Countermarketing About Fruit Drinks, Alone or With Water Promotion: A 2019 Randomized Controlled Trial in Latinx Parents

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See also Dorfman, p. 1905.

Objectives. To test whether fruit drink countermarketing messages alone or combined with water promotion messages reduce Latinx parents' purchases of fruit drinks for children aged 0 to 5 years.

Methods. We performed a 3-arm randomized controlled online trial enrolling 1628 Latinx parents in the United States during October and November 2019. We assessed the effect of culturally tailored fruit drink countermarketing messages (fruit drink–only group), countermarketing and water promotion messages combined (combination group), or car-seat safety messages (control) delivered via Facebook groups for 6 weeks on parental beverage choices from a simulated online store.

Results. The proportion of parents choosing fruit drinks decreased by 13.7 percentage points in the fruit drink–only group (95% confidence interval [CI] = −20.0, −7.4; $P < .001$) and by 19.2 percentage points in the combination group (95% CI = −25.0, −13.4; $P < .001$) relative to control. Water selection increased in both groups.

Conclusions. Fruit drink countermarketing messages, alone or combined with water promotion messages, significantly decreased parental selection of fruit drinks and increased water selection for their children.

Public Health Implications. Countermarketing social media messages may be an effective and low-cost intervention for reducing parents' fruit drink purchases for their children. (*Am J Public Health*. 2021;111(11):1997–2007. https://doi.org/10.2105/AJPH.2021.306488)

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Consumption of sugar-sweetened beverages (SSBs) is associated with adverse health outcomes among children that are inequitably distributed by race and income.[1–3] In the United States, nearly half of children aged 2 to 4 years consume an SSB on a given day,[4] and SSB intake is highest among Latinx and Black children.[5,6] Latinx children are the largest racial/ethnic group among children of color in the United States.[7] Fruit drinks (fruit-flavored beverages containing added sugar) are the most-consumed SSB among young children, including Latinx children.[4,5,8]

Most of the many public health awareness campaigns aimed at decreasing SSB consumption have used messages about the sugar content and health effects of these beverages.[9–15] However, misleading marketing may lead parents to believe fruit drinks are healthy beverages, contributing to high consumption.[16,17] Countermarketing campaigns highlighting industry's misleading messages may encourage healthier beverage choices and could complement the more traditional messages.[18] Tobacco countermarketing has increased antitobacco attitudes and lowered smoking rates and may serve as a model for applying this approach to unhealthy foods and beverages.[19,20]

Public health SSB campaigns have primarily used mass media channels for message delivery (Lina Pinero Walkinshaw, e-mail communication, July 15, 2019). Using social media to target messages may be a more cost-effective

and scalable approach.[21] Consumers, including Latinx people, are increasingly using social media as a source of health information.[22,23]

Despite the promise of countermarketing campaigns and social media as public health communication tools, few studies have evaluated their effects on parents' beverage choices for their children and children's SSB consumption. To address this gap and the need to reduce SSB consumption among Latinx children, we conducted a randomized controlled trial to test the hypothesis that fruit drink countermarketing messages delivered via Facebook groups would reduce the proportion of parents choosing fruit drinks for their children and reduce child fruit drink intake. We also assessed whether adding positive messages promoting the health benefits of water would enhance the effects of the negative countermarketing messages.

METHODS

The study was a parallel group, prospective, 3-arm, randomized controlled trial conducted in the United States between October 11 and November 22, 2019. We used Facebook groups to deliver fruit drink countermarketing messages to one intervention arm (fruit drink–only group), a combination of fruit drink countermarketing and water promotion messages to a second (combination intervention group), and car seat safety messages to an attention control arm.[24] The complete Standard Protocol Items: Recommendations for Interventional Trials (SPIRIT) protocol is available upon request.

Participants

A survey research firm (Galloway Research) recruited study participants using its nationwide proprietary database (populated with respondents to randomized phone survey invitations and former research project participants) and targeted social media messages. Potential participants were asked to enroll in a research study and share opinions about beverages. Eligibility criteria were self-identifying as Latinx, age 18 years or older, caretaker of a child aged 0 to 5 years, daily social media use, and preferring either English or Spanish when speaking. We stratified recruitment so that 80% of participants preferred English when using social media and 20% preferred Spanish, and educational status and household income were representative of the US Latinx population.[25]

Study Procedures and Randomization

After online eligibility screening, eligible respondents were directed to an online baseline survey and offered $15 for completing it. Before starting the survey, participants received information about study procedures and indicated that they understood and agreed to participate. We informed them that they would be asked to join a Facebook group for 6 weeks focused on kids' drinks and would receive information about these drinks. Those completing the survey were enrolled in the study and randomized to a study arm using a computer-generated random number and blocking procedure with randomly varied block size (Voxco RAN[0.01,0.99] command[26]). All research team members were blinded to assignments until data collection was complete.

Within study arms, participants were assigned to an English- or Spanish-language Facebook group based on their language preference.

Each of 9 campaign messages was posted twice to the Facebook groups, so participants received 3 messages per week over a 6-week study period. Messages consisted of a short text header and image (Figure A, available as a supplement to the online version of this article at http://www.ajph.org). Participants were asked to set Facebook notifications to display messages in their News Feeds and to view the group page at least weekly and received weekly e-mail reminders to view messages. They could "like" and comment on the messages. Interlex, a Latinx-led bilingual communications team, monitored posts for compliance with group rules, but otherwise study team members did not interact with the participants in the Facebook groups.

