by a grant from the Robert Wood Johnson Foundation, Princeton, NJ. The views expressed here do not necessarily reflect the views of the Foundation. The Robert Wood Johnson Foundation had no role in the design, analysis, interpretation of the data, writing of this article, or decision to submit this article for publication.
Author disclosures: The authors report no conflicts of interest.
Supplemental Tables 1 and 2 are available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at https://academic.oup.com/cdn/.

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Abbreviations used: HFCS, high-fructose corn syrup; NNS, nonnutritive sweetener; SSB, sugar-sweetened beverage; WIC, Special Supplemental Nutrition Program for Women, Infants, and Children.

Introduction

Domestic and global health organizations recommend limiting the consumption of sugar-sweetened beverages (SSBs) in children (1–3), given their long-term effects on health such as weight gain (4), type 2 diabetes, and cardiovascular disease, among others (5). Despite recommendations, SSBs are still highly consumed among young children (6, 7). Fruit drinks (which include fruit-flavored and juice drinks) in particular, are the most common type of SSB consumed by children aged <4 y (7) and the top source of added sugar in toddlers (8). Flavored waters, which are sweetened fruit-flavored drinks labeled as water, are also a popular drink commonly marketed towards children (9). In addition to sugar, most of these drinks also contain nonnutritive sweeteners (NNSs), ingredients increasingly present in US food and beverage purchases (10). NNSs are not recommended for consumption by children (1, 2, 11), given potential effects on sweet taste preferences, microbiome health, and other unknown longer-term health outcomes (12–15).

Provision of SSBs starts as early as the first year of life, and factors such as education level, socioeconomic status, race, and mother's age have been associated with provision (16). Because dietary patterns early in a child's life play a critical role in future consumption habits, interventions to prevent caregivers' provision of sugar-sweetened drinks are

needed (17–19). However, there is a gap in understanding the reasons why caregivers serve these drinks to young children. Previous research has shown certain types of SSBs, such as fruit drinks, are perceived as healthier than others, such as soda (20–22), which might begin to explain their provision at an early age.

In this study, we focused on 4 types of drinks commonly marketed for young children to consume (9): unsweetened juices—*1*) 100% juice and *2*) juice/water blends—and sweetened fruit-flavored drinks—3) flavored waters and *4*) fruit drinks. Unsweetened juices contain no added sugars or NNS and include 2 drink categories: 100% juice consists only of juice (can be from concentrate), whereas juice/water blends consist of juice or juice concentrate and water only. Sweetened fruit-flavored drinks contain added sugars and/or NNS and include 2 categories: flavored waters are water beverages (as indicated on product package), whereas fruit drinks are fruit-flavored drinks or juice drinks (some can have some juice) (9). These drinks marketed for children typically contain nutrition-related claims (9) (e.g., "100% vitamin C," "low sugar"), which substantially affect consumers' purchasing decisions (23). In addition, pictures of fruit on packages, cross-branding with unsweetened juices, and visuals suggesting the product is "natural" can also influence caregivers' perceptions of a drink's healthfulness (24). Recent research has shown that caregivers have difficulty recognizing the presence of added sugar, NNS, and percentage juice in these drinks (25), which might also contribute to parents serving these to their children at an early age.

The goal of our study was to understand the reasons and perceptions that underlie caregivers' provision of sweetened fruit-flavored drinks and unsweetened juices to their young children (aged 1–5 y). Specific objectives included: *1*) to assess caregivers' reasons for serving sweetened fruit-flavored drinks and unsweetened juices, *2*) to determine perceived healthfulness of different drink types and their ingredients, *3*) to assess accuracy in identifying drink ingredients (added sugars, NNS, and percentage juice), and *4*) to investigate associations between ingredient accuracy and perceived product healthfulness. We hypothesized that accuracy in identifying drink ingredients would be low, and that it would be positively associated with perceived product healthfulness.

Methods

This study used a cross-sectional online survey of caregivers with young children (aged 1–5 y). Data were collected in October 2019.

Study design and participants

Participants were recruited by Innovate MR (26), an online survey company that maintains a large panel whose members voluntarily agree to participate in online surveys. Participants receive rewards and gift cards for participating in the panel, as well as points when they complete a survey, but do not receive monetary incentives for individual surveys, to promote quality of responses. Furthermore, Innovate MR recruits its panel members through social networks, in-app banner advertising, and numerous web and SMS databases (26). Innovate sent an e-mail to a sample of their qualified panel members [i.e., adults with young children (aged 1–5 y) in their household] to invite them to participate in the survey. The e-mail included a link to the online survey if they wished to participate. Quota sampling ensured ≥150 each black, Hispanic, and Asian participants for comparison purposes. Eligibility for study participation included being responsible for what their child eats and drinks (either primary or shared) and child not having a disease or condition requiring a special diet (such as lactose intolerance, celiac disease, phenylketonuria). Participants who had >1 eligible child were asked to report information about the child with the most recent birthday. The study was determined to be exempt by the University of Connecticut's Institutional Review Board (document number X19-134).

