



Sociodemographic factors associated with attendance to Brighter Bites, a school-based food co-op nutrition intervention for low-income families

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Abstract

Participants: The analytic sample included 6,796 participants from five of the six cities in which Brighter Bites was implemented (Houston, Austin, Dallas, Washington, D.C., and Southwest Florida).

Main Outcome Measures: Predictor variables included child's grade, gender, race/ethnicity, parent employment, and government assistance utilization. Outcome variable was a binary measure of attendance: 1=attendance at or above the threshold or 0=attendance below the threshold, where the threshold was operationalized as attending 75% of the distributions.

Analysis: A multi-level logistic regression and bivariate analysis were completed to measure the association between attendance and predictor variables.

Results: Results show, compared to Hispanics, Whites were 39% and African Americans 53% less likely to attend at the threshold. Also, families who received SNAP benefits were 33% less likely to attend and families with homemakers had 1.68 greater odds of attending.

Conclusions and Implications Identifying predictors of program attendance can inform future equitable implementation and dissemination strategies. Findings indicate race/ethnicity, parent employment and receipt of certain government assistance have significant associations with attending Brighter Bites.

Keywords

program evaluation, social determinants of health, public health

Cover Page Footnote

The authors would like to thank Brighter Bites for their support as we completed this project. We would also like to thank the schools and families that contributed to the analysis.

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INTRODUCTION

Food insecurity, defined as the lack of access to enough food for an active, healthy life for all household members, is a prevalent public health issue across our country (*Food Security and Nutrition Assistance. USDA ERS - Food Security and Nutrition Assistance.*, n.d.; Ward et al., 2018). The United States Department of Agriculture (USDA) Economic Research Services reported 11.1 percent of households identify as being food insecure in the United States (US) (*Food Security and Nutrition Assistance. USDA ERS - Food Security and Nutrition Assistance.*, n.d.). Furthermore, socio-demographic disparities among this group have been discovered. For example, over half of the households that are food insecure include children (*Food Security and Nutrition Assistance. USDA ERS - Food Security and Nutrition Assistance.*, n.d.). When food insecure households are stratified by race/ethnicity, there are twice as many food insecure Hispanic households (18.0%) compared to White households (8.8%) and almost three times as many African American households (21.8%) compared to White households (*Food Security and Nutrition Assistance. USDA ERS - Food Security and Nutrition Assistance.*, n.d.). As seen in prior studies, food insecurity is associated with lower produce consumption, which is associated with poorer health outcomes in adults (Hasson et al., 2017; Ward et al., 2018). Moreover, African American and Hispanic children are disproportionately more likely to experience hunger and less likely to have access to nutritional food as compared to White children (Burke et al., 2018; *SPAN Data Explorer*, n.d.).

The Supplemental Nutrition Assistance Program (SNAP) was developed to provide access to food for families whose monthly household income fell at or below 130% of the poverty line based on the number of people in the home (Grummon & Taillie, 2018; *Supplemental Nutrition Assistance Program (SNAP)*, n.d.). The program accomplishes this by giving participants additional resources to purchase food to sustain their household (Mabli & Worthington, 2017; *Supplemental Nutrition Assistance Program (SNAP)*, n.d.). Yet, it was found that despite SNAP providing families with the needed resources to access food, these families had lower rates of purchasing nutritional food (Grummon & Taillie, 2018). Even though the US federal government has provided a way for lower-income households with children to gain access to nutritional food, there is still a need for interventions to increase nutritional practices among families who participate in the SNAP program.

Interventionists have sought to design nutrition programs to promote healthier eating habits among racially/ethnically diverse populations to reduce food insecurity and diet-related health disparities (Di Noia et al., 2013). Yet, despite these efforts, the implementation success of these interventions continues to be a challenge due to low attendance from the targeted population. Studies have shown factors, such as lack of cultural relevance and sensitivity, lack of motivation, time conflicts, transportation, loss of employment, moving residence, and lack of personal time to be reasons for low participation in behavioral interventions (Di Noia et al., 2013; Miller & Akohoue, 2017; Srivastava et al., 2018). In Brennan and colleague's attrition analysis of an adolescent obesity intervention for parents and teens, the leading parent-reported barriers to completing the program were lack of time (28%), travel (28%), and lack of interest (17%). Another study analyzed the reasons why parents decided against participating in a pediatric obesity intervention and similarly, lack of time (60%) was the number one reported reason followed by family challenges (9%) and travel (5%). To improve health outcomes,

interventionists first have to identify the factors associated with participation in behavioral interventions, and secondly, they have to address these factors to ensure optimal participation. Specifically, in interventions aimed at improving food access where participants are expected to procure their food at a particular location (e.g., food pantry, farmers market), it is important to understand factors informing attendance because of the added burden of food waste if participation is low.