After 6 weeks, all randomized participants received a link to an online exit survey, along with multiple e-mails and Facebook reminders to complete it. Participants received $20 for completing the exit survey.

Intervention Development

We developed preliminary messages informed by a Centers for Disease Control and Prevention compilation of existing SSB message campaigns,[9] a literature review, an Internet search, and an expert advisory group. Interlex created initial messages modeled on branding of fruit drinks popular in Latinx communities. Messages were developed simultaneously in English and Spanish to ensure consistency and relevance across languages and cultures. Findings from 5 focus groups across the United States with 45 Latinx parents of children aged 0 to 5 years informed the final content of the messages (Figure B, available as a

supplement to the online version of the article at http://www.ajph.org). For example, one message consists of an image of a child with tooth decay along with a fruit drink pouch displaying an "all-natural" claim and the text, "Just because a label states 'all-natural' doesn't make a fruit drink healthy. Don't let the beverage industry harm your kids."

Measures

Full measures and surveys are in Appendices A and B (available as supplements to the online version of this article at http://www.ajph.org). The baseline survey included the following:

- Supermarket shopping task: We asked participants to imagine a typical trip to the supermarket or grocery store and buying a beverage for their oldest child between age 0 and 5 years. They were asked to select 1 beverage from an image of shelves containing 2 waters (both with no added sweeteners, vitamins, or additives, and 1 with and 1 without flavor), 1 soda, two 100% juices, 6 fruit drinks, and 1 milk (2% fat, unflavored; Figure C, available as a supplement to the online version of this article at http://www.ajph.org). To incentivize real-world shopping behavior, participants were told that once they completed the study, they would receive two $2 coupons for the drinks they selected in the study store that could be redeemed at a real-world store (in reality they received a $4 cash payment in lieu of the 2 promised $2 beverage coupons). We assessed the proportion of parents choosing a fruit drink (primary outcome), water, soda, 100% juice, and milk.
- Beverage perceptions: Participants viewed 4 beverage images (2 fruit drinks, 1 water, 1 soda) and answered questions about each one: "How much do you think your child would **enjoy** this drink?" and "How likely are you to **serve or buy** this drink for your child in the next four weeks?" from not at all to extremely. They then rated how strongly they agreed or disagreed with the following: "Drinking this product often would . . . (1) lead my child to **gain weight**; (2) increase my child's risk of **diabetes**; (3) increase my child's risk of **cavities and tooth problems**; (4) help my child live a **healthier** life." All responses were on 1-to-7 Likert scales. We computed a health risk index by averaging responses to these last 4 items (reverse-coding the last statement); lower scores indicated healthier beverage perceptions. Fruit drink scores were averaged across the 2 drinks.
- Beverage intake: We assessed children's beverage consumption (ounces per day, main secondary outcome) with the Children's BevQ beverage frequency questionnaire[27] and adult consumption (frequency per day) with 2 questions from the Family Life, Activity, Sun, Health, and Eating (FLASHE) Study.[28]
- Sociodemographic information: Participants provided their age, gender, race, country of origin, educational attainment, child's age and gender, and household composition and income (from which we calculated percentage of the 2020 federal poverty level).[29]

The exit survey included the following additional measures:

- Message recall: Participants viewed each of the 9 messages they received and indicated how often they saw each in the past 6 weeks: never, once, or more than once. Recall was averaged across the 9 messages.
- Message perceptions: Participants viewed 3 randomly selected messages from their study arm and provided Likert scale ratings on 10 dimensions including likeability, believability, and providing new information.[30,31]
- Perceptions of beverage brands: Participants viewed images of 2 fruit drink brands and completed a Net Promoter Score rating and an adaptation of the Brand Trust Scale.[32] The Net Promoter Score assesses the likelihood of recommending a brand to a friend or colleague.[33] Based on response to a Likert scale ranging from 0 (not at all likely to recommend) to 10 (extremely likely to recommend), the respondent was classified as a promoter (9 or 10), passive (7 or 8), or detractor (0–6). The net score is the difference in the percentage of respondents who are promoters and detractors. We averaged the 5 items from the Brand Trust Scale to create an overall score from 1 to 5, with higher scores indicating greater trust.
- Facebook engagement metrics: We collected data on the counts of "views," "likes," and comments for each message 1 week after posting.

Sample Size

A sample size of 385 per group was needed to detect a reduction of 10 percentage points in choice of fruit drink relative to control (conservatively assuming baseline prevalence of 50%), with 2-sided α of .05 and power of .8.

We sought to enroll 514 people per group to allow for 25% attrition.

Statistical Methods

The primary analysis was intention to treat and included all randomized participants regardless of whether they joined a Facebook group or completed the exit survey. We used multiple imputation with predictive mean matching using 20 imputation data sets, 84 variables, and a set of 5 candidate donors from complete cases for the missing entry to estimate missing exit survey outcome data for those not completing the study and for missing baseline data for parental beverage consumption (22% of latter missing because of a survey programming error).[34,35] A secondary per-protocol analysis included only those participants who both joined a Facebook group and completed the exit survey.

We used linear regression models with robust standard errors to model the effect size of the intervention as the adjusted absolute difference in proportions (percentage point difference) or means between groups. The dependent variable was the postintervention value of the outcome. Independent variables were the baseline value of the outcome (except when outcome was measured at exit only) and a dummy variable for each intervention group (control was the reference).

