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An online randomized trial of healthy default beverages and unhealthy beverage restrictions on children's menus

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ABSTRACT

Several U.S. jurisdictions have adopted policies requiring healthy beverage defaults on children's menus, but it is unknown whether such policies or restrictions leads to fewer calories ordered. We recruited 479 caregivers of children for an online choice experiment and instructed participants to order dinner for their youngest child (2–6 years) from two restaurant menus. Participants were randomly assigned to one type of menu: 1) standard beverages on children's menus (*Control*; n = 155); 2) healthy beverages on children's menus (water, milk, or 100% juice), with unhealthy beverages available as substitutions (*Default*; n = 162); or 3) healthy beverages on children's menus, with no unhealthy beverage substitutions (*Restriction*; n = 162). We used linear regression with bootstrapping to examine differences between conditions in calories ordered from beverages. Secondary outcomes included percent of participants ordering unhealthy beverages (full-calorie soda, diet soda, and/or sugar-sweetened fruit drinks) and calories from unhealthy beverages. Calories ordered from beverages did not differ across conditions at Chili's [*Default*: 97.6 (SD = 69.8); p = 0.82; *Restriction*: 102.7 (SD = 71.5); p = 0.99; *Control*: 99.4 (SD = 72.7)] or McDonald's [*Default*: 90.2 (SD = 89.1); p = 0.55; *Restriction*: 89.0 (SD = 81.0); p = 0.94; *Control*: 96.5 (SD = 95.2)]. There were no differences in the percent of orders or calories ordered from unhealthy beverages. Though *Restriction* participants ordered fewer calories from full-calorie soda [(3.0 (SD = 21.6)] relative to *Control* participants [13.4 (SD = 52.1); p = 0.04)] at Chili's, we observed no such difference between *Default* and *Control* participants, or across McDonald's conditions. Overall, there was no effect of healthy default beverages or restrictions in reducing total calories ordered from unhealthy beverages for children in our experiment.

1. Introduction

Excess weight among youth is predicted by poor dietary habits (Rocha et al., 2017), and fast food and sugary drinks account for approximately 10–15% of daily calories consumed by children and adolescents (Wang et al., 2008). Recent data indicate that over one-third of children and adolescents in the U.S. consume fast food on a given day, and the average percentage of calories consumed from fast food among children and adolescents increased from 10.6% in 2009–2010 to 14.4% in 2017–2018 (Fryar et al., 2020). Low-income families, especially low-income Latinx families, are more likely to live in neighborhoods with more fast food restaurants and fewer supermarkets than higher-income families, which may contribute to higher fast food consumption (Ranjit et al., 2015; Ramirez et al., 2015). Previous research shows that children who eat fast food consume more calories, fat, carbohydrates, added sugars, and sugary beverages per day than children who do not eat fast food (Bowman et al., 2004). Other studies have demonstrated that the likelihood of purchasing a sugary drink is higher for fast food consumers

Abbreviations: NYC, New York City.

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who order a combination meal or from a children's menu compared to those who do not (Moran et al., 2019; Cantor et al., 2016).

Amid growing concerns about the poor nutritional quality of children's fast food meals (Batada et al., 2012), some companies have voluntarily offered healthier side options (e.g., apple slices) and decreased the portion size of French fries (Harris et al., 2010; Aubrey, 2022). Yet a majority of foods and beverages on children's menus continue to exceed U.S. Department of Agriculture recommendations for estimated energy needs for a single meal, which is about 400 calories per meal (United States Dietary Guidelines Advisory Committee, 2010), and many restaurants still feature sugary beverages on their children's menu. To improve the nutritional quality of beverages offered on children's meals, the New York City (NYC) Council enacted a bill in April 2019 that requires NYC restaurants to offer water, milk, 100% fruit juice, or flavored water without added sweeteners as the default (i.e., automatic) option in children's meals (New York City Council, 2019). The policy does not prohibit restaurants from selling other child-size beverages (e.g., soda) as substitutions upon request. Similar healthy default beverage policies have been implemented in several cities and states (Davis Municipal Code Ch, 2015; Stockton, 2016; Cathedral City Municipal Code, 2017; Long Beach Ordinance No, 2017; Perris Ordinance, 2017; Lafayette Ord, 2017; State of California Ch, 2018; Louisville City, 2018; Baltimore City, 2018; Daly City Ordinance No 1415, 2018; State of Hawaii, 2018), and other municipalities are currently considering such policies. (Vermont Gen, 2017; Council of the District of Columbia, 2019).