Brighter Bites is a school-based health promotion program, grounded in social cognitive theory, which aims to increase consumption of fresh produce among low-income children and their families (Bandura, 1986). The program provides a weekly distribution of fresh produce for 16 weeks in the school year combined with nutrition education for students and parents (Sharma et al., 2016). The program is now disseminated in over 100 educational sites among 25,000+ families each week across Houston, Austin, Dallas, New York City, Washington, D.C., and Southwest Florida. Most participating schools are located in urbanized regions, and there is at least one school located in a rural community in Southwest Florida (Sharma et al., 2016). This food co-op intervention is implemented in public and charter elementary schools as well as Head Start programs in which at least 75% of students are eligible for free- or reduced lunch. Brighter Bites is disseminated through the Brighter Bites 501c3 non-profit organization (Sharma et al., 2016). This 16-week school-based nutrition program consists of three main components: 1) Weekly distributions of 50 servings of fresh donated fruits and vegetables (F&V) sourced from local food banks sent home with parents, 2) Nutrition education, which includes the evidence-based Coordinated Approach to Child Health (CATCH) program in schools, and parent education through bilingual nutrition handbooks and recipe cards, and 3) Weekly recipe demonstrations at produce pick up time (Hoelscher et al., 2010; Sharma et al., 2016). Participating parents are expected to come once a week to pick up their free, weekly distribution of fresh produce at their child's school. Results of Brighter Bites evaluations have demonstrated significant improvements in the intake of F&V among participating children and parents and improvements in the home nutrition environment (Sharma et al., 2016). Yet Brighter Bites has encountered challenges with recruiting non-Hispanic families and maintaining attendance at or above the threshold among non-Hispanic families that have specifically been seen among predominantly African American schools, which has led to the program ending early.

The purpose of our study was to describe and analyze sociodemographic factors associated with attendance to the Brighter Bites weekly food distributions as a means to explore differential implementation across schools. We focused on two questions in this study: 1) What are the sociodemographic predictors of participation in Brighter Bites, defined as attendance to Brighter Bites produce distributions, and how do these vary by race/ethnicity? 2) Are there significant differences in the characteristics of families who successfully attend Brighter Bites distributions versus those who do not? Identifying the sociodemographic differences in those families who had attended at or above the threshold (attending 75% of the distributions or more) compared to those who were below the threshold will allow programs similar to Brighter Bites to focus on addressing and mitigating these factors to improve program implementation.

METHODS

Study Design

We conducted a secondary analysis of cross-sectional data collected as part of the Brighter Bites evaluation study of the 2018-2019 school year across five of the six cities of implementation (Houston, Austin, Dallas, Washington, D.C., and Southwest Florida).

Brighter Bites uses a convenience sampling methodology where schools apply to host the program and Brighter Bites selects which schools to include based on predetermined criteria. Historically, schools serving a predominantly Hispanic population have applied which leads to a biased sample when conducting different analyses of the data. The goal of this study was to complete secondary data analysis of data collected in the real-world implementation of a health promotion program and, as such, highlight the challenges associated with real-life program implementation.

Families enrolled in Brighter Bites are not required to complete the surveys to participate in the program because Brighter Bites uses an opt-in format. At the start of the school year, all families in the participating schools were invited to take part in the program. A participant electronic roster (one entry per family) was created based on the responses on the opt-in form. Every Brighter Bites family was provided with a key card that has a unique QR code. Each week, as the families came to pick up their bags of produce at the school, their key cards were scanned. Then they were checked in by a Brighter Bites project staff member, and their information was entered into the Brighter Bites SQL database. Typically, at the end of the school day, the parents (or designated family member) came to the school, picked up their child, and then picked up their bag of produce from the designated area in the school (e.g., cafeteria) each week for the 16 weeks of the school year. While a majority of the families (>75%) were recruited at the start of the school year, those within the participating schools were still allowed to join any week during the school year.