Study instrument

Participants first read an information sheet about the study and then checked a box to indicate their consent to participate before completing the survey.

The survey included 4 sections: *1*) frequency of providing different types of drinks to their child and reasons for serving, *2*) accuracy in identifying ingredients contained in the drinks served, *3*) perceived healthfulness and other behavioral factors, and *4*) demographic characteristics. **Supplemental Table 1** includes specific questions of the survey instrument. The survey was administered via Qualtrics survey software and took ∼25 min to complete. Responses to additional survey questions have been previously reported (25).

Measures

Drink provision.

Provision of specific products in 4 categories commonly served to children was assessed, including unsweetened juices—1) 100% juice and *2*) juice/water blends—and sweetened fruit-flavored drinks—3) flavored waters and *4*) fruit drinks. For each category, participants were asked, "In the last month, did you give your child any [*drink category*]?" followed by a definition of the drink type. In the same question, they were asked, "Please select all that you gave your child in the past month" followed by a list of popular products in that category, with options to write in another product or select "I did not give my child any [*drink category*] in the past month." The products listed in each drink category included those commonly provided to children, based on 2018 sales data (9). For brands containing products in >1 category (e.g., Capri Sun), the survey listed both the brand and variety name (e.g., Capri Sun Original compared with Capri Sun Roarin' Waters). Caregivers also reported whether they served other categories of drinks to their child during the past month: plain water, plain milk, toddler milk, flavored milk, soda (regular and diet), sports drinks, iced teas, and smoothie drinks.

Reasons for providing.

Caregivers who reported serving unsweetened juices and/or fruit-flavored drinks then selected the top 3 reasons for providing the specific brand they reported providing most often to their child, from a list of reasons identified in previous research (20), with an open-ended option for "other."

Accuracy in identifying ingredients.

For each drink category that caregivers reported serving their child in the past month, they were then asked to indicate whether they thought the specific brand they reported serving most often contained added sugar (yes/no), NNSs (yes/no, described as "diet sweeteners" in the survey, a term best understood in previous focus groups) and the

percentage juice (0–100% sliding scale). Accuracy (yes = 1, no = 0) was defined as correctly identifying each ingredient (presence of added sugars and NNS, and percentage juice range) for each drink category. **Supplemental Table 2** presents criteria used for defining accuracy for each drink category and brand.

Perceived healthfulness of drink categories, added sugar, and NNSs. All caregivers rated the healthfulness of fruit drinks, flavored water, 100% juice, and juice/water blends, including categories they had not served their child; as well as plain water, plain milk, and regular and diet soda for comparison purposes. They also rated the healthfulness of commonly used added sugars [sugar, cane sugar, high-fructose corn syrup (HFCS), sucrose, and agave] and NNSs (sucralose, aspartame, stevia). Answers were given on a scale of 1 (very unhealthy) to 10 (very healthy).

Demographic variables. We collected age, gender, and race for caregiver and child. For caregivers, we also collected Hispanic ethnicity, education level, family history of nutrition-related health conditions (obesity, hypertension, diabetes, and cardiovascular disease), and participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

Data cleaning and analysis

A total of 2591 participants responded to the survey invitation. After excluding those who did not agree to participate ($n = 59$), did not meet eligibility criteria ($n = 703$), or did not complete the survey ($n = 215$), the final analytic sample included 1614 caregivers. Data were analyzed using STATA statistical package version 16 (StataCorp LLC). In addition to ingredient-specific accuracy, we created a composite accuracy score for each drink category served by summing the 3 individual ingredient scores (added sugars, NNSs, and percentage juice). This composite accuracy score ranged from 0 to 3 for the number of ingredients accurately identified.

One-factor ANOVAs with post hoc comparisons, applying Bonferroni correction, were used for comparisons of interest as follows: *1*) Drinks: 100% juices compared with *a*) juice/water blends, *b*) flavored waters, and *c*) fruit drinks; juice/water blends compared with *a*) flavored waters and *b*) fruit drinks; flavored waters compared with fruit drinks; and fruit drinks compared with regular soda. *2*) NNSs: sucralose compared with *a*) aspartame and *b*) stevia; aspartame compared with stevia. *3*) Added sugars: sugar compared with *a*) cane sugar, *b*) HFCS, *c*) sucrose, and *d*) agave. Independent sample *t* tests determined differences in mean perceived healthfulness of fruit drinks and flavored waters by ingredient perception (i.e., participants who believed the drink contained an ingredient compared with those who did not). ANOVAs with Scheffe post hoc correction test determined whether perceived healthfulness of sweetened drinks differed by composite ingredient accuracy score.

Results

Sample characteristics

Participants in the study were mostly female, between the ages of 25 and 44, and diverse in race, ethnicity, and education (**Table 1**). About one-fifth reported currently participating in WIC. Participants' children were 48% female, and 62% were 3–5 y old.