Default options leverage the status quo bias, or consumers' preference for inaction and tendency to select automatic options (Thaler and Sunstein, 2009). Setting default options have powerfully influenced behavior in other domains, such as organ donation (Johnson and Goldstein, 2003). One study using receipt data also found that offering healthier default side options on children's menus (e.g., salad instead of fries) increased orders of the healthier options (Anzman-Frasca et al., 2015). In another study, default beverages on children's menus at Walt Disney World restaurants were changed from sugary beverages to low-fat milk, water, or 100% fruit juice, which led to a decrease in the percentage of children's meals served with a sugary beverage (Peters et al., 2016). A systematic review, however, reported that the study was at risk of bias due to incomplete outcome data and detection bias (von Philipsborn et al., 2019). Despite the limited existing evidence, policymakers expect that requiring restaurants to offer only healthy beverages by default will encourage most consumers to stick with the healthy option, while still giving them the option to switch beverages if they desire (Roberto and Kawachi, 2015). But requiring healthy default beverage options may have minimal impact on the number of calories ordered in cases where restaurants have already removed unhealthy beverages from children's menus (Alliance for a Healthier Generation, 2015), or when healthy beverages (e.g., milk) are higher in calories than unhealthy beverages. A recent evaluation of the implementation of this policy revealed that menu boards changed to reflect healthy beverage defaults in California but not in Wilmington, Delaware; and that restaurant staff in both locations were not always aware of the policy and thus did not always verbally offer default beverages (Karpyn et al., 2020). In addition to issues with implementation, customers may adapt by ordering unhealthy beverages from other parts of the menu.

To address the gaps in the literature, the current study aimed to examine: 1) whether healthy default beverage policies are likely to reduce beverage calories ordered; and 2) whether the policy is more effective at reducing beverage calories ordered if consumers are not permitted to make substitutions for unhealthy beverages. To accomplish these objectives, we conducted an online randomized controlled experiment in which we asked parents to make hypothetical purchases for their children from two national chain restaurants. We hypothesized that participants in the experimental conditions (i.e., healthy default beverage options and restrictions on unhealthy beverages) would order fewer total calories from beverages for their children compared to the control condition. We also hypothesized that participants in the experimental conditions would order a lower percentage of full-calorie soda, diet soda, and/or sugar-sweetened fruit drinks, herein referred to as "unhealthy beverages"; and order fewer calories from those beverages, excluding diet soda because it is calorie-free.

2. Methods

2.1. Study sample

In 2019, we used Dynata to recruit a sample of adults ages 18 years or older living in the U.S. who were the parent or primary caregiver of a child between the ages of 2 and 6 years. Dynata is a commercial sampling firm that recruits participants via online advertisements, text messages, and phone alerts. The firm randomly matches participants with surveys for which they might be eligible and are likely to complete. Researchers compensate Dynata for survey responses, and Dynata provides household panelists with points that can be redeemed for prizes. This survey was administered in April–September 2019 via Qualtrics, an online survey program. Dynata ensured that the age and gender distribution of study participants approximated national averages.

