Preventive Medicine 119 (2019) 37–43

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

Dissemination of healthy kids out of school principles for obesity prevention: A RE-AIM analysis

Christina D. Economos[a,*], Stephanie Anzman-Frasca[b,1], Alyssa H. Koomas[a,1], Peter J. Bakun[a], Clarissa M. Brown[a,1], Diane Brown[a,1], Sara C. Folta[c], Karen J. Fullerton[a], Jennifer M. Sacheck[c,d], Shanti Sharma[a], Miriam E. Nelson[a,e]

[a] ChildObesity180, Friedman School of Nutrition Science and Policy, Tufts University, United States of America
[b] Pediatrics, Jacobs School of Medicine and Biomedical Sciences, University at Buffalo, United States of America
[c] Friedman School of Nutrition Science and Policy, Tufts University, United States of America
[d] Department of Exercise and Nutrition Sciences, Milken Institute School of Public Health, The George Washington University, United States of America
[e] Hampshire College, United States of America

ARTICLE INFO

Keywords:
Out-of-school
Nutrition
Physical activity
Obesity prevention
RE-AIM
Afterschool
Health promotion
OST
Snacks
Beverages

ABSTRACT

Health-promoting behaviors for childhood obesity prevention are needed across multiple environments where children spend time, including out-of-school time (OST).

Therefore Healthy Kids Out of School (HKOS) developed intervention strategies to promote three evidence-based principles (Drink Right, Move More, Snack Smart) for obesity prevention in OST. The strategies were developed with stakeholder input, disseminated, and evaluated (2012–2015) in two volunteer-led OST organizations, Boy Scouts of America (BSA) and 4-H, across three US states using the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) framework. Mixed methods were used involving surveys, key informant interviews, and organizational-level data collection.

Sixty out of 81 (74.1%) BSA districts and 4-H counties reaching 84,590 children (72% of children participating in BSA and 4-H in three states) adopted the strategies. 530 surveys completed by local OST leaders at baseline and 294 at follow-up showed the percentage of programs offering healthy beverages and opportunities for physical activity increased from baseline to follow-up (beverages 26% baseline, 35% follow-up, odds ratio (OR) 1.53; physical activity 31% baseline, 45% follow-up, OR 1.79; all $p < 0.05$). The increasing trend for healthy snacks was statistically non-significant ($p = 0.09$). Leaders interviewed reported the strategies were easy to implement, a good fit with their program, facilitated success, and they expected to maintain the changes. Integration of HKOS customized materials (BSA patch and 4-H pin) on BSA and 4-H national websites is a broader indicator of maintenance.

Intervention strategies developed with stakeholder input and disseminated with training can effectively facilitate healthy environments for children, and have potential for national scale.

1. Introduction

The childhood obesity epidemic continues to impact US children despite national efforts (Skinner et al., 2016; Ogden et al., 2016). A systematic approach that encourages consistent health-promoting behaviors across environments where children spend time is therefore needed. Efforts to increase physical activity (PA) and encourage healthy eating in schools and in staff-led afterschool programs are underway (Brown and Summerbell, 2009; Wolfenden et al., 2017; Wiecha et al., 2012; Weaver et al., 2017). However volunteer-led out-of-school-time (OST) programs, including enrichment and youth sports programs, are largely overlooked. These programs reach tens of millions of children, with many participating over multiple years. For instance, over four million youth participate in scouting programs, and nearly six million in 4-H (Boy Scouts of America, n.d.; Girl Scouts of the USA, n.d.; 4-H, 2014). However, there is evidence that these programs could be improved to better support healthy habits and obesity prevention (Economos et al., 2017). For instance, a survey in New England found

* Corresponding author at: Friedman School of Nutrition Science and Policy, Tufts University, 150 Harrison Ave., Boston, MA 02111, United States of America.
E-mail address: Christina.Economos@tufts.edu (C.D. Economos).
[1] These authors were with ChildObesity180 at the Friedman School of Nutrition Science and Policy at Tufts University when this study began.

https://doi.org/10.1016/j.ypmed.2018.12.007
Received 27 June 2018; Received in revised form 5 December 2018; Accepted 16 December 2018
Available online 19 December 2018

that among 4-H and Boy Scouts of America (BSA) programs that provided snacks and beverages during typical meetings, salty and sweet snacks and sugary beverages were prevalent (Economos et al., 2017). Additionally, only a third of these programs reported offering PA at most meetings (Economos et al., 2017).