We corrected model-generated *P* values for multiple comparisons.[36] We considered a corrected *P* value of less than .05 significant.

We conducted exploratory analyses to assess whether a set of demographic and baseline consumption variables modified intervention effects on the primary outcome with separate regression models for each variable. Models included the primary model variables and terms that interacted the modifier with the group assignment variable. Because these were exploratory analyses, we deemed $P < .05$ without correction for multiple comparisons as significant. All analyses were 2-tailed and performed using R version 3.6.3[37] (including the {mice} package for multiple imputation and {miceadd} for linear model cluster robust standard error) and STATA/SE version 15.1.[38] We preregistered the trial before recruitment at AsPredicted #29421.[39]

RESULTS

We assessed 5297 individuals for eligibility and enrolled 1628 into the study, of whom 90% joined a Facebook group, and 79% completed both the intervention and the exit survey (Figure 1). Nine participants left the groups. Study arms were well-balanced demographically at baseline (Table 1). Participants were predominantly female and of Mexican descent, used social media frequently, lived in lower-income households, and had not completed college.

The proportions completing the study were similar across the groups (77%–82%). Participant characteristics associated with not joining a Facebook group included Spanish as preferred language, non-White race, less than college educational attainment, and low household income (Table A, available as a supplement to the online version of this article at http://www.ajph.org).

Primary Outcome

The proportion of parents choosing a fruit drink for their child decreased absolutely by 13.7 percentage points in the fruit drink–only group (95% confidence interval [CI] = –20.0, –7.4; $P < .001$) and by 19.2 percentage points in the combination group (95% CI = –25.0, –13.4; $P < .001$) relative to the control group (Table 2). The decreases in the intervention groups did not differ significantly. The relative percent decrease compared with the control group was 30.9% (95% CI = 16.7%, 45.1%) for the fruit drink–only group and 42.6% (95% CI = 29.7%, 55.4%) for the combination group. The per-protocol analysis showed larger effect sizes and a significantly larger decrease in the combination arm relative to the fruit drink–only arm (Table B, available as a supplement to the online version of this article at http://www.ajph.org).

Secondary Outcomes and Additional Analyses

Choice of other beverages. The proportion of parents choosing water for their child (Table 2) increased by 17.6 percentage points in the fruit drink–only group relative to the control group (95% CI = 11.9, 23.4; $P < .001$) and by 29.7 percentage points in the combination group (95% CI = 24.0, 35.5; $P < .001$). The increase was larger in the combination group compared with the fruit drink–only group (12.1 percentage points; 95% CI = 5.7, 18.5; $P = .002$). The proportion choosing 100% fruit juice declined significantly in the combination group relative to control, although the difference between intervention groups was not significant. There were no significant differences in changes in choice of soda or milk across groups. Per-protocol analysis (Table B) showed a similar pattern but with larger effect sizes on choice of water and 100% juice.