Before the start of the Brighter Bites program in the fall semester, parent electronic surveys were used to obtain data on various sociodemographic variables. Completion of the survey was voluntary and informed consent was obtained from all participants prior to the start of the study. Data is collected by Brighter Bites non-profit organization, and then is de-identified and shared with the University of Texas Health Science Center (UTHealth) for analysis as part of a data sharing agreement and approved by the UTHealth Committee for Protection of Human Subjects. Brighter Bites staff used Formsite (Vroman Systems Inc., Illinois, USA) to send out the self-report surveys to the participating Brighter Bites families. There was a total of 6,796 surveys completed across 87 schools in 13 school districts throughout 5 cities. The response rate for this sample was 32.38%. Brighter Bites has a data-sharing agreement in place with the University of Texas School of Public Health who conducts secondary data analysis of the data gathered by Brighter Bites to make program-level inferences and understand the effect of the intervention on the participants. This project has been approved by the University of Texas Health Science Center at Houston, Committee for Protection of Human Subjects internal review board.

The data used in this analysis was originally gathered to evaluate Brighter Bites' performance during the 2018-2019 school year. Although multiple strategies were used to reach non-respondents, the response rate was low. Approval for data collection was obtained from the Houston, Austin, Dallas, Washington, D.C., and Southwest Florida school district's IRB committees. The process to obtain approval from the New York school district was more involved and took longer than expected resulting in the research team missing the window of

survey administration for the 2018-2019 school year, hence New York data were excluded from this analysis. Sociodemographic variables considered in the analysis included child's grade level, child's gender, child's race/ethnicity, parents' employment status, and household government assistance program utilization. Program options included the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), Supplemental Nutrition Assistance Program (SNAP), Double Dollars, Medicaid, Medicare, National School Lunch and/or Breakfast Programs (free/reduced lunch), and Children's Health Insurance Program (CHIP).

Data Analysis

De-identified aggregated data was used in this analysis. First, the families in the survey database were matched to the attendance database for the 2018-2019 school year. Optimal attendance across the 16 weeks of Brighter Bites distribution was the primary outcome for our analysis. This was indicated as a binary variable such that "attendance at or above the threshold" was defined as attending 75% or more of the possible 16 distributions (i.e. 12 or more out of 16 distributions). "Attendance below the threshold" was defined as attending less than 75% of the distributions.

Descriptive statistics including means, SD, n, and percentages were calculated to describe the attendance and sociodemographic variables of interest. Stratified analysis was conducted using the chi-square and fisher exact test to further assess differences in attendance by race/ethnicity.

A mixed-effects logistic regression analysis was used to test the association between attendance, child's race/ethnicity, parents' employment status, government assistance utilization, and city where the family resides, where attendance was the outcome and the family demographics were the predictors. As fixed effects, child's race/ethnicity, parent employment status, government assistance utilization, and city were entered into the first level of the model. Intercepts for schools were entered at the second level of the model as random effects. The overall significance of the model was tested using the Wald test and a p-value set at .05 to measure significance. All analyses were conducted in STATA 16.0 (*StataCorp*, 2019).

RESULTS

Table 1 provides a summary of the descriptive statistics for the analytic sample. Due to sparse data in some cells when tabulated across race/ethnicity, Asian, Native Hawaiian or Pacific Islander, American Indian or Alaskan Native, and Mixed Race/Ethnicity were collapsed into the "Other" race/ethnicity group. Overall 55.57% (N=3741) of the families in the study sample had attendance at or above the threshold. There was no significant difference in child grade and gender between families who had attended at or above the threshold and families who had attendance below the threshold. Of note, we see participation declines as children age. One contributing factor is that parent engagement in schools and at home has been found to decrease as children get older (Hill & Taylor, 2004; Izzo et al., 1999). Another contributing factor is Brighter Bite's strategic efforts to provide consistent exposure to the intervention over the longest period. Prior studies have found earlier approaches towards inculcating dietary behaviors are more impactful later in life (Laitinen, Nuotio, Niinikoski, et al., 2020; Laitinen, Nuotio, Rovio, et al., 2020; Lehtovirta et al., 2018). During elementary, children can be expected to remain in the same school for 6 years at a time allowing for continuity of exposure to the

Brighter Bites program components. Yet, in middle school, children are only in the same school for 3 years and preschool for 2 years. It has been more feasible to target elementary school children based on these environmental structures because Brighter Bites can have a greater effect on the students' dietary habits when these barriers to continuity of exposure are removed. Lastly, Brighter Bites uses a membership application process to select which schools to implement the program in and most of the schools that apply are elementary schools which also contributes to the decline among middle school-age children.