TABLE 1 Sociodemographic characteristics of study participants ($n = 1614$)

	n	%
Caregivers' characteristics		
Female	1272	78.8
Age, y		
<25	142	8.8
25–34	821	50.9
35–44	531	32.9
≥45	104	6.4
Education level		
High school or less	351	21.7
Some college, or 2-y degree	658	40.8
College complete, 4-y or more	591	36.6
WIC participant	332	20.6
Race		
White only	943	58.4
Black only	237	14.7
Asian only	144	8.9
Mixed/other	136	8.4
Hispanic	318	19.7
Family history		
Obesity	218	13.5
Hypertension	226	14.0
Diabetes	280	17.3
Cardiovascular disease	71	4.4
Any of the above	509	31.5
Child characteristics		
Female	773	47.9
Age, y		
1 to 2	620	38.4
3 to 5	994	61.6
Race		
White only	906	56.1
Black only	222	13.8
Asian only	110	6.8
Mixed/other	236	14.6

Drink provision and reasons for providing

The most commonly provided drink type was 100% juice (90.7% provided), followed by fruit drinks (61.0%), juice/water blends (61.3%), and flavored waters (48.6%). Caregivers' reasons for providing differed by category, although some reasons were commonly mentioned across drink categories (**Table 2**). For example, their "child likes it" was the top reason in all 4 categories (selected by >50%). More than 30% selected "it's healthy" for unsweetened juices; "my child asks for it" for sweetened fruit-flavored drinks; and low cost for fruit drinks. **Figure 1** displays the percentage of caregivers who provided additional categories of drinks to their child in the past month.

Accuracy in identifying ingredients

Figure 2 shows the actual percentage juice, added sugar, and NNS content of the brands identified in each category. All 100% juice and juice/water blend brands did not contain added sugar or NNS. The percentage juice in most juice/water blends ranged from 35% to 70%. All sweetened fruit-flavored drinks contained added sugar, and most contained NNS (3 of 4 flavored waters and 8 of 9 fruit drinks). Flavored

TABLE 2 Caregivers' reasons for serving different types of unsweetened juices and sweetened fruit-flavored drinks ($n = 1614$)[1]

	Unsweetened juices		Sweetened drinks	
Reason	100% juices ($n = 1435$)	Juice/water blends ($n = 930$)	Flavored waters ($n = 774$)	Fruit drinks ($n = 982$)
My child likes it	63.4	49.9	55.0	56.9
It's healthy	35.3	38.7	25.5	12.5
It was inexpensive	16.9	15.2	22.6	35.3
My child asks for it	24.5	23.2	31.4	33.5
It comes in a box or pouch	18.2	28.7	21.1	20.2
It provides vitamins or nutrients	27.0	23.4	17.1	11.3
It's a special treat	18.0	18.6	26.4	28.5
It's what we always buy	18.3	11.3	14.6	18.6
It was on sale or a special deal	17.4	19.7	17.4	18.9
It provides fruits or vegetables	19.6	18.9	8.4	6.1

[1]Numbers reported are percentages of the subsample reporting provision of each beverage type.

waters had 0% juice, whereas the percentage juice in fruit drinks ranged from 0% to 11%. Participants' accuracy in identifying ingredients in the drinks they served their child most often varied by category, brand, and specific ingredient assessed (**Table 3**). When estimating percentage juice, accuracy was lowest for flavored waters (9% answered correctly) and fruit drinks (19%), with most caregivers perceiving that they contained more juice than they actually did (data not shown). On average 58% knew that flavored waters contained added sugar, and 53% to 54% knew that 100% juice and juice/water blends did not, whereas the accuracy of knowing that fruit drinks contained added sugar was considerably higher (80%). More than 80% knew that 100% juice and juice/water blends did not contain NNSs. However, <30% of participants who served their child a fruit drink or flavored water that contained NNS accurately answered that it contained NNS.

Figure 2 additionally displays composite accuracy score by drink category. Overall accuracy was lower for flavored waters and fruit drinks, with 76% and 57% of participants accurately identifying 0 or 1 ingredient, respectively. In contrast, the majority accurately identified 2 or 3 ingredients in 100% juices (74%) and juice/water blends (64%).

Perceived healthfulness of drinks, added sugars, and NNSs

Caregivers' perceptions of the healthfulness of different drink categories and ingredients are presented in **Figure 3**. Among the 4 categories, caregivers perceived 100% juice to be healthiest, followed by juice/water blends, flavored waters, and lastly fruit drinks. Plain water and milk were rated as the healthiest drinks, whereas regular and diet soda were rated as significantly less healthy than fruit drinks. Among types of NNS, stevia was perceived as healthier than both sucralose and