The National AfterSchool Association established voluntary Healthy Eating and Physical Activity Standards for OST settings in 2011, which have been adopted by numerous national OST organizations that provide afterschool care, including YMCA of the USA and the National Parks and Recreation Association (Wiecha et al., 2012; YMCA of the USA website, n.d.; National Parks and Recreation Association website, n.d.). While these guidelines are well-suited for staff-led organizations, volunteer-led OST organizations may face implementation challenges, since they often rely on parent volunteers, experience high turnover of and offer less training for these parent leaders, and have less control over implementation compared to traditional staff-led afterschool programs. The unique needs of volunteer-led OST programs together with their influence on millions of US children call for customized, simple, and actionable messaging and programming for health promotion in these settings to encourage environmental changes.

Healthy Kids Out of School (HKOS) is an initiative that aims to address childhood obesity by promoting healthy eating and physical activity during out-of-school-time (OST) (Sliwa et al., 2014). The HKOS initiative created simple, actionable, and evidence-based principles for obesity prevention in collaboration with, and to specifically support, volunteer-led OST organizations: Drink Right: choose water over sugar-sweetened beverages; Move More: boost movement and physical activity in all programs; and Snack Smart: fuel up on fruits and vegetables (Sliwa et al., 2014). These principles aim to significantly reduce added sugar intake, increase intake of essential nutrients, and increase PA, consistent with national guidelines (US Department of Agriculture and US Department of Health and Human Services, 2015; US Department of Health and Human Services, 2008; Vos et al., 2017). Through engagement with OST leaders, the principles were disseminated via intervention strategies specifically customized for different volunteer-led OST organizations (Folta et al., 2015).

The goal of this study was to evaluate the dissemination of the intervention strategies in two volunteer-led enrichment OST organizations (BSA and 4-H) in Maine, New Hampshire, and Massachusetts. This evaluation utilized the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) framework due to its focus on evaluating public health interventions across practical, real-world dimensions (Glasgow et al., 1999).

2. Methods

2.1. Study population and recruitment

Two enrichment organizations, BSA and 4-H, were studied from May 2012 to April 2015. The organizational structure of BSA is: National Council → Regions → Councils → Districts → Troops/Packs/Dens. The organizational structure of 4-H is: National Council → State Extension offices → Counties → Clubs. A repeated cross sectional design was utilized in a sample of participating BSA troops/packs/dens and 4H clubs. Program administrators at BSA districts and 4-H counties in Maine, New Hampshire and Massachusetts, USA were contacted via email or phone to schedule presentations for disseminating the intervention strategies locally to BSA troops/packs/dens and 4-H clubs. Administrators provided access for presentations to local OST program leaders, after which leaders could sign on for study participation. Local OST program leaders were eligible if they worked directly with children ages 5 to 12 years in BSA troops/packs/dens and 4-H clubs. To assess implementation, a sub-sample of leaders participated in key informant interviews (2 interviews per organization, per state, resulting in n = 12). Study measures and their correspondence to RE-AIM framework components are discussed below. Human subject research activities were approved by Tufts University Institutional Review Board.

2.2. Intervention strategies and process of dissemination

HKOS intervention strategies to support adoption of the three evidence-based principles (Drink Right: choose water over sugar-sweetened beverages; Move More: boost movement and physical activity in all programs; and Snack Smart: fuel up on fruits and vegetables) were developed for both BSA and 4-H after an in-depth, early-stage engagement process with local OST program leaders, as detailed elsewhere (Folta et al., 2015). The intervention strategies were designed to integrate the principles within each organization's culture, while leveraging their existing policies and communication channels. These strategies encouraged leaders of troops/dens/packs/clubs to promote the three principles over a specific number of meetings to allow children to earn an incentive (SCOUTStrong Healthy Unit Award patch or 4th H for Health Challenge pin) and establish a new norm (Folta et al., 2015). To earn the SCOUTStrong Healthy Unit Award, leaders needed to offer a fruit/vegetable snack at 3 meetings, water at 6 meetings, and ≥15 min of PA at 9 meetings; and to complete the 4th H for Health Challenge, leaders needed to offer a fruit/vegetable snack at 4 meetings, water at 4 meetings, ≥15 min PA at 4 meetings, and any principle of their choosing at 4 more meetings.