Beverage intake. Children's fruit drink consumption decreased 0.6 ounces per

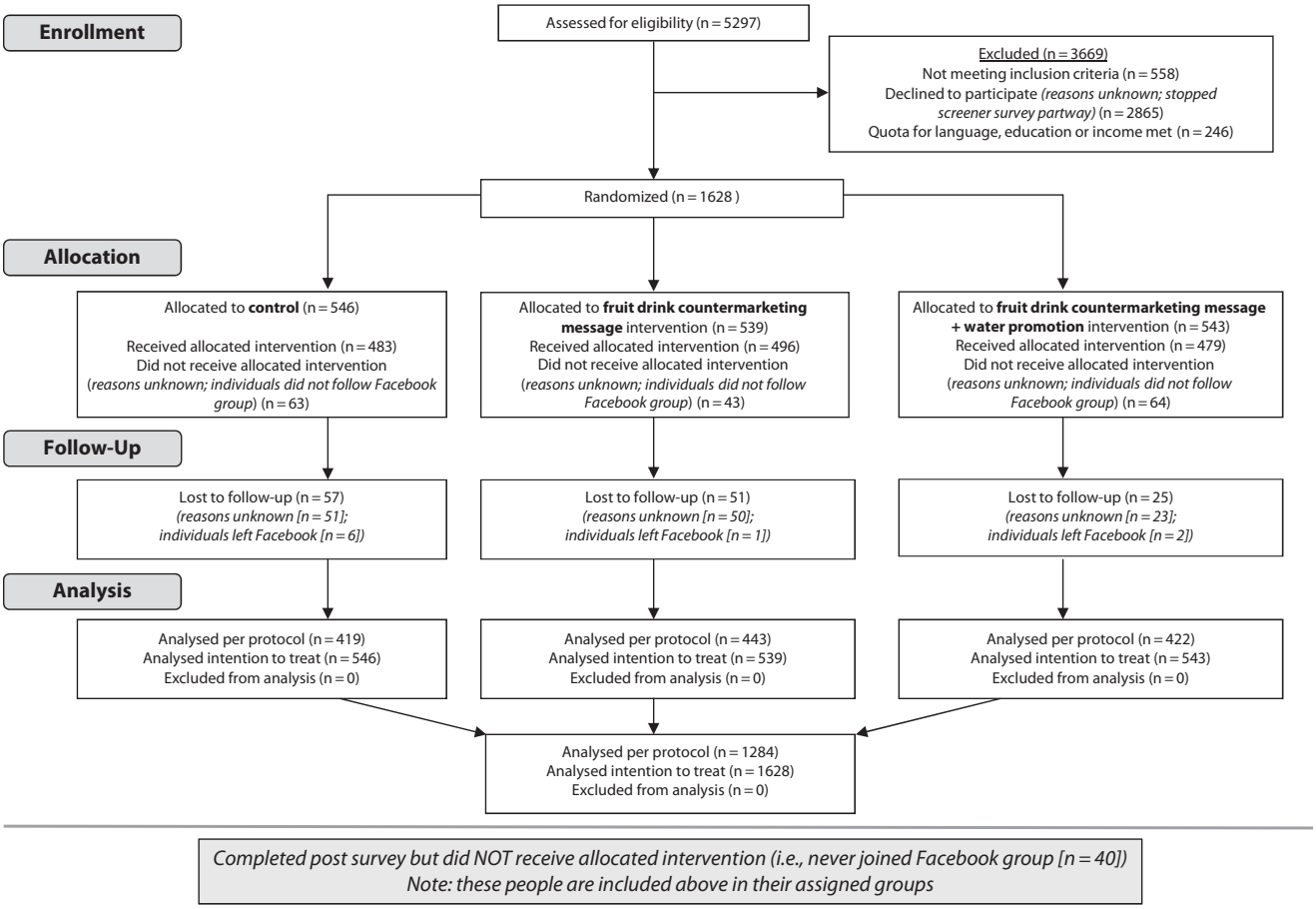

FIGURE 1— CONSORT Flow Diagram for Randomized Controlled Trial Participants

Note. CONSORT = Consolidated Standards of Reporting Trials.

day in the fruit drink–only group (95% CI = −1.1, −0.2; $P = .02$) and 0.8 ounces per day in the combined group (95% CI = −1.4, −0.3; $P = .01$) compared with the control group (Table 2). A decrease of 0.8 ounces per day is equivalent to approximately 2 grams of added sugars, given the added sugars content of commonly consumed fruit drinks. This represents a 22% decrease in added sugars from sweetened beverages consumed by children aged 2 to 5 years.[40] Consumption of milk and 100% fruit juice decreased significantly more in both intervention groups relative to the control group. We observed no significant differences in changes in water consumption. Parents in both intervention groups reported drinking sugary drinks less frequently compared with the control group. The per-protocol analysis revealed similar patterns for parents' and children's beverage consumption, although children's reductions for all types of SSB intake were significant for both arms (data not shown).

Beverage perceptions. Parental perceptions of fruit drinks as healthy or enjoyable and their intentions to buy or serve them for their children decreased significantly in both intervention groups relative to the control group (Table 3). Parents' intention to serve or buy soda for their children decreased significantly in both groups while perceptions of soda as healthy and enjoyable declined only in the combined group.

Brand perceptions and trust. Parents in both intervention groups were significantly less likely to be promotors of fruit drink brands and to trust fruit drink brands at the time of the exit survey relative to the control group (Table 3).

Tests for effect modification. We did not detect significant modification of the intervention effect on the primary outcome by caretaker age, income,