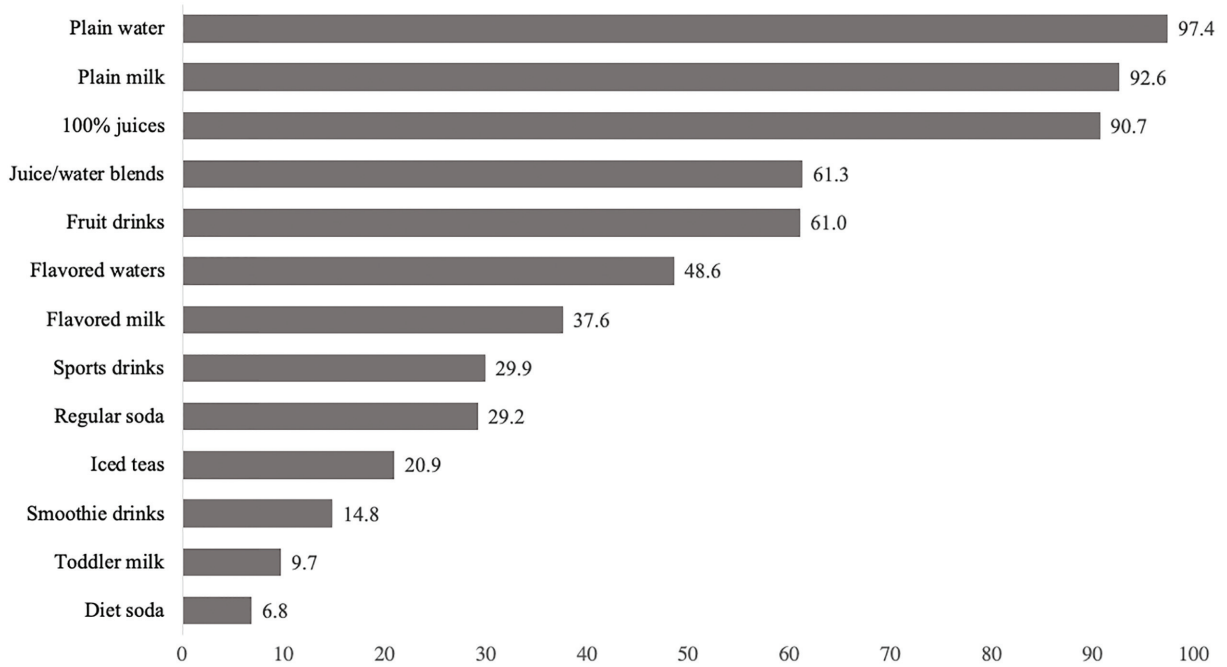

FIGURE 1 Percentage of caregivers who provided different types of drinks for their child in the past month ($n = 1614$).

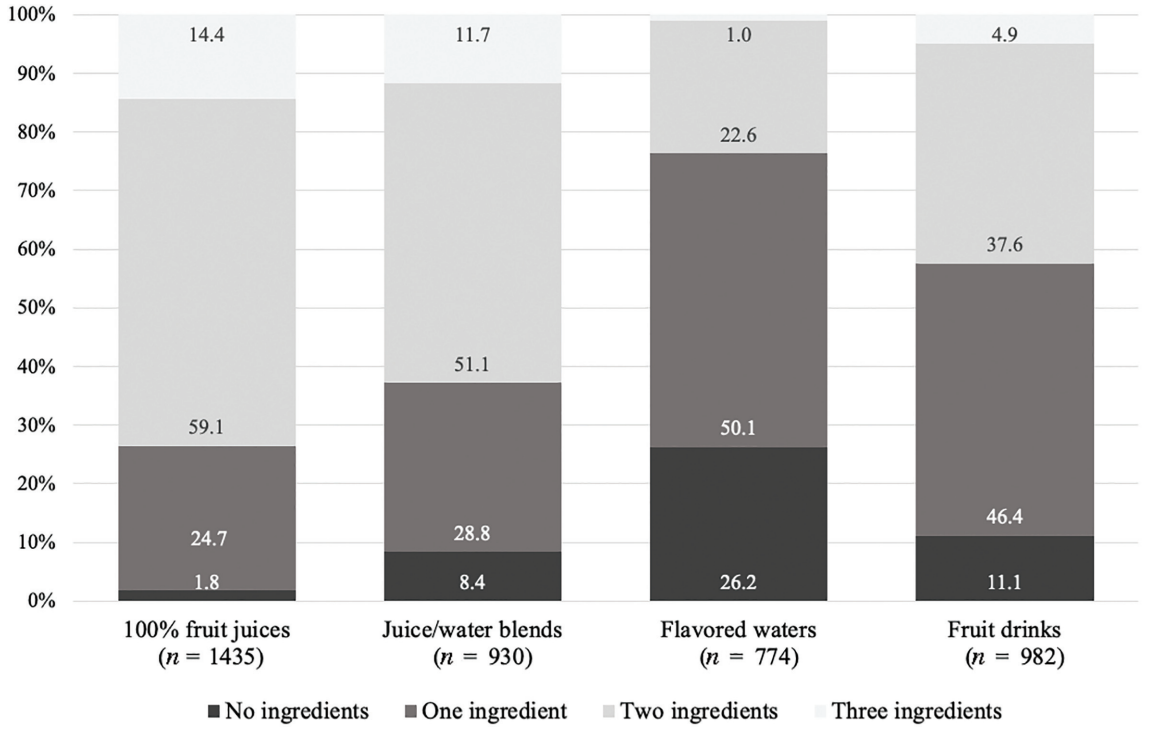

FIGURE 2 Number of ingredients (added sugars, nonnutritive sweeteners, percentage juice) accurately identified in different types of drinks provided to children.

aspartame. Among types of added sugars, sugar was rated healthier than HFCS and sucrose, but less healthy than cane sugar and agave. All contrasts were statistically significant ($P < 0.05$).