HKOS staff provided training for the SCOUTStrong Healthy Unit Award or 4th H for Health Challenge to local OST program leaders via hands-on, interactive (in-person and virtual) presentations during regularly-scheduled OST program leader meetings at the district/county levels. Overall, 66 presentations took place across the three states and ranged from 15 to 90 min (on average, approximately 40 min). Local OST program leaders were also given supporting materials (e.g. water bottles, PA games, fruit/vegetable snack recipes, and educational activities such as an interactive sugar quiz showing amounts of sugar in popular beverages) and technical assistance.

2.3. Measures

2.3.1. RE-AIM framework components

Methods utilized to evaluate each RE-AIM framework component are described below and summarized in Table 1.

Reach was captured at the child level, State OST enrollment data were used to estimate the number of children enrolled in BSA districts and 4-H counties that adopted the intervention strategies/principles The percentage of children exposed to the principles was calculated as the number of children enrolled in participating districts/counties divided by the total number of children participating in BSA and 4-H in the three states. To assess representativeness, child demographics were captured by local OST program leader report at baseline and follow-up and were compared to state enrollment demographic data. Since children did not “choose to participate” but participated by virtue of the program beings offered at their OST organization, this definition of reach represents a modification of the classical definition. This modification is philosophically consistent with other research using RE-AIM to assess built environment and policy changes (King et al., 2010; Jilcott et al., 2007).

Effectiveness was captured at the troops/dens/packs/clubs level as a proxy for child-level results. The Out-of-School-Time Snacks, Beverages, and Physical Activity Questionnaire (OST-SBPA) is a validated program-leader-report survey that assesses the snacks and beverages served at OST program meetings and opportunities for PA (Anzman-Frasca et al., 2015). It was used to gauge Effectiveness of the intervention strategies in promoting the three principles, and was administered to local OST program leaders using Qualtrics software (Qualtrics, Provo, UT). Leaders who attended a presentation and provided contact information were invited to complete the survey at baseline and follow-up, with the aim to survey as many eligible leaders

Table 1
RE-AIM framework components.

RE-AIM component	Primary questions	Measurement level	Measurement methods
Reach	*What percentage of children who participate in target OST programs are being exposed to the principles (via participation in troops/packs/dens/clubs in BSA districts and 4-H counties that adopted the intervention strategies)?*	BSA districts and 4-H counties	State child enrollment data provided by BSA or retrieved from 4-H website
	Are those reached representative of all children who participate in BSA and 4-H in the three states?	Local OST program leaders	Child demographics reported by local OST program leaders via survey at baseline and follow-up; State enrollment data
Effectiveness	*Are local OST program leaders providing more nutritious foods and beverages and more opportunities for PA to the children they serve during typical program sessions since implementation of the customized programs?* *Are a greater percentage of local BSA troops/packs/dens and 4-H clubs meeting pre-defined success indicators for healthy meetings since implementation?*	Local OST program leaders	OST-SBPA questionnaire at baseline and follow-up
Adoption	*What percentage of programs at the BSA district or 4-H county level adopted the principles?*	BSA district and 4-H county level OST programs	Tracking of in-person and virtual HKOS presentations approved for dissemination by BSA district and 4-H county administrators
Implementation	*What actions did local OST program leaders take to implement the intervention strategies and what was the process?* *What adaptations were made to the principles?* *What factors served as facilitators to implementation?*	Local OST program leaders	Eligibility screening and recruitment via telephone On-site key informant interviews with successful implementers post implementation
Maintenance	*Are the intervention strategies sustained at the local, state or national level?*	Local OST program leader; BSA district and 4-H county administrators	Maintenance questions on follow-up survey Key informant interviews with local OST program leaders Inclusion and integration of HKOS tailored materials on state/regional/national websites

as possible at each time point. Baseline surveys were distributed on a rolling basis following presentations but prior to implementation of the intervention strategies locally. Follow-up surveys were sent just prior to the end of the program year, 6–8 months post implementation. When necessary, up to two reminder emails were sent to BSA district and 4-H council administrators asking them to remind the local OST program leaders about the survey.