TABLE 1— Baseline Characteristics of 1628 Participants in a Randomized Controlled Trial of a Social Media Fruit Drink Countermarketing Campaign for Latinx Parents of Children Aged 0 to 5 Years: United States, 2019

Characteristic	Study Group, Mean ±SD or No. (%)			
	Overall (n = 1628)	Fruit Drink Only (n = 539)	Combination (n = 543)	Control (n = 546)
Parent				
Age, y[a]	30.94 ± 5.16	30.76 ± 5.13	31.03 ± 5.26	31.03 ± 5.09
Gender[b]				
Female	1483 (91.1)	482 (89.4)	498 (91.7)	503 (92.1)
Male	140 (8.6)	55 (10.2)	43 (7.9)	42 (7.7)
White race	828 (50.9)	277 (51.4)	280 (51.6)	271 (49.6)
Mexican origin or descent	1129 (69.3)	374 (69.4)	385 (70.9)	370 (67.8)
Educational attainment[b]				
High school or less	585 (35.9)	199 (36.9)	183 (33.7)	203 (37.2)
Some college attended, but no degree	526 (32.3)	182 (33.8)	172 (31.7)	172 (31.5)
College degree or higher	493 (30.3)	150 (27.8)	179 (33.0)	164 (30.0)
Preferred language when speaking with others				
English more than Spanish	718 (44.1)	253 (46.9)	232 (42.7)	233 (42.7)
English and Spanish equally	595 (36.5)	189 (35.1)	201 (37)	205 (37.5)
Spanish more than English	315 (19.3)	97 (18.0)	110 (20.3)	108 (19.8)
Prefer to use English when using social media	1275 (78.3)	432 (80.1)	411 (75.7)	432 (79.1)
Use Facebook more than once a day	1512 (92.9)	497 (92.2)	508 (93.6)	507 (92.9)
Use Instagram more than once a day	1066 (65.5)	368 (68.3)	340 (62.6)	358 (65.6)
Child				
Age, y	3.32 ± 1.42	3.34 ± 1.41	3.34 ± 1.44	3.30 ± 1.41
Gender[b]				
Female	815 (50.1)	282 (52.3)	261 (48.1)	272 (49.8)
Male	802 (49.3)	253 (46.9)	278 (51.2)	271 (49.6)
Household				
Income as % of federal poverty level[29]				
< 100%	682 (41.9)	232 (43.0)	215 (39.6)	235 (43)
100% to 199%	505 (31.0)	174 (32.3)	170 (31.3)	161 (29.5)
200% to 399%	313 (19.2)	96 (17.8)	110 (20.3)	107 (19.6)
≥ 400%	128 (7.9)	37 (6.9)	48 (8.8)	43 (7.9)
No. of adults in household				
1	189 (11.6)	62 (11.5)	67 (12.3)	60 (11.0)
2	1116 (68.6)	367 (68.1)	363 (66.9)	386 (70.7)
≥ 3	323 (19.8)	110 (20.4)	113 (20.8)	100 (18.3)
No. of children in household				
1	449 (27.6)	126 (23.4)	154 (28.4)	169 (31.0)
2	561 (34.5)	192 (35.6)	199 (36.6)	170 (31.1)
3	372 (22.9)	130 (24.1)	117 (21.5)	125 (22.9)
≥ 4	246 (15.1)	91 (16.9)	73 (13.4)	82 (15.0)