To calculate our sample size, we used estimates from a similar study that found that the presence of calorie information on a McDonald's menu resulted in parents ordering an average of 102 (SD = 236) fewer calories for their children than controls (Tandon et al., 2010). Based on these findings, we estimated that 150 participants in each of the three arms would provide 90% power to detect a difference of 102 calories between conditions. We recruited participants until we had exceeded this minimum sample size. Exceeding the sample size enabled us to account for participants who were excluded because they failed to meet eligibility criteria.

A total of 784 eligible parents and primary caregivers provided consent to participate in our study. Prior to data analysis, we excluded participants who 1) reused the same IP address (n = 14); 2) ended the survey before completing any menu ordering questions (n = 9); 3) finished the survey in under 1/3 of the median completion time, 10.6 min (n = 6); and/or 4) failed our data integrity questions (n = 294). Our final sample size was 479 participants. In a sensitivity analysis, we included participants who failed our data integrity questions, and results did not change (Supplemental Table 1).

2.2. Survey design

We used menus from McDonald's and Chili's because we wanted to study a healthy default beverage policy in both a fast food and casual sit-down restaurant context, where purchasing behavior and restaurant location characteristics may differ (see Appendix for menus). These two restaurants are large, national chains and provide prices and calorie information online, which facilitated menu creation and modification. We selected a random sample of entrées, salads, sides, desserts, and beverages sold by each restaurant to display on the menus so that participants could easily view all options, including children's meal items. Price and calorie information came from websites or mobile applications of franchise locations in NYC. Calories and prices were displayed to the right of or below each menu item.

Participants were told the study would involve viewing restaurant menu items and answering questions about their attitudes and opinions of them (see Appendix for survey). Participants were then randomly assigned to one of three conditions where they ordered from menus with: 1) standard beverage options on the children's menu (*Control*) (n = 155); 2) healthy default beverage options on the children's menu, with the option of ordering unhealthy beverages as a substitution (*Default*) (n = 162); or 3) healthy default beverage options on the children's menu, with no option to order unhealthy beverages as a substitution (*Restriction*) (n = 162). We defined "healthy" beverages using the criteria in the NYC bill (i.e., white milk, chocolate milk, 100% apple

juice, water) (New York City Council, 2019). All participants were offered the opportunity to substitute a beverage or side if they ordered any combination meal that came with a drink or side by default, including children's meals. We first asked all participants: "You have selected [selected choices] for your child. If you ordered a kids' meal, did you want to make a substitution?" If they selected "Yes", we asked, "What do you want to swap out in the kids' meal (select all that apply)?" If they selected a kids' drink, we asked "You initially selected [selected choices] for your child. Which kids' drink would you like instead?" We offered substitutions to reflect the healthy default beverage bill in NYC (New York City Council, 2019), which does not prohibit restaurants from selling other beverages upon request. For Chili's and McDonald's, this meant excluding full-calorie soda and diet soda from the list of standard options in children's meals in the *Default* and *Restriction* conditions. In the *Restriction* condition, if participants wanted an unhealthy beverage, they would have had to order an additional drink.

After random assignment to conditions, participants viewed menus from McDonald's and Chili's one at a time in a random order. For each menu, they were asked to imagine they were at that restaurant with their youngest child and to order dinner for that child by clicking on the text of each item (up to five items per restaurant). After ordering for their child from each restaurant, participants were asked to order dinner for themselves from the same restaurants, for a total of four separate ordering tasks. After ordering from menus, participants completed demographic questions about themselves and their youngest child (see Appendix for questions). At the end of the survey, participants also completed questions about frequency of drinking sugary drinks; frequency of purchasing food from McDonald's and Chili's; how likely they were to bring their child to McDonald's and Chili's; how healthy they rated the children's meals at McDonald's and Chili's; the degree to which they supported a law that would improve the nutritional standards of beverages included in children's meals at restaurants; whether they noticed the absence of soda offered as a default option with children's meals (experimental conditions only); whether they were trying to lose, gain, or maintain their weight; and their history of chronic diseases and health conditions.