982 local OST leaders attended trainings and signed up for study participation. After de-duplication to remove surveys completed by multiple leaders from the same troop/pack/den/club, 562 baseline and 320 follow-up surveys remained, corresponding to response rates of 57.2% at baseline and 32.6% at follow-up. These estimates are conservative given the removal of duplicate programs from the numerator but not the denominator.

2.3.1.1. Success indicators. Effectiveness was quantified as in prior studies (Economos et al., 2017), and defined as success in offering snacks, beverages, and physical activity opportunities that corresponded to the three principles. OST-SBPA data were used to assess programs' success (Economos et al., 2017):

Snack success:
- No snacks at meetings, or
- If provided: (1) Fruits/vegetables were served at most or all meetings, and salty and sweet snacks at only some or no meetings, or (2) Fruits/vegetables were served at some meetings and salty and sweet snacks at none (Anzman-Frasca et al., 2015).

Beverage success:
- If programs provided beverages: Water was provided at most or all meetings, and sugar-sweetened beverages (SSBs) at no meetings.
- If children brought beverages: Water was brought to most or all meetings and SSBs to only some or no meetings.

PA success:
- Programs offered PA at most or all meetings, for ≥15 min per meeting.

Adoption of the principles was defined as the percent of BSA districts and 4-H counties that hosted HKOS presentations. As with Reach, the definition used for Adoption represents a modification of the classical definition, since participation in a presentation did not guarantee that the principles were delivered to the target audience (children). However, this definition is philosophically consistent with Adoption as a setting-level factor, and with modifications that have been made in other research using RE-AIM to assess policy changes (Jilcott et al., 2007). All BSA districts/4-H counties in the three-state region were invited to participate. Non-adoption was defined as a lack of response or declining to participate.

Implementation was captured via key informant interviews with a sub-set of local OST program leaders and was designed to understand how implementation unfolded among successful programs. Less successful programs were not interviewed due to resource limitations and the priority to apply lessons learned from successful programs in subsequent implementation efforts. To maximize resources, the a priori sample size was set at 12 leaders: two leaders in each of the three states, with leaders representing different BSA districts and 4-H counties. Leaders were recruited for interviews via telephone, with contact information arranged in a randomized order. Eligibility was based on completing the BSA patch or 4H pin with their troop/pack/den/club or making another substantial change attributed to HKOS programming (e.g., changing to water as the only beverage provided at program meetings). Recruitment via telephone continued until the a priori sample size was reached. Implementation-related interview questions centered on actions taken by successful programs to implement the principles; modifications to the principles; and facilitators of implementation (Table 1).

While the study timeline precluded long-term follow-up, likelihood of Maintenance at the organizational level was gauged in three ways. First, during key informant interviews, data were collected on likelihood of sustaining changes. Second, questions were added to the follow-up survey completed by local OST program leaders about willingness to use and current usage of the intervention strategies, and plans to participate in local OST programs the following year. Finally, integration of HKOS intervention materials on regional, state or national websites at follow-up was recorded.

2.4. Data analysis

To analyze Effectiveness data, duplicate cases within time points were removed as done previously (Economos et al., 2017). SAS 9.4 was used to run a logistic regression model predicting success in implementing healthy beverages, snacks, and PA opportunities. With time as the single predictor the model tested whether each variable changed from its baseline value. Wald chi-square values were used to test Beta = 0 at the 0.05 level of significance. Odds ratios calculated indicated the odds of success at follow-up versus baseline. The two groups were treated as independent samples given the sampling strategy of obtaining sizeable, representative samples of leaders at each time point (and not necessarily repeated measures of the same leaders as specified a priori). In addition to these a priori analyses, a parallel, post-hoc analysis was conducted to compare the offering of healthy snacks at baseline versus follow-up among only programs offering snacks, after noting a high prevalence of programs that did not offer snacks. To analyze Implementation data, interviews were audio recorded and transcribed. Descriptive and thematic coding approaches were used, with a codebook generated based directly on the discussion guide and on preliminary themes identified by review of the transcripts by the lead analyst (Saldana, 2009; Braun and Clarke, 2006; Ryan and Deci, 2000). Inter-coder reliability was established by randomly selecting two transcripts to be coded by a research assistant and compared with coding by the lead analyst. All codes reached a pre-determined threshold of ≥80% agreement, and the research assistant coded the remaining transcripts. NVivo (QSR International, Version 10) was used to assist with qualitative analysis. Project team members discussed themes and summarized findings. Themes were examined overall and by organization type.