When attendance was explored across child's race/ethnicity, a majority of Hispanic families (57.29%, N=3144) had attendance at or above the threshold. Whereas, the majority of African American (64.11%), White (56.52%), and Other (55.81%) families had attendance below the threshold. When the parents' employment status was considered, parents who were homemakers had the largest percentage (61%) of attendance at or above the threshold, and parents who were employed had the lowest percentage (48%) of attendance at or above the threshold.

Table 1- Demographics of Students Included in the Analysis by Attendance Categories

Variable	Overall (N=6732) N (%)	Attendance at or above the threshold (N=3741) N (%)	Attendance below the threshold (N=3055) N (%)	p-values
Grade (%)				.132
PreK	1338(19.88)	737(55.08)	601(44.92)	
K	1222(18.15)	642(52.54)	580 (47.46)	
1st	1060(15.75)	586(55.28)	474(44.72)	
2nd	996(14.80)	540(54.22)	456(45.78)	
3rd	837(12.43)	466(55.68)	371(44.32)	
4th	808(12.00)	438 (54.21)	370(45.79)	
5th<	471(7.00)	286(60.72)	185(39.28)	
Gender (%)				.363
Male	3339(50.58)	1,817 (48.57)	1,522 (49.82)	
Female	3263(49.42)	1,812 (48.44)	1,451(47.5)	
Child's Race/Ethnicity (%)				<.001
African American	482(7.49)	173 (35.89)	309 (64.11)	
Hispanic	5488(85.24)	3,144 (57.29)	2,344(42.71)	
White	253(3.93)	110 (43.48)	143(56.52)	
Other	215(3.34)	95(44.19)	120(55.81)	
Employment Status (%)				<.001
Employed	2348(38.66)	1120(47.70)	1228(52.30)	
Homemaker	3125(51.45)	1909(61.09)	1216(38.91)	
Not Working	601(9.89)	332(55.24)	269(44.76)	
WIC				
No	4762 (73.44)	2586 (54.30)	2176 (45.70)	.069

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Yes	1722 (26.56)	979 (56.85)	743 (43.15)	
SNAP				
No	4211 (65.44)	2449 (58.16)	1762 (41.84)	<.001
Yes	2224 (34.56)	1078 (48.47)	1146 (51.53)	
Double Dollars				
No	6291 (98.84)	3432 (54.55)	2859 (45.45)	.025
Yes	74 (1.16)	50 (67.57)	24 (45.29)	
Medicaid				
No	2615 (40.63)	1434 (54.84)	1181 (45.16)	.978
Yes	3821 (59.37)	2094 (54.80)	1727 (45.20)	
Medicare				
No	400 (6.27)	3288 (54.98)	2692 (45.02)	.288
Yes	5980 (93.73)	209 (52.25)	191 (47.75)	
Free/Reduced Lunch				
No	1623 (25.59)	891 (54.90)	732 (45.10)	.991
Yes	4720 (74.41)	2592 (54.92)	2128 (45.08)	
CHIP				
No	4999 (79.15)	2691 (53.83)	2308 (46.17)	<.001
Yes	1317 (20.85)	785 (59.61)	532 (40.39)	

Implementation success: 1=attendance at or above the threshold (75% or greater; e.g. 12 out of 16 distributions); 0=attendance below the threshold (<75%);

Data obtained during the 2018-2019 school year parent surveys administered across the Brighter Bites program.

When we looked at sociodemographic differences in attendance within each race/ethnicity (Table 2), a greater proportion of African Americans (69.82%), Whites (61.16%), and Others (64.86%) who were receiving SNAP benefits had attendance below the threshold compared to those who were not receiving SNAP benefits ($p<.05$) (Table 2). For Hispanics, this was the opposite in that those who were receiving SNAP benefits had a greater proportion of families who had attended at or above the threshold (51.48%). Among White families, a greater proportion of those who were receiving Medicaid had attendance below the threshold (64.06%, $p=.044$). Among Hispanic families, a greater proportion of those who were receiving CHIP benefits had attendance at or above the threshold (61.99% $p<.001$). Finally, families who had parents who were homemakers (61.09%) or unemployed parents (55.24%) had a higher proportion of attendance at or above the threshold compared to families who had employed parents ($p<.001$).