2.3. Outcomes

Our primary outcome was total calories from beverages ordered for the child. This differed from our pre-specified analysis plan to measure total calories because the survey software did not have a tool to allow us to track substitutions; thus we could not infer which side participants wished to substitute from their combination meal(s). We were able to calculate total calories from beverages, however, by making the following decisions about beverage orders and substitutions: 1) If a participant chose to substitute a kids' drink and their subsequent choice was the same kids' drink, we did not modify total calories from beverages (n = 17); 2) If a participant chose to substitute a kids' drink but did not order any drink in their original order, then we added the drink to their order (n = 51); 3) If a participant ordered multiple drinks in their original order (because we did not force participants to choose one kids' drink in a kids' meal) and chose to swap out a kids' drink, we excluded these participants because we could not discern which drink they chose for substitution (n = 7); and 4) If a participant ordered no beverage, we assigned a value of zero calories from beverages (n = 210).

We pre-specified several secondary outcomes, including the percentage of participants who ordered an unhealthy beverage for their child and the total number of unhealthy beverage calories participants ordered for their child. At McDonald's, unhealthy beverages included small-sized full-calorie and diet sodas on the children's menu; and small-, medium-, and large-sized full-calorie soda, diet soda, and sweet tea on the main menu. At Chili's, unhealthy beverages included small-sized full-calorie and diet sodas on the children's menu; and large-sized full-calorie soda, diet soda, Minute Maid lemonade, strawberry lemonade, and mango iced tea on the main menu. Our rationale for including these secondary outcomes was that some beverages that are classified as healthy in the NYC bill (e.g., chocolate milk) have more calories than some unhealthy beverages (e.g., sweet tea). We also calculated the total calories from beverages that participants ordered for themselves to capture whether changes to kids' menu options influenced parents' preferences and choices.

In order to report key beverage-related analyses that were not initially included in our pre-specified analysis plan, we added three secondary outcomes prior to analysis: 1) the percentage of participants who ordered diet soda; 2) the percentage of participants who ordered full-calorie soda; and 3) total calories participants ordered from full-calorie soda. Our rationale was based on the language of the NYC bill, which, in the restaurants included in this study, only prohibits full-calorie and diet soda from children's menus.

2.4. Statistical analysis

We assessed whether demographic characteristics were balanced across conditions using chi-square tests and one-way analysis of variance tests. We also used chi-square tests to assess whether the mean response for health status and policy support questions differed by condition. To examine differences in calories ordered from beverages between conditions, we used a linear regression model with bootstrapping to account for non-normality in the outcome residuals. We used logistic regression models to examine whether the likelihood of ordering specific beverages differed between conditions.

We tested for potential interactions by 1) child's gender, 2) child's BMI *z*-score, and 3) noticing our changes to the menus by including a cross-product term in separate regression models. Due to differences in calorie needs per day by weight status and gender (Institute of Medicine, 2005), we hypothesized that the influence of default options and restrictions on parents' hypothetical purchase decisions would be greater among parents ordering for a male child and children with higher BMI *z*-scores. We hypothesized that the difference in calories would be greater among participants who reported noticing our changes to the menus because these participants may be more responsive to cues that default options are normal (Roberto and Kawachi, 2015). In all analyses, we used a $p < 0.05$ significance threshold and corrected for multiple comparisons using the Bonferroni-Holm procedure (Holm, 1979). We also report uncorrected p-values in cases where they were significant but corrected values were not significant. We used Stata version 15.1 (StataCorp LP, College Station, TX) for all analyses.

3. Results

In the full sample, 94.4% and 85.9% of participants reported visiting a fast food restaurant like McDonald's and a sit-down restaurant like Chili's, respectively, at least once in the past month (Table 1). Only 42.4% and 25.4% of participants, however, reported that they were likely or very likely to bring their youngest child to McDonald's and Chili's, respectively, in the next four weeks. A greater percentage of participants rated children's meals at McDonald's as unhealthy or very unhealthy (35.3%) versus children's meals at Chili's (16.0%). Half of participants in the experimental conditions reported noticing that the children's meals did not come with regular or diet soda (55.3%). All conditions were balanced on demographic characteristics, health status, and policy support questions.