[a]Age is missing for 23 participants.

[b]Percentages do not add to 100% because of unknown or refused responses.

TABLE 2— Beverage Choice and Consumption: Baseline and Exit Values by Study Group and Adjusted Differences Across Study Groups: United States, 2019

	Fruit Drink Only (n = 539), Mean (95% CI) or % (No.)[a]		Combination (Fruit Drink + Water) (n = 543), Mean (95% CI) or % (No.)[a]		Control (n = 546), Mean (95% CI) or % (No.)[a]		Fruit Drink Only Vs Control, Difference (95% CI)[b]	Combination vs Control, Difference (95% CI)[b]	Combination vs Fruit Drink Only, Difference (95% CI)[b]
	Baseline	Exit	Baseline	Exit	Baseline	Exit			
Parent beverage choice in online store, % choosing[c]									
Fruit drink	44.3 (239)	27.4 (148)	45.1 (245)	22.1 (120)	47.6 (260)	41.9 (229)	−13.7*** (−20.0, −7.4)	−19.2*** (−25.0, −13.4)	−5.5 (−11.6, 0.7)
Soda	1.5 (8)	2.1 (11)	2.0 (11)	2.2 (12)	2.0 (11)	3.8 (21.0)	−1.6 (−3.7, 0.6)	−1.6 (−3.7, 0.4)	−0.1 (−1.9, 1.8)
Water	22.6 (122)	40.7 (219)	21.5 (117)	52.5 (285)	20.0 (109)	22.3 (121)	17.6*** (11.9, 23.4)	29.7*** (24.0, 35.5)	12.1** (5.7, 18.5)
Milk	8.5 (46)	14.1 (76)	8.3 (45)	10.1 (55)	9.2 (50)	11.4 (62)	2.9 (−1.3, 7.0)	−1.1 (−5.0, 2.8)	−4.0 (−7.8, −0.1)
100% fruit juice	23.0 (124)	15.7 (85)	23.0 (125)	13.1 (71)	21.2 (116)	20.5 (112)	−5.2 (−10.0, −0.5)	−7.8* (−12.6, −3.1)	−2.6 (−7.1, 1.9)
Child beverage consumption, mean oz per day[d]									
Fruit drink	2.7 (2.2, 3.1)	1.7 (1.3, 2.0)	2.5 (2.1, 2.9)	1.4 (1.0, 1.9)	3.0 (2.6, 3.5)	2.4 (2.0, 2.8)	−0.6* (−1.1, −0.2)	–0.8* (–1.4, –0.3)	–0.2 (–0.7, 0.4)
Regular soda	1.1 (0.8, 1.4)	0.7 (0.5, 0.9)	1.2 (0.9, 1.5)	0.8 (0.4, 1.1)	1.2 (1.0, 1.5)	1.2 (0.8, 1.5)	−0.4 (−0.7, −0.1)	–0.4 (–0.8, 0.1)	0.0 (–0.3, 0.4)
Diet soda	0.4 (0.2, 0.6)	0.4 (0.1, 0.6)	0.7 (0.4, 0.9)	0.3 (0.1, 0.6)	0.6 (0.4, 0.8)	0.7 (0.4, 1.0)	−0.2 (−0.6, 0.2)	−0.4 (−0.8, 0.0)	−0.1 (−0.5, 0.2)
Sports and energy drink	1.0 (0.8, 1.3)	0.7 (0.5, 0.9)	1.1 (0.8, 1.4)	0.6 (0.2, 1.1)	1.3 (1.0, 1.6)	1.2 (0.8, 1.5)	−0.4 (−0.7, 0.0)	−0.4 (−1.0, 0.1)	−0.1 (−0.6, 0.5)
Sweet tea	0.7 (0.5, 0.9)	0.5 (0.3, 0.7)	0.7 (0.4, 0.9)	0.4 (0.1, 0.8)	0.8 (0.5, 1.1)	0.8 (0.5, 1.2)	−0.3 (−0.6, 0.0)	−0.4 (−0.8, 0.1)	0.0 (−0.4, 0.3)
Water	15.8 (15.1, 16.6)	15.1 (14.2, 15.9)	16.3 (15.5, 17.1)	16.7 (15.9, 17.6)	16.1 (15.3, 16.9)	15.6 (14.8, 16.5)	−0.4 (−1.4, 0.6)	1.0 (0.0, 2.0)	1.4 (0.4, 2.4)
Milk	10.1 (9.4, 10.9)	8.1 (7.3, 8.8)	10.1 (9.4, 10.8)	7.8 (7.1, 8.5)	9.8 (9.1, 10.5)	9.3 (8.5, 10.1)	−1.4* (−2.3, −0.6)	−1.7* (−2.6, −0.8)	−0.3 (−1.1, 0.6)
100% fruit juice	4.2 (3.8, 4.7)	2.7 (2.2, 3.2)	4.7 (4.2, 5.2)	2.6 (1.9, 3.2)	4.7 (4.1, 5.2)	4.1 (3.5, 4.7)	−1.2** (−1.9, −0.6)	−1.5**(−2.3, −0.7)	−0.3 (−1.1, 0.4)
Other[e]	0.1 (0.1, 0.2)	0.3 (0.1, 0.5)	0.3 (0.2, 0.5)	0.1 (0.0, 0.3)	0.3 (0.1, 0.5)	0.2 (0.1, 0.4)	0.1 (−0.2, 0.3)	−0.1 (−0.3, 0.1)	−0.2 (−0.4, 0.1)
All sugar sweetened beverages	5.6 (4.8, 6.4)	3.6 (2.9, 4.3)	5.5 (4.5, 6.4)	3.3 (2.0, 4.6)	6.4 (5.4, 7.3)	5.6 (4.4, 6.7)	−1.7 (−2.8, −0.6)	−1.9 (−3.5, −0.3)	−0.2 (−1.7, 1.2)
All healthier drinks[f]	26.0 (24.8, 27.2)	23.1 (22.0, 24.3)	26.4 (25.3, 27.5)	24.5 (23.4, 25.6)	25.9 (24.8, 27.0)	25.0 (23.7, 26.2)	−1.8 (−3.2, −0.4)	−0.7 (−2.1, 0.8)	1.2 (−0.3, 2.6)
Parent beverage consumption, mean times per day[g]									
Fruit drinks and teas	0.4 (0.4, 0.5)	0.3 (0.3, 0.4)	0.5 (0.4, 0.5)	0.3 (0.3, 0.4)	0.5 (0.4, 0.5)	0.4 (0.3, 0.4)	0.0 (−0.1, 0.0)	0.0 (−0.1, 0.0)	0.0 (−0.1, 0.1)
All sugary drinks	0.9 (0.8, 0.9)	0.6 (0.6, 0.7)	0.8 (0.7, 0.9)	0.6 (0.5, 0.6)	0.9 (0.8, 0.9)	0.7 (0.7, 0.8)	−0.1* (−0.2, 0)	−0.2* (−0.3, −0.1)	0.0 (−0.1, 0.1)