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Table 2- Attendance Behavior Variation Across Child Grade Level, Child Gender, Type of Government Assistance Received and Employment Status Stratified by Child's Race/Ethnicity

Variable	African American			Hispanic			White			Other		
	At or Above Threshold N (%)	Below Threshold N (%)	p	At or Above Threshold N (%)	Below Threshold N (%)	p	At or Above Threshold N (%)	Below Threshold N (%)	p	At or Above Threshold N (%)	Below Threshold N (%)	p
Grade Level	N=172	N=308	.263	N=3134	N=2341	.068	N=110	N=142	.814	N=95	N=120	.236
PreK	49 (43.36)	64 (56.64)		624 (57.30)	465 (42.70)		18 (40.91)	26 (59.09)		21 (42.86)	28 (57.14)	
Kinder	31 (34.83)	58 (65.17)		543 (54.41)	455 (45.59)		18 (46.15)	21 (53.85)		12 (33.33)	24 (66.67)	
1st grade	25 (35.71)	45 (64.28)		495 (58.03)	358 (41.97)		22 (44.90)	27 (55.10)		19 (47.50)	21 (52.50)	
2nd grade	20 (29.41)	48 (70.59)		466(56.83)	354(43.17)		14 (37.84)	23 (62.16)		10 (40.00)	15 (60.00)	
3rd grade	18 (36.73)	31 (63.26))		389(57.12)	292(42.88)		15 (46.87)	17 (53.12)		15 (51.72)	14 (48.27)	
4th grade	14 (25.00)	42(75.00)		375(56.90)	284(43.09)		16 (53.33)	14 (46.67)		11 (45.83)	13 (54.17)	
5th grade and up	15 (42.86)	20 (57.14)		242(64.53)	133(35.47)		7 (33.33)	14 (66.67)		7 (58.33)	5 (41.67)	
Gender	N=169	N= 299	.894	N=3082	N= 2299	.651	N= 109	N= 140	.216	N= 92	N= 119	.155
Male	82 (35.81)	147 (64.19)		1556 (56.97)	1175 (43.02)		49 (39.84)	74 (60.16)		40 (37.04)	68 (62.96)	
Female	87 (36.40)	152 (63.60)		1526 (57.58)	1124 (42.41)		60 (47.62)	66 (52.38)		52 (50.48)	51 (49.51)	
Government Assistance Received	N=152	N=287		N=2792	N=2041		N=81	N=101		N=85	N=118	
WIC	40 (34.19)	77(65.81)	.525	857 (59.35)	587 (40.65)	.057	18 (41.86)	25(58.14)	.911	20 (40.00)	30 (60.00)	.615

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SNAP	70 (30.17)	162 (69.82)	.012	901 (51.48)	849(48.51)	<.001	40 (38.83)	63 (61.16)	.258	26 (35.13)	48 (64.86)	.871
Double Dollars	7 (58.33)	5 (41.67)	.131	34 (66.67)	17 (33.33)	.164	3 (75.00)	1 (25.00)	.314	1 (50.00)	1 (50.00)	.424
Medicaid	88 (34.51)	167 (65.49)	.409	1821 (57.16)	1365 (42.84)	.926	46 (35.94)	82 (64.06)	.044	41 (40.20)	61 (59.80)	.723
Medicare	29 (38.67)	46 (61.33)	.638	149 (55.18)	121 (44.81)	.521	6 (46.15)	7 (53.85)	.774	11 (45.83)	13 (54.17)	.271
Free Reduced Lunch	138 (34.76)	259 (65.24)	.105	2228 (57.78)	1628 (42.21)	.233	74 (43.27)	97 (56.72)	.886	62 (43.05)	82 (56.94)	.778
CHIP	38 (38.38)	61 (61.61)	.792	672 (61.99)	412 (38.01)	<.001	17 (44.74)	21 (55.26)	.793	21 (51.22)	20 (48.78)	.540
Employment Status	N= 162	N=286	.899	N= 2849	N=2173	<.001	N= 101	N=132	.841	N= 87	N=112	.101
Employed	112 (36.13)	198 (63.87)		881 (50.46)	865 (49.54)		49 (42.24)	67 (57.76)		26 (47.27)	29 (52.73)	
Homemaker	19 (38.77)	30 (61.22)		1774 (62.05)	1085 (37.95)		33 (42.86)	44 (57.14)		11 (73.33)	4 (26.67)	
Not Working	31 (34.83)	58 (65.17)		194 (46.52)	223 (53.48)		19 (47.50)	21 (52.50)		11 (68.75)	5 (31.25)	