3.1. Calories ordered from beverages for children

We did not observe differences across conditions in our primary outcome of total calories from beverages ordered for a child from either restaurant (Table 2). Approximately 85% of participants ordered a beverage for their children at Chili's (n = 405). Few participants chose to substitute their beverage (2.1%) or add a beverage to their order (3.8%) (Supplemental Table 2). The total calories from beverages

Table 1
Descriptive statistics of sample, by experimental condition.

	All (n = 479)	Controls (n = 155)	Defaults (n = 162)	Restriction (n = 162)	Test for equality
	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	Mean (SD) or %	
Child					
Age	3.7 (1.4)	3.7 (1.4)	3.7 (1.4)	3.7 (1.3)	0.83
Male	48.1	53.1	41.3	50.3	0.18
BMI *z*-score	1.6 (5.1)	1.4 (5.3)	2.1 (5.3)	1.4 (4.9)	0.62
Parent or primary caregiver					
Age	35.2 (8.7)	35.1 (8.4)	35.5 (9.2)	35 (8.6)	0.50
Male	50.0	51.0	56.1	44.0	0.15
BMI	28 (7.0)	27.1 (6.4)	27.8 (6.7)	29.3 (7.5)	0.13
Hispanic	17.6	13.8	22.7	16.1	0.11
Race					
Asian	8.4	11.1	5.9	8.4	0.49
Black	5.5	5.6	3.3	7.7	
White	78.5	77.8	81.7	76.1	
Hawaiian/Pacific Islander	0.2	0.7	0.0	0.0	
Native American/ Alaska Native	1.1	0.7	1.3	1.3	
Other	3.3	1.4	3.9	4.5	
More than 1	2.9	2.8	3.9	1.9	
Married	72.7	73.6	71.7	72.9	0.93
Number of children	2.2 (1.3)	2.2 (1.1)	2.3 (1.4)	2.3 (1.3)	0.06
High school or less	79.4	77.2	81.6	79.4	0.65
Income					
<$25,000	10.7	9.0	12.6	10.3	0.37
$25,001–50,000	4.2	2.8	6.0	3.9	
$50,001–75,000	28.7	29.9	22.5	33.6	
$75,001–100,000	23.8	23.6	21.9	25.8	
$100,001–125,000	13.8	16.0	13.9	11.6	
$125,001–150,000	11.1	9.7	15.9	7.7	
>$150,000	7.8	9.0	7.3	7.1	
Relationship to weight					
Trying to gain weight	5.5	7.2	5.4	4.0	0.41
Trying to lose weight	61.7	56.1	61.7	66.9	
Not trying to gain or lose weight	32.8	36.7	32.9	29.1	
No heart disease	96.4	96.4	98.0	94.7	0.60
No diabetes	93.6	92.1	94.0	94.7	0.71
No high cholesterol	84.5	86.3	87.8	79.5	0.29
No high BP	83.3	85.6	82.4	82.1	0.73
No cancer	96.6	97.1	97.3	95.4	0.30
Frequency of consuming SSBs, never	14.3	16.1	14.6	12.3	0.38
Frequency of eating at a fast food restaurant, never	5.6	5.6	6.6	4.6	0.99
Frequency of eating at a sit-down restaurant, never	14.1	16.2	15.2	11.0	0.51
Likelihood of bringing child to a fast food restaurant in the next 4 weeks, likely or very likely	42.4	41.6	40.7	44.8	0.74
Likelihood of bringing child to a sit-down restaurant in the next 4 weeks, likely or very likely	25.4	23.4	26.7	26.0	0.80
How healthy are kid's meals at McDonald's, unhealthy or very unhealthy	35.3	32.6	34.7	38.3	0.58
How healthy are kid's meals at Chili's, unhealthy or very unhealthy	16.0	14.1	14.0	19.5	0.34
Support or strongly support beverage policy	48.8	52.9	44.7	49.0	0.38
Noticed menu changes?	55.3	–	53.0	57.6	0.42