Healthfulness of drinks by caregivers' beliefs and accuracy regarding ingredients

Table 4 displays caregivers' perceived healthfulness of fruit drinks and flavored waters stratified by their beliefs and accuracy regarding ingredients. For both drink categories, caregivers who believed the drink did not contain added sugar rated it as healthier (1–10 scale) compared with those who knew it contained added sugar: 5.9 ± 2.8 compared with 4.7 ± 2.3 for fruit drinks ($P < 0.001$), and 6.9 ± 2.5 compared with 6.4 ± 2.3 for flavored waters ($P = 0.002$). In addition, caregivers who overestimated the percentage juice in a fruit drink rated it as healthier than those who were accurate about juice content (5.3 ± 2.5 compared with 3.5 ± 1.9; $P < 0.001$). Finally, for fruit drinks only, mean perceived healthfulness differed according to composite accuracy score ($P < 0.001$); that is, increased ingredient accuracy was associated with decreased perceived drink healthfulness.

Discussion

In this cross-sectional online study, we found that misperceptions regarding ingredients in drinks caregivers serve their children were common, with many inaccurately believing the drinks they served did not contain added sugar and/or NNSs, and overestimating the drinks' percentage juice. These misperceptions were widespread and might contribute to sugary drink provision. Our study confirms prior research that has shown that perceived healthfulness of sugary drinks varies by drink type (20–22) and that caregivers are prone to misperceptions regarding product ingredients (25). We extend this prior research by assessing how perceived healthfulness relates to ingredient accuracy and identifying common misperceptions for different types of drinks and ingredients.

The composite accuracy score, which sought to assess misperceptions for each drink category as a whole, showed that participants were more likely to inaccurately identify ingredients in fruit drinks and flavored waters compared with unsweetened juices. This is concerning, because these drinks contain ingredients not recommended for children (1), such as NNSs and added sugars. In particular, caregivers did not realize that many of the drinks they served contain NNSs. For example, ~60% inaccurately thought that the fruit drink they provided their child did not contain NNS, when in fact it did. Health and nutrition organizations caution against consumption of drinks with NNSs by children (1, 11), yet many products that are marketed to children contain them (9). Caregivers express concerns about serving drinks with NNS to their children (20, 27), which suggests that caregivers might not provide these drinks if the NNS content was clearly disclosed on the package. That differences in perceived healthfulness of NNSs depend on the type also reveals consumer misperceptions. Participants considered stevia to be healthier than sucralose and aspartame, which might be because it is a plant extract and often marketed as "natural." However, all types of NNS are not recommended for children given how they might affect development of sweet taste preferences and as a precautionary measure given unknown longer-term effects (15).

TABLE 3 Accuracy regarding ingredients contained in unsweetened juices and sweetened fruit-flavored drinks caregivers served to their child in the past month ($n = 1614$)[1]

Products served most often by drink category	Number of caregivers[2]	Accuracy by ingredient					
		Percentage juice		Added sugars		NNS	
		n	%	*n*	%	*n*	%
100% fruit juices[3]	1435	674	47.0	756	52.7	1241	86.5
Mott's 100% juice	377	202	53.6	173	45.9	334	88.6
Capri Sun 100% juice	330	118	35.8	215	65.2	263	79.7
Juicy Juice 100% juice	263	140	53.2	129	49.0	236	89.7
Apple & Eve 100% juice	144	58	40.3	59	41.0	125	86.8
Minute Maid 100% juice	130	54	41.5	97	74.6	105	80.8
Tropicana Orange Juice	103	42	40.8	53	51.5	93	90.3
Juice/water blends[4]	930	269	28.9	501	53.9	775	83.3
Capri Sun	373	135	36.2	136	36.5	286	76.7
Honest Kids	318	80	25.2	222	69.8	291	91.5
Apple & Eve	120	23	19.2	75	62.5	94	78.3
Mott's Sensibles	106	27	25.5	62	58.5	93	87.7
Flavored waters[5]	774	69	8.9	449	58.0	244	31.5
Capri Sun	409	11	2.7	246	60.1	84	20.5
Vitamin Water	156	18	11.5	81	51.9	109	69.9
Tum E Yummies	143	5	3.5	102	71.3	32	22.4
Fruit drinks[6]	982	184	18.7	785	79.9	369	37.6
Capri Sun Original	213	20	9.4	154	72.3	179*	84.0
Sunny D	147	17	11.6	115	78.2	39	26.5
Kool-Aid ready-made	145	33	22.8	129	89.0	37	25.5
Kool-Aid drink mix	123	53	43.1	106	86.2	26	21.1
Minute Maid Lemonade	95	14	14.7	83	87.4	25	26.3
Hawaiian Punch	94	15	16.0	77	81.9	28	29.8
Little Hug	74	8	10.8	62	83.8	18	24.3
Hi-C	59	11	18.6	43	72.9	13	22.0