Frequencies were calculated to summarize other RE-AIM indicators, as described in Table 1.

3. Results

3.1. RE-AIM framework components

3.1.1. Reach

84,590 children (72%) were enrolled in the 60 BSA districts and 4-H counties that adopted the intervention strategies out of a total of 117,765 children participating in BSA and 4-H in the three states (Table 2).

Demographics of children reached as reported by local OST program leaders aligned with demographics from the organizations' state enrollment data (Table 3). Children attended OST programs that spanned urban, rural, and suburban communities across the three states.

3.1.2. Effectiveness

562 surveys were submitted at baseline and 320 at follow-up. Surveys missing both respondent demographics and respondent estimated child demographics were considered incomplete and not included for the purposes of this effectiveness analysis, resulting in analysis of 530 surveys at baseline and 294 at follow-up. The percentage of programs that provided healthy beverages and PA, based on pre-defined success indicators, increased ($p < 0.05$) from baseline to follow-up (Table 2). Programs meeting two or more success indicators increased ($p < 0.05$), with 2 or more successes 1.82 times more likely at follow-up versus baseline (Table 2). While the percentage of programs achieving snack success also increased from baseline to follow-up, the change did not reach statistical significance ($p = 0.09$). However, the majority of programs (77% at baseline; 68% at follow-up) did not provide snacks. Looking only at programs that did provide snacks, snack success increased from 23% at baseline to 32% at follow-up ($p < 0.05$).

3.1.3. Adoption

Sixty out of a total of 81 (74.1%) BSA districts and 4-H counties adopted the intervention strategies: 67.4% of BSA districts; 81.6% of 4-H counties (Table 2).

3.1.4. Implementation

Thirty-three local OST program leaders were screened until a priori sample sizes were reached for key informant interviews to assess implementation. Of these, 23 (70%) were deemed successful implementers and eligible for interviews. Interviews were conducted with 12 leaders, six from BSA and six from 4-H. Key themes and representative quotes are summarized in Table 4. Among these successful implementers, a majority of leaders adopted all three principles, and found changes relatively easy to implement. Though leaders did not modify the principles, some focused on one principle more than others, usually in the area that they perceived as needing the most improvement. Almost all leaders interviewed reported that the principles were a good fit with their program, and resources provided facilitated success. Many leaders reported no barriers to making changes to their program, though some noted that parents might resist efforts. Some leaders reported the “snack smart” principle was the most challenging, since they perceived that healthy snacks cost more and require more effort and time to prepare.

3.1.5. Maintenance

The majority of leaders who completed follow-up surveys reported they were currently using or very willing to use each of the HKOS principles (Table 2). All leaders interviewed expressed the intent to maintain the changes made. An indicator of maintenance is integration of HKOS materials on 4-H and BSA websites. The 4th H for Health Challenge pin is now available at the 4-H national online shop, and 4th H for Health Challenge materials are promoted at state-level 4-H offices in 21 states, including Maine, New Hampshire and Massachusetts http://www.4-hmall.org/Product/award-pins/4th-h-for-health-pin/HKOS.aspx. The SCOUTStrong Healthy Unit Award is promoted on the BSA national website, and the patch and HKOS principles are promoted nationally to leaders in the updated BSA 2015 Den Leader Handbook (http://www.scouting.org/scoutstronghealthyunit.aspx).