participants ordered for their children at Chili's did not differ in the *Default* condition [(97.6 (SD = 69.8); p = 0.82)] or the *Restriction* condition [(102.7 (SD = 71.5); p = 0.99)] relative to the *Control* condition [(99.4 (SD = 72.7)]. For the McDonald's ordering task, 83.1% of participants ordered a beverage for their children (n = 398), including 4 (0.8%) beverage substitutions. The total calories from beverages ordered for a child at McDonald's did not differ for participants in the *Default* [(90.2 (SD = 89.1); p = 0.55)] or the *Restriction* [(89.0 (SD = 81.0); p = 0.94)] conditions relative to the *Control* condition [(96.5 (SD = 95.2)]. We also did not observe differences in total calories from beverages participants ordered for themselves across conditions at either restaurant. In interaction analyses, we did not observe statistically significant differences in total calories from beverages across conditions by child gender (p for interaction = 0.28); child's BMI *z*-score (p for interaction = 0.27); or noticing our changes to the menus (p for interaction = 0.94).

3.2. Percent ordering unhealthy beverages for children and calories from those beverages

The percentage of participants ordering an unhealthy beverage for their children at Chili's was lower for participants in the *Default* (11.7%; p = 0.75) and *Restriction* (7.4%; p = 0.22) conditions relative to the *Control* condition (12.9%), but these did not reach statistical significance (Table 2). Total calories from unhealthy beverages ordered for a child at Chili's was also lower for participants in the *Default* [15.2 (SD = 50.0); p = 0.29] and *Restriction* [12.5 (SD = 52.0); p = 0.32] conditions relative to the *Control* condition [22.7 (SD = 71.2)], though differences were not statistically significant. We observed no differences in the percentage of and total calories from unhealthy beverages across conditions at McDonald's.

Although not statistically significant, the percentage of participants ordering a full-calorie soda for their children at Chili's was lower in the *Default* (11.7%; p = 0.34) and *Restriction* (3.1%; uncorrected, p = 0.03; corrected, p = 0.06) conditions compared to the *Control* condition (9.0%). There were no significant differences in the percentage of participants ordering diet soda for their children at Chili's between *Default* (1.2%; p = 0.99) and *Restriction* (1.9%; p = 0.64) conditions compared to the *Control* condition (0.6%). Participants in the *Restriction* condition, however, ordered statistically significantly fewer total calories from full-calorie soda for their children at Chili's [3.0 (SD = 21.6)] compared to

Table 2
Effect of potential healthy beverage defaults and unhealthy beverage restrictions on calories ordered from beverages.

	Controls (n = 155) Mean (SD) or n (%)	Defaults (n = 162) Mean (SD) or n (%)	Restriction (n = 162) Mean (SD) or n (%)
Primary outcomes			
Total beverage calories ordered for child at Chili's	99.4 (72.7)	97.6 (69.8)	102.7 (71.5)
Total beverage calories ordered for child at McDonald's	96.5 (95.2)	90.2 (89.1)	89.0 (81.0)
Secondary outcomes			
Ordered an unhealthy beverage for child at Chili's[†]	20 (12.9%)	19 (11.7%)	12 (7.4%)
Total calories from unhealthy beverages ordered for child at Chili's[†]	22.7 (71.2)	15.2 (50.0)	12.5 (52.0)
Ordered an unhealthy beverage for child at McDonald's[†]	20 (12.9%)	21 (13.0%)	23 (14.2%)
Total calories from unhealthy beverages ordered for child at McDonald's[†]	30.8 (94.6)	28.4 (77.6)	27.4 (73.4)
Ordered diet soda for child at Chili's	3 (1.9%)	2 (1.2%)	1 (0.6%)
Ordered full-calorie soda for child at Chili's	14 (9.0%)	10 (6.2%)	5 (3.1%)
Total calories from full-calorie soda ordered for child at Chili's	13.4 (52.1)	6.1 (31.2)	**3.0 (21.6)**
Ordered diet soda for child at McDonald's	7 (4.5%)	6 (3.7%)	4 (2.5%)
Ordered full-calorie soda for child at McDonald's	14 (9.0%)	16 (9.9%)	13 (8.0%)
Total calories from full-calorie soda ordered for child at McDonald's[†]	18.8 (70.8)	20.3 (65.1)	16.1 (56.7)
Total beverage calories ordered for themselves at Chili's	61.0 (89.3)	70.6 (94.0)	76.7 (98.7)
Total beverage calories ordered for themselves at McDonald's	102.2 (118.1)	108.3 (116.6)	108.9 (148.3)