Implementation success: 0=attendance below the threshold (75% or greater; 12 out of 16 distributions); 1=attendance at or above the threshold (<75%)

Data obtained during the 2018-2019 school year parent surveys administered across the Brighter Bites program.

Results of the mixed-effects logistic regression (Table 3) found the overall model to be significant. Of the different government assistance programs, participation in SNAP, WIC, and Free/Reduced Lunch programs had significant associations with attendance. Interestingly, families who received SNAP benefits were 33% less likely to have attendance at or above the threshold compared to families who do not receive SNAP benefits (Adjusted OR: .67; 95% CI: .59, .75 $p < .001$). Yet, families who received WIC were about 18% more likely to have attendance at or above the threshold, and families who had children participating in the Free/Reduced Lunch were 20% more likely to have attendance at or above the threshold. The contradictory findings of WIC and SNAP could be due to the nutritional requirement and eligibility differences between the programs. WIC requires families to purchase items from a set of predetermined eligible food products, where SNAP does not have any stipulations on the food items a participant can purchase. WIC also has eligibility limitations where families are only able to receive the benefits if there is a child in the household under the age of 5 or the mother is pregnant, but SNAP does not have these types of stipulations on eligibility requirements. Therefore, since our sample is largely made up of families with elementary school-age children in the household, a number of our participants may not meet the requirements to participate in WIC and the families who are receiving the benefits may need additional resources to supplement their nutrition since WIC limits the items they can purchase.

Compared to Hispanics, Whites were 39% less likely to have attendance at or above the threshold (Adjusted OR: .61; 95% CI: .46, .82 $p = .001$), and African Americans were 53% less likely to have attendance at or above the threshold (Adjusted OR: .47; 95% CI: .38, .62 $p < .001$). Compared to families with parents who were employed, homemakers had 1.68 greater odds of having attendance at or above the threshold (Adjusted OR: 1.68; 95% CI: 1.48, 1.9 $p < .001$), and unemployed parents had 1.03 greater odds of having attendance at or above the threshold (Adjusted OR: 1.03; 95% CI: .85, 1.26 $p = .739$). Despite unemployed parents having greater odds of attendance at or above the threshold, these results were not significant.

Table 3-Results of the mixed-effects regression model to assess the sociodemographic predictors of program implementation success for Brighter Bites (N=5671)

Variable	Adjusted Odds Ratio	p-value	95% CI
WIC	1.1791	.022	1.0239, 1.3578
SNAP	.6344	<.001	.5506, .7308
Double Dollar	1.5762	.151	.8469, 2.9335
Medicaid	1.0109	.877	.8813, 1.1595
Medicare	1.1019	.459	.8522, 1.4247
Free/Reduced Lunch	1.2027	.008	1.0483, 1.3799
CHIP	1.0912	.249	.9408, 1.2656
Child's Race/Ethnicity:			
Hispanic	Ref	-	-
African American	.4855	<.001	.3807, .6190
White	.6286	.002	.4674, .8453
Other	.7967	.161	.5800, 1.0944
Employment Status			
Employed	Ref	-	-
Home maker	1.6507	<.001	1.4518, 1.8769
Not employed	.9717	.786	.7900, 1.1952
City			
Houston	Ref	-	-
Dallas	2.314	<.001	1.8606, 2.8789
Southwest Florida	1.6488	.025	1.0664, 2.5494
Washington DC	1.5668	.041	1.0181, 2.4111
Austin	4.2735	<.001	3.2515, 5.6167

Implementation success: 0=attendance below the threshold (75% or greater; 12 out of 16 distributions); 1=attendance at or above the threshold (<75%)

Data obtained during the 2018-2019 school year parent surveys administered across the Brighter Bites program.