4. Discussion

Results from this RE-AIM evaluation support the promise of promoting strategies for obesity prevention in volunteer-led enrichment OST organizations. The strategies were based on three evidence-based principles that were developed with stakeholder input. 74.1% of BSA districts and 4-H counties adopted intervention strategies to promote the principles, reaching three-quarters of children enrolled in BSA and 4-H in the three states. The percentage of local OST leaders reporting healthy beverages and opportunities for PA increased from baseline to follow-up, with the change for snacks trending in the same direction. The odds of having success in two or more of these areas also increased. During interviews with successful implementers, most reported adopting all three principles, thought the principles fit well with their program, reported that changes were easy to implement, and believed provided resources aided success. All leaders interviewed expected to maintain the changes. Integration of HKOS materials on BSA and 4-H websites is a broader indicator of maintenance. Thus, intervention strategies developed with early stakeholder input allowed for organizational changes that can positively impact children who participate in these organizations now and in the future.

Past studies evaluating the effectiveness of behavioral interventions for obesity prevention in OST environments have shown mixed results. Evaluation of a statewide PA intervention at afterschool programs found no change in effectiveness from baseline to follow-up and a need for improved attendance at trainings to implement strategies (Beets et al., 2017a). In contrast, evaluation of changes in foods and beverages

Table 2
Results for RE-AIM measures.

RE-AIM dimension	Indicator(s)	Finding(s)
Reach	Children reached, no. (% of total BSA and 4-H enrollment)	84,590 (72%)
Effectiveness[a]	Frequency of success, % of programs (p-value)	
	Beverage	**Baseline: 26% follow-up: 35% (0.0071)**
	Snack	Baseline: 52% follow-up: 58% (0.0914)
	Physical activity	**Baseline: 31% follow-up: 45% (0.0001)**
	Odds of success at follow-up vs. baseline, OR (LCL-UCL)	
	Beverage	**1.53 (1.12–2.07)**
	Snack	1.28 (0.96–1.71)
	Physical activity	**1.79 (1.34–2.41)**
	Frequency of ≥2 successes, % (p-value)	**Baseline: 29% follow-up: 43% (0.0001)**
	Odds of ≥2 successes, OR (LCL-UCL)	**1.82 (1.35–2.46)**
Adoption	No. of BSA districts and 4-H counties adopting principles/total no. of BSA districts and 4-H counties (%)	60/81 (74.1%)
Implementation	No. of successful implementers/no. of study participants screened before reaching a priori sample size (%)	23/33 (70%)
	Implementation insights	Qualitative summary in Table 4
Maintenance (level: local BSA troop/pack/den; 4-H club)	Using or very willing to use principles, no. (%)[b]	
	Offer water as the main beverage	268 (92.4%)
	Serve fruits or vegetables as snacks	212 (78.0%)
	Add 10–15 min of physical activity	245 (84.2%)
Maintenance (level: organizational/national)	Integration of HKOS tailored materials on state/regional/national websites for future years post intervention	(A) Availability of 4th H for Health Challenge pin at the 4-H online shop (http://www.4-hmall.org/Product/award-pins/4th-h-for-health-pin/HKOS.aspx) (B) Promotion of 4th H for Health Challenge materials by state-level 4-H offices in 21 states, including Maine, New Hampshire and Massachusetts (C) SCOUTStrong Healthy Unit Award promoted nationally on the BSA website (http://www.scouting.org/scoutstronghealthyunit.aspx) (D) SCOUTStrong Healthy Unit Award and 3 principles promoted nationally to leaders in BSA 2015 Den Leader Handbooks

Boldface indicates statistical significance ($p < 0.05$).
[a] Baseline (n = 530); follow-up (n = 294).
[b] N (number of responses to each question by program leaders completing follow-up survey): beverage, 290; snack, 272; PA, 291.

Table 3
Demographics of children reached[a].

Child characteristics reported by participating local OST program leaders[b] (n = 84,590)[c, d]					Child enrollment data from 4-H (2014)[c] & BSA (2011)[d]
	Baseline		Follow-up		Mean %
	Mean response %	Median response %	Mean response %	Median response %	
Race/ethnicity					
White	90.5	99	89.6	99	90
Black	3.1	0	2.8	0	4
Hispanic	2.3	0	1.9	0	5
Asian	1.9	0	2.6	0	3
Other	2.2	0	3.2	0	2
Gender					
Boys	79.5	100	80.5	100	75
Girls	20.5	0	19.5	0	25
Age (years)					
< 5	0.5	0	0.5	0	0
5–7	17.5	0	16.0	0	22
8–12	54.6	50	49.6	50	57
≥13	27.5	6	33.8	25	21