Note: Boldface indicates statistical significance at $p < 0.05$ relative to the Controls condition (after correcting for multiple comparisons using the Bonferroni-Holm procedure).

[†] Unhealthy beverages include regular and diet soda and sweet tea at McDonald's; and regular and diet soda, Minute Maid lemonade, strawberry lemonade, and mango iced tea at Chili's.

the *Control* condition [13.4 (SD = 52.1)] ($p = 0.04$). There was no difference in total calories from full-calorie soda between the *Default* condition [6.1 (SD = 31.2)] relative to the *Control* condition ($p = 0.13$). At McDonald's, we observed no differences across conditions in the percentage of participants ordering full-calorie or diet soda for their children, nor total calories from full-calorie soda.

4. Discussion

There were no statistically significant differences across conditions in the number of total calories from beverages that parents hypothetically ordered for their children from our online menus. Yet, parents with no option to order unhealthy beverages as a substitution (*Restriction* condition) ordered significantly fewer calories from full-calorie soda and marginally significantly fewer calories from unhealthy beverages for their children from the Chili's menu relative to control participants. Though differences were not statistically significant, potentially due to inadequate statistical power, calories from unhealthy beverages at Chili's were also marginally lower among parents who had the option of ordering unhealthy beverages as a substitution upon request (*Default* condition) relative to parents ordering from standard menus. We did not, however, observe differences in the likelihood of ordering or total calories from unhealthy beverages available on the McDonald's menu across conditions.

Although many of the results in this study were in the expected direction, almost none of the results were statistically significant. Our findings, therefore, are in contrast to a study showing that healthy default *food* items in sit-down restaurants may lead to lower calories ordered for children.(29) This suggests that policies that require healthy default beverages or that restrict unhealthy beverages on children's menus may not reduce total *beverage* calories ordered, or may do so only by a small amount. The success of these policies also depends on how each policy classifies a beverage as "unhealthy". If the approach to classification undermines the intended goals of such policies, consumers may not behave as expected—as suggested by our results. It is always possible that the policies may not work for other reasons, but policymakers should strive to use an evidence-based classification system.

Though the restriction policy tested in this study led to reductions in total calories from full-calorie soda at a full-service chain restaurant, we did not, however, observe significant differences in total calories from unhealthy beverages. These findings suggest that parents may have ordered other unhealthy beverages for their children in lieu of soda on the Chili's menu (e.g., sweet tea, lemonade). Furthermore, the changes to menus did not lead to reductions in total calories or calories from unhealthy beverages ordered at McDonald's, suggesting such policies may have differential effects across types of restaurants. It is possible these differences are due to different beverage offerings at the two restaurants (e.g., Chili's has a greater number of unhealthy beverage options), or the position of menu items (e.g., first, last, etc.), which has been shown to influence beverage choice in previous research (Schmidtke et al., 2019). Future studies should test beverage default and restriction policies using a range of restaurants.