$\chi^2 = 350.72$ $p < .001$

Random effect: $\sigma^2 = .3285$ $p < .001$

Significance at $p < .05$ (co-variates adjusted for across the model)

DISCUSSION

Overall, the results of our study indicated that race/ethnicity, parent employment status, and receipt of some government assistance programs (SNAP benefits, WIC, Free/Reduced Lunch, and Medicaid) have a significant association with families' attendance to the Brighter Bites program. As seen in the descriptive statistics, the Brighter Bites program is disproportionately serving more Hispanic families despite previous studies finding fresh F&V consumption disparities among both Hispanics and African Americans. At a national level, there is a higher percentage of African Americans (39.7%) who report not consuming at least one serving of vegetables daily compared to Whites (36.1%) and Hispanics (34.3%). Lucan et al., found among Philadelphia residents, Hispanics were 16% less likely to consume fresh F&V, and African Americans were 35% less likely to consume fresh F&V compared to non-Hispanic Whites (Lucan et al., 2014). In Alabama, Bateman et al. found only 38.7% of African Americans

consumed the daily recommended number of fruit servings and only 14% consumed the daily recommended number of vegetable servings (Bateman et al., 2017). These results indicate a need for programs like Brighter Bites to be present in African American communities. To date, a national rate of fruit and vegetable consumption across race/ethnicity has not been found, which speaks to the importance of the findings in this study. African Americans and Hispanics have been found to consume less fresh produce, yet Brighter Bites has not been able to effectively reach both racial/ethnic groups. Although the Brighter Bites program has sought to provide an equal opportunity for diverse lower socioeconomic status communities, the vast majority of the participants are from one ethnic background, Hispanic. This is likely due to a systematic selection bias over time given that the Brighter Bites membership criteria requires schools to provide parent volunteers, parent commitment to pick up the produce weekly, and a high level of school engagement. The results of our quantitative analysis also provide insight into possible reasons for this selection bias. Parental employment status was found to be strongly associated with attendance. Parents who were homemakers were much more likely to attend at or above the threshold than those who were employed. In our sample, the Hispanic households had a greater number of homemakers than the African American households, which is likely why attendance was higher among Hispanic families. The program appears to be more conducive to households that have homemakers than households with employed parents, which speaks to the systematic selection bias we observed in this study. Prior studies have identified challenges with parent engagement among African American families (Di Noia et al., 2013; Miller & Akohoue, 2017; Srivastava et al., 2018). These results along with those seen in our study indicate that programs, such as Brighter Bites, may need to consider additional strategies to ensure equitable and successful program implementation across diverse populations.

Households that received SNAP benefits, WIC, or Free/Reduced Lunch had a significant association with attendance to the Brighter Bites program. Notably, out of these three programs, households that received SNAP benefits were the only ones to have lower odds of attendance at or above the threshold compared to households that did not receive the benefits. There were differences in SNAP participation by race/ethnicity as well. Nearly 50% of African American families reported participating in the SNAP program, where only 33.15% of Hispanic families reported participating. Interestingly, despite 70% of our study sample reportedly being food insecure, only 35% participated in the SNAP program. This could be due to multiple reasons related to eligibility or lack of knowledge of the SNAP enrollment process that needs to be explored in future studies. However, our data suggest that despite the high prevalence of food insecurity, a majority of the families do not have access to SNAP benefits to supplement their nutrition, and other resources—such as Brighter Bites—are warranted. This is supported by our findings of higher participation in the Brighter Bites program among families who did not receive SNAP benefits because the program provided the needed food to the families to mitigate food insecurity. It could be speculated that willingness to participate in a program that provides fresh produce would be lower among households that receive SNAP benefits because the families may be using their benefits to purchase produce at retail stores. Yet, while SNAP is a proven model to effectively address food insecurity, unlike WIC benefits and the Free/Reduced Lunch program, SNAP does not have regulated requirements for which foods a participant can purchase with the benefits. Studies have reported mixed findings on the SNAP program's ability

to improve produce consumption among the participants (Wolfson & Bleich, 2015). A study by Wolfson and Bleich found a lower percentage of families who received SNAP benefits consumed the recommended amounts of F&V compared to families who did not receive the benefits (Wolfson & Bleich, 2015). A recent study by Moran et al. found families who received SNAP benefits reported buying more processed food because this type of food had a longer shelf life and cost less (Moran et al., 2019). However, this needs to be explored in future studies. The large proportion of low-income families with children who are food insecure and not receiving SNAP benefits in our study underscores the need for programs such as Brighter Bites. There is a need for programs that combine access to food and robust nutrition education to teach families how to use the produce provided to them in a healthy and tasty way so improvements in eating habits can be seen.