[1] NNS, nonnutritive sweetener.
[2] Numbers within brands do not add to total per category because "other" brands not listed. Brand listed refers to the brand served most often to child. "Other" additional brands were written in for 6.1% of 100% juice (88 of $n = 1435$), 1.4% of the juice/blends (13 of $n = 930$), 3.3% of the fruit drinks (32 of 982), and 8.5% of the flavored waters (66 of $n = 774$).
[3] All 100% juices contained 100% juice, no added sugar, and no NNS.
[4] Most juice/water blends contained no added sugar and 38–66% juice. Capri Sun for this category included Fruit & Veggie Blends, Organic, Refreshers. Mott's Sensibles contains fruit juice + coconut water, so although a juice/water blend, the information panel lists 100% juice.
[5] Includes Roarin' Waters, Sport. All flavored water contained added sugar and NNS, except Vitamin Water, which did not contain NNS.
[6] All fruit drinks contained added sugar and NNS, except Capri Sun Original, which did not contain NNS. Kool-Aid ready-made included Jammers and Bursts.

Misperceptions regarding whether or not a drink contained added sugar were more prevalent for unsweetened juices (100% juice and juice/water blends), with almost half our sample believing they have added sugars, when they do not. For fruit drinks, close to 1 in 5 caregivers believed that the products had no added sugars, when in fact they did. These misperceptions could reflect consumer confusion regarding differences between total and added sugars. In January 2020, the FDA's requirement to disclose added sugars on labels came into full effect for large manufacturers (28), and participants were interviewed in 2019. In a randomized experiment (29), the new label disclosing added sugars was found to improve understanding regarding added sugar content in a diverse set of products compared with the label not disclosing these, which is encouraging. However, disclosure did not affect purchase intentions of the products. Health warning labels [e.g., "Drinking beverages with added sugar(s) contributes to obesity, diabetes and tooth decay"] could hold promise for improving caregivers' understanding of health harms associated with overconsumption of SSBs and lowering purchase intentions (30, 31). For fruit drinks specifically, warning labels decreased perceived product healthfulness and consumption interest (32) and reduced odds of selecting fruit drinks for child consumption, an effect mediated by changes in health beliefs and risk perceptions (21).

Because perceived healthfulness of drinks has been associated with providing the drink to children (20, 22), it is important to understand what might influence caregivers' perceptions of a drink's healthfulness. In our study we found that caregivers' beliefs that a drink contained added sugar was associated with lower perceived healthfulness, but this was not the case for NNSs. That is, caregivers who believed a drink contained NNS did not rate the healthfulness of the drink they served differently than those who did not believe it contained NNS. These findings are somewhat unexpected given prior research on caregivers' concerns regarding NNSs in the drinks they serve their children (20) as well as in foods in general (33, 34), showing that they prefer to avoid NNSs and have negative feelings about these. Although the latest Dietary Guidelines for Americans state that NNSs are not recommended for children aged <2 y (2), they do not include statements regarding consumption by other age groups. However, other expert recommendations advise against serving drinks with NNSs to children aged <5 y (1) and against prolonged consumption by children in general (11). These inconsistencies might contribute to caregiver confusion about NNS.