Note. CI = confidence interval.

[a]Baseline and exit values for proportions within groups were modeled using linear regression with robust standard error, which gives the percent value (%). No. is calculated using (%) × (total n).
[b]Adjusted percentage point differences between groups were modeled using linear regression with robust standard error controlling for baseline value. Adjusted mean differences between groups were modeled using linear regression with robust standard error controlling for baseline value.
[c]*P* values of between-group comparisons were adjusted using Bonferroni–Holm correction for 3 tests for fruit drinks (primary prespecified outcome) and 12 tests for other beverages.
[d]*P* values of between-group comparisons were adjusted using Bonferroni–Holm correction for 3 tests for fruit drinks (secondary prespecified outcome) and 30 tests for other beverages.
[e]Includes aguas frescas, nut milk, tea, coffee, smoothies, hot chocolate, yogurt drinks, and multiple beverages combined in self-report.
[f]Includes milk and water.
[g]*P* values of between-group comparisons were adjusted using Bonferroni–Holm correction for 6 tests.
*$P < .05$; **$P < .01$; ***$P < .001$.

TABLE 3— Beverage Health Perceptions and Brand Perceptions: Baseline and Exit Values by Study Group and Adjusted Differences Across Study Groups: United States, 2019

	Fruit Drink Only (n = 539), Mean (95% CI) or % (No.)		Combination (Fruit Drink + Water; n = 543), Mean (95% CI) or % (No.)		Control (n = 546), Mean (95% CI) or % (No.)		Fruit Drink-Only Vs Control, Difference (95% CI)	Combination Vs Control, Difference (95% CI)	Combination Vs Fruit Drink Only, Difference (95% CI)
	Baseline	Exit	Baseline	Exit	Baseline	Exit			
Parent beverage perceptions, mean rating[a,b]									
Child's enjoyment of beverage[c]									
Fruit drink	4.9 (4.7, 5.0)	4.5 (4.3, 4.7)	4.8 (4.6, 4.9)	4.3 (4.1, 4.5)	4.8 (4.6, 4.9)	4.8 (4.6, 5.0)	−0.4** (−0.6, −0.2)	−0.5*** (−0.7, −0.3)	−0.1 (−0.3, 0.1)
Soda	4.2 (4.0, 4.4)	4.2 (4.0, 4.4)	4.0 (3.8, 4.2)	3.8 (3.5, 4.0)	4.2 (4.0, 4.4)	4.5 (4.3, 4.7)	−0.3 (−0.5, 0.0)	−0.6*** (−0.8, −0.3)	−0.3 (−0.5, 0.0)
Water	5.8 (5.6, 5.9)	5.9 (5.7, 6.0)	5.8 (5.7, 5.9)	6.0 (5.6, 6.4)	5.7 (5.6, 5.8)	5.8 (5.6, 6.0)	0.0 (−0.2, 0.2)	0.2 (−0.3, 0.6)	0.1 (−0.3, 0.6)
Likelihood of serving or buying for child[c]									
Fruit drink	3.2 (3.1, 3.3)	2.1 (2.0, 2.3)	3.3 (3.1, 3.4)	2.2 (2.1, 2.3)	3.1 (3.0, 3.2)	3.1 (2.9, 3.2)	−1.0*** (−1.1, −0.8)	−0.9*** (−1.1, −0.8)	0.0 (−0.1, 0.2)
Soda	2.1 (2.0, 2.2)	1.8 (1.7, 1.9)	2.2 (2.0, 2.3)	1.8 (1.7, 1.9)	2.2 (2.0, 2.3)	2.3 (2.1, 2.4)	−0.4*** (−0.6, −0.3)	−0.5*** (−0.6, −0.3)	−0.1 (−0.2, 0.1)
Water	6.4 (6.3, 6.5)	6.6 (6.5, 6.7)	6.3 (6.2, 6.5)	6.6 (6.4, 6.7)	6.3 (6.2, 6.4)	6.5 (6.3, 6.6)	0.1 (0.0, 0.3)	0.1 (−0.1, 0.3)	0.0 (−0.2, 0.1)
Health risk of beverage to child[d]									
Fruit drink	4.6 (4.5, 4.7)	5.6 (5.5, 5.7)	4.6 (4.5, 4.7)	5.5 (5.3, 5.6)	4.6 (4.5, 4.7)	4.7 (4.6, 4.8)	0.9*** (0.7, 1.0)	0.7*** (0.6, 0.9)	−0.1 (−0.3, 0.0)
Soda	6.4 (6.3, 6.5)	6.5 (6.4, 6.6)	6.4 (6.3, 6.5)	6.6 (6.5, 6.6)	6.4 (6.3, 6.4)	6.4 (6.3, 6.4)	0.1 (0.0, 0.2)	0.2* (0.1, 0.3)	0.0 (−0.1, 0.2)
Water	1.4 (1.4, 1.5)	1.4 (1.3, 1.5)	1.4 (1.3, 1.5)	1.3 (1.2, 1.4)	1.4 (1.3, 1.5)	1.4 (1.3, 1.6)	−0.1 (−0.2, 0.1)	−0.2 (−0.3, 0.0)	−0.1 (−0.2, 0.0)
Parent brand perceptions at exit, % in each category (n)[a,e,f]									
Promoters	. . .	4.5 (24)	. . .	5.6 (30)	. . .	17.3 (94)	−12.8*** (−16.8, −8.7)	−11.7*** (−15.9, −7.5)	1.1 (−1.8, 4.0)
Passives	. . .	7.1 (38)	. . .	9.9 (54)	. . .	24.4 (133)	−17.3*** (−21.7, −12.9)	−14.5*** (−19.2, −9.9)	2.8 (−0.8, 6.4)
Detractors	. . .	88.4 (477)	. . .	84.5 (459)	. . .	58.3 (318)	30.1*** (25.0, 35.3)	26.2*** (20.6, 31.9)	−3.9 (−8.3, 0.5)
Parent brand trust at exit, mean score (95% CI)[g,h,i]									
Brand trust score	. . .	2.3 (2.1, 2.4)	. . .	2.4 (2.3, 2.5)	. . .	3.4 (3.3, 3.5)	−1.1*** (−1.3, −1.0)	−0.9*** (−1.1, −0.8)	0.2* (0.0, 0.3)

Note. CI = confidence interval.

[a]*P* values of between-group comparisons were adjusted using Bonferroni–Holm correction for 9 tests for each of the 3 measures.
[b]Adjusted mean differences between groups were modeled using linear regression with robust standard error controlling for baseline value.
[c]Response from 1 to 7, where 1 means not at all, and 7 means extremely.
[d]Response from 1 to 7, where 1 means healthy, and 7 means unhealthy.
[e]Response options were a Likert scale from 0 (not at all likely to recommend brand to friend or colleague) to 10 (extremely likely). Participants were assigned to the following categories based on their scores: as promoter (9 or 10), passive (7 or 8), or detractor (0–6). The net promoter score was calculated as (percent promoters)–(percent detractors).
[f]Adjusted percentage point differences between groups were modeled using linear regression with robust standard error.
[g]*P* values of between-group comparisons were adjusted using Bonferroni–Holm correction for 3 tests.
[h]Response from 1 to 5, where 1 is completely disagree and 5 is completely agree with statements describing level of trust in brand (lower score means lower trust).
[i]Mean differences between groups were modeled using linear regression with robust standard error.
*$P < .05$; **$P < .01$; ***$P < .001$.

education, race, and preferred language, nor child's or caretaker's baseline fruit drink consumption (Table C, available as a supplement to the online version of this article at http://www.ajph.org).

Facebook Engagement, Messages, and Cost

The proportion of participants joining their assigned Facebook group ranged from 88.5% to 92.0% across groups. Averaged across all 6 weeks, 80.0% to 83.5% of group members viewed the Facebook posts. The proportion of participants "liking" messages from each group, averaged across all messages received during the 6 weeks, ranged from 36.4% to 40.5%. The average proportion posting comments ranged from 0% to 10.7%. One third (33.7%) of intervention-group participants reported seeing the messages at least once, while 47.1% reported seeing them more than once, and 19.2% reported never seeing them or did not know. Participants found the messages convincing and informative (Table D, available as a supplement to the online version of this article at http://www.ajph.org). The cost of delivering the messages and moderating the Facebook group was $20 000, or $12.29 per person.