The findings in this study led to Brighter Bites revisiting some of the requirements that were identified as potential barriers to families participating and implementing new practices during the fall 2020 academic semester. To accommodate working parents, the times for the distributions were extended beyond the school day and some sites conducted distributions on the weekend. Another change implemented was that boxes were prepacked for the families to remove the need for parent volunteers. A produce voucher program was developed in each participating city to allow families to purchase produce at their convenience even if they were unable to participate in their child's school distribution. Note, these implementation changes coincided with the changes the program had to adapt to accommodate city-wide shut-downs, restricted large gatherings, and prolonged health threat of the novel Coronavirus. An analysis of the effect of these changes is needed to inform future implementation strategies.

Limitations of the study include an unequal distribution of families across the cities (Houston=3461, Dallas=1756, Austin=966, Washington DC=309, and Southwest Florida=249). However, this is reflective of the extent of the program's dissemination across the participating cities. As mentioned previously, there was a response rate of 32.38% which introduces the potential threat of response bias to our findings. If our findings are replicated in another sample with a greater response rate, we would have greater confidence in the generalizability of our results.

The strengths of our study include a large sample size with a diverse population across five cities in the United States. Furthermore, the implementation data collected using objective tracking and attendance data allows for prediction assessment.

Implication for Research and Practice

Brighter Bites is an evidence-based program that has demonstrated success in increasing produce consumption and nutritional education among elementary school children and their parents in several cities across the nation. Yet, despite the overall success of the program, there is still a disparity in the implementation of the program across races/ethnicities. Brighter Bites aims to provide a program that would be accepted in any racial/ethnic group, yet the results of the current study reveal a disparity in racial/ethnic group participation. The direct causes of this disparity warrant a more detailed analysis, but the current analysis provides directions for the next steps. The parental time commitment is the first factor that needs to be explored. Brighter Bites requires weekly parent participation which could be a burden for African American, Asian, Native Hawaiian or Pacific Islander, American Indian or Alaskan Native, and Mixed

Race/Ethnicity, and White families since a large percentage of those families have employed parents in the household. But among Hispanics, there is a higher prevalence of households with parents who are homemakers. This difference in household employment status could be due to a cultural factor, but this analysis is not able to support that conclusion. Another factor that needs further exploring is the role SNAP enrollment plays in participation in the program. Hispanic families have the smallest percent of households participating in the SNAP program which suggests more families in the Hispanic racial/ethnic group were less likely to have monetary resources to supplement their nutrition. Citizenship is one of the qualifications to receive SNAP benefits and this could potentially be a systematic barrier that is causing lower SNAP enrollment among Hispanic families. Brighter Bites could be filling a void a greater percentage of Hispanic families are experiencing because of systematic barriers to accessing food, consequently causing more Hispanic families to participate in the program.

During the 2020-2021 school year, Brighter Bites used the results of this study to identify and implement new ways to provide a more equitable program across all racial/ethnic groups. Brighter Bites established a formal DEI (Diversity, Equity, and Inclusion) Committee that focuses on ensuring everything the company does considers principles of DEI; including school selection by making sure the schools they serve represent the diversity of the community in need. Brighter Bites also applied for and was awarded funding to implement a pilot program in a historically African American community the program previously served but was unable to successfully maintain a presence. Brighter Bites will use the pilot to test programmatic steps to augment the program to help parents get around employment/attendance barriers (such as longer distribution hours, weekend distributions, and pre-boxed produce), increase variety in produce to reflect culturally specific items, and develop a voucher program to transition families away from depending on Brighter Bites distributions and begin to incorporate purchasing produce during their grocery shopping times.

Whether Brighter Bites implementation methods cause certain races/ethnicities to decide against participating or if Brighter Bites program structure lacks cultural sensitivity is a question better answered with qualitative data. Yet, insight into sociodemographic factors that predict program attendance can inform future equitable implementation and dissemination strategies of health promotion programs such as Brighter Bites.

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