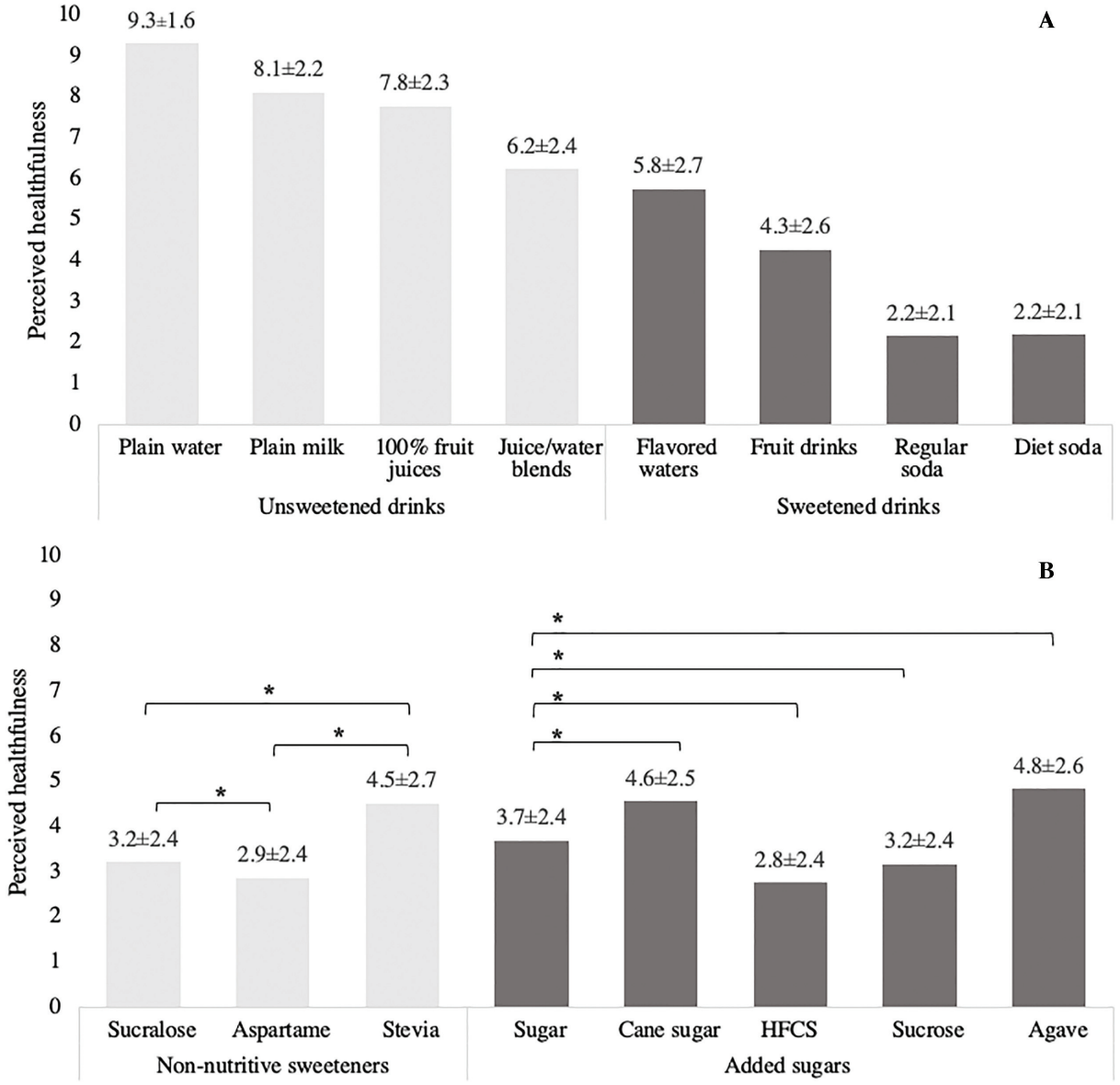

FIGURE 3 Perceived healthfulness reported for different types of beverages, nonnutritive sweeteners, and added sugars ($n = 1614$). (A) Perceived healthfulness of different drink categories. (B) Perceived healthfulness of nonnutritive sweeteners and added sugars. Numbers reported are means ± SD. For panel A, all pairwise comparisons are statistically significant ($P < 0.05$), per ANOVA with Bonferroni adjustment, except for regular compared with diet soda. *$P < 0.05$. HFCS, high-fructose corn syrup.

Limitations and strengths

Our study does have limitations. Our sample was drawn from an online panel of consumers who voluntarily participated in the survey. There might be reasons that motivated participants to participate in the survey (compared with those who did not) that make them different from the broader population, which might affect our study's generalizability. However, online panel surveys are broadly used when assessing consumers' knowledge and behavior. Participants might have been subject to misreporting in brands and frequency, given that they were asked about the drinks provided to their children in the previous month (as opposed to the previous day). However, given the frequency of consumption reported in previous studies, assessing over the past month was appropriate for our research questions. Given that products from different drink categories have similar names and marketing strategies, parents might have misidentified the drink category(ies) they provided their child. To minimize this possibility, the survey questions included both definitions of drink categories and a list of popular products in the category, including both brand and variety names, when assessing whether participants provided drinks in each category.

Despite these limitations, our study had strengths worth highlighting. Perceived healthfulness of drink categories has been assessed in other studies (20–22, 35), but our study also assessed perceived

TABLE 4 Perceived healthfulness of sweetened fruit-flavored drinks according to caregivers' beliefs and accuracy regarding ingredients

	Fruit drinks (n = 982)						Flavored waters (n = 774)					
			Perceived healthfulness[1]						Perceived healthfulness[1]			
	n	%	Mean	SD	F	P value	n	%	Mean	SD	F	P value
Added sugar												
Believes drink contains it	785	80	4.7	2.3	39.6	<0.001[2]	449	58	6.4	2.3	9.8	0.002[2]
Believes drink does not contain it	197	20	5.9	2.8			325	42	6.9	2.5		
Nonnutritive sweetener (NNS)												
Believes drink contains it	224	23	5.0	2.4	0.1	0.788[3]	182	24	6.5	2.2	0.2	0.655[3]
Believes drinks does not contain it	758	77	4.9	2.7			592	76	6.6	2.5		
Percentage of juice in drink												
Overestimates	798	81	5.3	2.5	75.8	<0.001[4]	705	91	6.6	2.4	1.6	0.205
Accurate	184	19	3.5	1.9			69	9	6.9	2.4		
Composite accuracy score												
0 accurate ingredients	109	11	6.0	2.6	17.1	<0.001[5]	203	26	6.7	2.6	0.5	0.593
1 accurate ingredient	456	46	5.1	2.4			388	50	6.5	2.4		
2 or 3 accurate ingredients	417	42	4.5	2.4			183	24	6.5	2.2		