DISCUSSION

The delivery of culturally tailored countermarketing messages about fruit drinks via a Facebook group to Latinx parents of young children, alone or combined with water promotion messages, led to large and significant reductions in the proportion of parents choosing fruit drinks for their children in an online simulated store. There was no effect modification by race, income, education level, age, or language preference. The fruit drink messages also increased parents' selection of water, with a larger effect from the combined messages. Both messages led to significant decreases in parents' reports of their children's fruit drink consumption and increased parents' negative perceptions of fruit drinks and beverage company brands. To our knowledge, this is the first study to demonstrate the efficacy of countermessages delivered solely via social media as well as the first to specifically target sweetened beverage consumption among young children.

Unexpectedly, we observed a decrease in parental report of their children's consumption of both 100% juice and milk. Juice consumption may have declined because parents may not always clearly differentiate between 100% juice and fruit drinks containing some juice and may perceive the large total sugar content of 100% juice to be unhealthy. Milk consumption may have declined if parental concerns about artificial flavors in flavored milks increased and they therefore chose milk less often for their children.

Although SSB or added sugars countermarketing campaigns have been described, none have been rigorously evaluated.[41,42] There are numerous reports of mass media campaigns using traditional health education messages—not countermessages—focused on the amount of added sugars in SSBs and their health effects.[9–15] These campaigns have used multiple communication channels, including social media digital advertisements, but not social media groups. Evaluations have yielded mixed findings, and most have been limited to a single site or used an uncontrolled study design (only 3 were controlled[10,11,15]). The positive studies found 3% to 10% relative reductions in SSB sales or self-reported consumption. Costs ranged from $300 000 to $1.6 million in the 3 studies reporting them, which may be prohibitive for public and nonprofit agencies.[10,11,13]

Many public health organizations use social media to disseminate health messages, but few rigorous studies have evaluated their impact. Most social media–based nutrition interventions have been tested in small pilot or feasibility studies and have focused primarily on White youths and adults.[43] Our study suggests that organic social media may be an effective, low-cost method for organizations with existing social media followings to launch SSB communication campaigns. As costs were fixed, the cost per person would decrease proportionate to the number of participants.

Our study had several limitations. First, our primary outcome was beverage choice in a simulated online store rather than a real store, but participants believed that they would receive a coupon for their beverage selection, incentivizing a real-world choice. Self-reported beverage consumption may be biased by social desirability, although we used a well-validated questionnaire and did not reveal study hypotheses to participants. Future research should assess additional outcomes like retail sales or 24-hour dietary recalls.

Second, we do not know whether effects persisted after the interventions ended. Third, participants were recruited in part from a marketing database and may not be representative of the population of Latinx parents of young children, although they do reflect

the educational status and household income of the US Latinx population. Fourth, people with lower incomes, with less education, who were non-White, and who preferred communicating in Spanish were less likely to join a Facebook group or complete the study. Barriers to engaging these populations in social media interventions and approaches for additional tailoring of interventions should be explored. Fifth, participants were recruited and offered incentives to join our social media groups, which might be prohibitively expensive in the real world. It will be useful to learn whether social media advertising alone, which is less costly than implementing social media groups, has effects comparable to those produced by joining a group. Finally, although effect modification analyses were not significant, our sample size was insufficient to detect modest effects.

Study strengths included its longitudinal, randomized controlled design; large sample size; high degree of participant engagement; and good participant retention.

Conclusions

In summary, this first, to our knowledge, rigorous assessment of fruit drink countermarketing messages tailored to Latinx parents of young children and delivered via a Facebook social media group, alone and in combination with water promotion messages, demonstrated reductions in parental choice of these beverages in an online simulated store and children's reported intake. Purchases of water increased. These results suggest that countermarketing messages delivered through social media groups may be a useful addition to existing sugary drink–reduction strategies.

Public Health Implications

Our findings highlight the promise of social media countermarketing messages as either a low-cost stand-alone tool or one integrated into broader mass media campaigns, deployed during SSB policy adoption campaigns, or combined with other SSB reduction strategies.[44] It would be useful to understand the added benefits of combining social media countermarketing messages with traditional mass media campaigns and to test our approach with different beverage types and populations. AJPH

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CONTRIBUTORS

J. Krieger originated the study. J. Krieger and C. A. Roberto designed the study and provided oversight of all aspects of study implementation and analysis. L. P. Walkinshaw performed project management and focus group implementation analysis. J. Krieger, L. P. Walkinshaw, and R. Ruiz designed the messages. J. Krieger, C. A. Roberto, L. P. Walkinshaw, and T. Kwon designed the survey and measures. J. Yan and T. Kwon analyzed the data. J. Krieger prepared drafts of the article with input from co-authors. All authors contributed to refinement of the study design and protocol and reviewed the final article.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to report.

HUMAN PARTICIPANT PROTECTION

Because the research team had no participant contact or access to identifiable data, the University of Washington institutional review board (IRB) determined the study did not require IRB review. The survey firm adhered to its established privacy policy (https://www.gallowayresearch.com/privacy-policy).

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