This study has several limitations, including the hypothetical design, which may fail to capture the experience of a default policy in a real-world setting. For example, cashiers may not always ask customers if they want to substitute the default beverage in their child's meal; restaurants typically offer tap water as an option even though it is not included on the menu; restaurants may also introduce promotions that undermine policy; and participants may have behaved differently if they were making actual choices with their own money, though our randomized design still enables us to compare differences across groups. Natural experiments of children's meal default policies are needed to understand the long-term effects on purchasing in the real-world. It is also critical to understand the factors that shape parents' fast food purchases for their children, including "pester power," where children beg parents for specific foods, toys, or products; cooking confidence; time pressures; and perceptions of ease and convenience (Baldassarre et al., 2016; Fulkerson, 2018; Huang et al., 2016; Lawlor and Prothero, 2011). This study also had a moderate sample size, and thus had limited statistical power to detect small but potentially meaningful reductions in calories ordered from unhealthy beverages. Though the study was anonymous, it is also possible that social desirability may have affected parents' orders, particularly orders related to their children, resulting in fewer orders of unhealthy beverages across all conditions.

The demographic characteristics of our sample may limit the generalizability of our findings. Our sample was primarily comprised of families earning between $50,000–125,000 (66.3%), whereas the U.S. Census reports 40% of families earn less than $50,000 annually (U.S. Census, 2019). Our sample also had a slightly higher percentage of people who reported trying to lose weight (61.6%) compared to the US populations (49.1%), and those trying to lose weight may make different choices than those who are not (Martin et al., 2018). One real-world study indicated that 60% of female adults make fast food purchases for children, which is slightly higher than our balanced sample, though their sample size was small (n = 50) (Cohen et al., 2017). There was also a higher percentage of orders from children's menus (72–80%) in this study relative to previous real-world studies where the percentage of meals ordered for children ranged from 35 to 48% (Elbel et al., 2015;

Otten et al., 2014), potentially due to the inclusion of older children in their samples (e.g., 7–12 years of age). Due to the limitations of Qualtrics, we were not able to calculate total calories from all foods and beverages because we could not make unambiguous assumptions about participants' substitutions of entrees and sides. This study has a number of strengths, however, including a randomized-controlled design, the use of real menus from two popular chain restaurants, and the ability to directly compare two different beverage policies. Most studies evaluating fast food policies have examined the influence of one policy with actual receipt data (Anzman-Frasca et al., 2015; Elbel et al., 2015; Otten et al., 2014; Hobin et al., 2012), though we often want to know whether one policy design would perform better than another, which may be not be feasible in the real-world.

5. Conclusions

The results of this study, which may be underpowered, provide limited evidence that current healthy default beverage policies and potential beverage restriction policies may be effective in reducing the total calories ordered from unhealthy beverages for children, especially calories from full-calorie soda. Our moderate sample size may have reduced our ability to detect small but meaningful reductions in calories ordered. Therefore, future studies should focus on beverage calories as a primary outcome *a priori*, and ensure adequate sample sizes to detect those effects. More experimental research should compare the effects of removing additional calorie-dense default beverage choices on children's menus (e.g., chocolate milk), making healthy beverages the default options on the whole menu, and implementing healthy food defaults.

CRediT authorship contribution statement

Pasquale E. Rummo: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Visualization, Writing - original draft, Writing - review & editing. **Alyssa J. Moran:** Conceptualization, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Aviva A. Musicus:** Conceptualization, Investigation, Methodology, Visualization, Writing - original draft, Writing - review & editing. **Christina A. Roberto:** Conceptualization, Investigation, Methodology, Writing - original draft, Writing - review & editing. **Marie A. Bragg:** Conceptualization, Funding acquisition, Investigation, Methodology, Supervision, Visualization, Writing - original draft, Writing - review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Ethics approval

The study protocol was approved by the New York University Grossman School of Medicine Institutional Review Board.

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Appendix A. Supplementary data

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