[1]Measured on a scale of 1 = very unhealthy to 10 = very healthy.
[2]Denotes significance in comparing mean perceived healthfulness between participants who thought the drink contained added sugar compared with those who did not think it contained it.
[3]Denotes significance in comparing mean perceived healthfulness between participants who thought the drink contained NNS compared with those who did not think it contained it.
[4]Denotes significance in comparing mean perceived healthfulness between participants who overestimated the percentage of juice in the drink compared with those who were accurate.
[5]Per Scheffe post hoc test all contrasts were significant at $P < 0.05$ for "Fruit drinks:" 0 vs. 1 ($P = 0.003$), 0 vs. 2–3 ($P < 0.001$), 1 vs. 2–3 ($P = 0.003$).

healthfulness of specific ingredients and caregivers' accuracy in understanding ingredients in the drinks they serve their child. Furthermore, assessing perceived healthfulness and ingredient accuracy for specific brands within the drink categories enabled us to further identify areas for improvement in labeling and nutrition education efforts. Finally, our large and diverse sample ensured adequate subsamples to make comparisons among those reporting providing the different drink categories.

Implications for policy and practice

Public health campaigns are necessary and could highlight several key messages. First, our findings suggest that additional campaigns recommending plain water and milk as the only drinks for toddlers and young children are needed. Second, juice/water blends are a lower-calorie, lower-sugar alternative to 100% juice, which is an important distinction to convey given that caregivers perceived juice/water blends to be less healthy than 100% juice. Third, educational campaigns should inform caregivers that flavored waters and fruit drinks contain added sugar and NNSs, which are not recommended for young children, and that they contain little or no juice. Flavored waters, in particular, may be prone to confusion due to their name, which might imply they are "just water." As shown in our results, they were perceived as healthier than fruit drinks. Finally, health professionals in clinical settings such as pediatricians and dietitians should reinforce these public health messages.

As has also been also shown in prior research (25, 36), current labeling of sweetened fruit-flavored drinks and unsweetened juices makes it difficult to distinguish between different product types, as well as identify those that have added sugar and/or NNSs. Front-of-package disclosures for these key nonrecommended ingredients could improve accuracy in identifying ingredients in drinks. Since January 2020, the FDA has required food companies to disclose added sugars in the nutrition facts panel of their products. Although this requirement might help to better inform consumers, nutrition panels are not always read or understood (37), a barrier that could be reduced by providing standardized disclosures and/or warning labels on package fronts.

Further complicating public health efforts to discourage consumption of sweetened drinks, healthfulness was not a top reason for provision. Even though caregivers who provided fruit drinks rated them as healthier than caregivers who did not provide them, they provided them for other reasons such as low cost and children's requests. Therefore, policies that affect underlying factors related to food choice are required. Krieger and colleagues (38) provide a helpful framework of potential policies. Sugar taxes, for example, would increase the price of SSBs while raising revenue that could finance additional public health campaigns. In addition, the importance of children's requests in parents' provision of sweetened fruit-flavored drinks indicates a continued need to reduce children's exposure to marketing for these products.

Unhealthy food and beverage marketing is an important determinant of dietary intake and food preferences in children (39, 40), and children's exposure remains high despite industry self-regulation of advertising to children (9, 41). Indeed, "pester power"—defined as children's influence through requests for certain products to caregivers—can undermine attempts by caregivers to provide their child with a healthy diet (42). Furthermore, in the United States, black youth are disproportionately exposed to television food advertising compared with white youth

(43, 44), and advertising on Hispanic- and black-targeted TV programming is more likely to promote unhealthy food categories, including sugary drinks (45). This targeted marketing likely contributes to disparities in diet and diet-related diseases affecting communities of color (6, 46). Policies seeking to discourage sugary drink consumption could be approached, therefore, with a health equity lens in mind.

Conclusion

In summary, misperceptions regarding sweetened fruit-flavored drinks and unsweetened juices (and their ingredients) that caregivers provide young children are common. Effective public health efforts must address the underlying factors leading to sweetened drink provision, including misperceptions about drink ingredients, low cost, and child requests, to contribute to improved diet, health, and well-being of young children in the longer term.

Acknowledgments

We thank Ahmad Kibwana-Jaff and Haley Gershman for their assistance in data collection.

The authors' responsibilities were as follows—JLH, FF-M: led the conceptualization, obtained funding, and acquired the data for this study; MLJ: conducted the analyses and wrote the first draft of the manuscript with substantial input from all coauthors; and all authors: assisted with data interpretation, provided critical revisions, and read and approved the final manuscript.

Data Availability

Data described in the manuscript, code book, and analytic code will be made available upon request pending authorization from the senior author of the study.

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