[a] Children exposed to the principles through participation in target OST programs.
[b] As reported by local OST program leader respondents via survey.
[c] 4-H enrollment data retrieved from: https://reeis.usda.gov/reports-and-documents/4-h-reports – enrollment data from 2014.
[d] BSA enrollment data for 2011 provided by BSA national office for Maine, New Hampshire and Massachusetts.

served at afterschool programs during a community-based intervention found overall improvements and the need for other strategies or longer exposure to the intervention for greater impact (Beets et al., 2017b). While more research is needed, the present study, coupled with extant research, support the potential of OST environments as a setting for health programming. Instead of focusing on educational and/or behavioral interventions at the individual level, the intervention strategies reported here focused on making systematic changes within organizations, providing healthier environments for children (McLeroy et al., 1988). Such environmental changes at the organizational level hold promise for maintenance and long-term impact on millions of children.

There are some limitations to the present study. Effectiveness was measured at baseline and follow-up with no comparison group, and was not captured at the child level since such data collection would have been resource-intensive and cost-prohibitive. Therefore only snacks, beverages, and opportunities for PA offered to children were evaluated, and not children's consumption or participation in PA. In an effort to recruit the largest possible representative sample of leaders at each time point, a repeated cross-sectional design was used, rather than assessing all of the same local programs longitudinally. However, demographics across baseline and follow-up were similar for both OST leaders and children. The sample size for the follow-up effectiveness survey was smaller than for the baseline survey, and there is potential for bias, with follow-up surveys being more likely to be completed by successful implementers. Therefore, multiple imputation was used to examine the influence of the differing samples on results by repeating effectiveness analyses (Yuan, 2011; Schafer and Graham, 2002). Encouragingly, similar results were found using imputed data (data not shown). Implementation findings are potentially biased since only leaders of successful programs were interviewed. Less successful implementers were not interviewed due to resource limitations, and the priority to learn

Table 4
Implementation: summary of themes and representative quotes from key informant interviews.

Key informant interview theme	Representative quotes
Implementation process	
• The majority of program leaders indicated that they had adopted all 3 of the principles in some form. • BSA program leaders described actions related to working toward fitness and nutrition badges, like performing fitness challenge type activities and creating a healthy eating cookbook. • 4-H leaders likewise described working toward a goal, mainly the 4th H for Health Challenge. They described introducing more fruit and vegetable snacks using a variety of strategies, for example rotating responsibility for snack among parents to reduce cost, or simplifying the snack. • The general sentiment was that the changes were relatively easy to implement. A theme was that communicating with parents was key in making changes.	*But it was so easy, honestly, to incorporate – you know, water? Boom. Done. That's an immediate change. The 15 min of physical activity? What boy doesn't like to get out there and, you know, mess around?* *Everything was really, really easy. And, again, I mean, by serving water, it just – it literally made my expense go down, the decision making faster – it was just so easy … Knowing that you're doing the right thing is a bonus.*
Modifications to principles	
• Leaders indicated that they did not make any modifications to the principles. • However, some expressed focusing on one principle more than the others, or on implementing them in more subtle ways.	*I wouldn't say that really we had to modify anything because the program allows for such flexibility of its own nature.*
Facilitating factors and barriers	
Facilitators	
• The main facilitating factors that leaders mentioned were the HKOS website and handouts. Most of the leaders noted that these resources were most helpful in the beginning of the change process since they provided information that could be easily sent to parents to "get the word out." • Most 4-H leaders specifically mentioned the water bottles, trackers, and sugar quiz, provided by HKOS, as being particularly helpful. • Across all programs, parents and other program leaders were noted as being supportive of the changes. Those who were not supportive were "neutral", expressing neither support nor opposition. • 4-H leaders mentioned having the leadership of older children as a key to success. • Almost all program leaders expressed that the principles were a good fit with their program, both at the level of the larger organization and at their local level. • Leaders indicated that children's natural thirst facilitated water consumption, causing "drink right" in many cases to be the easiest principle to implement. They also felt it was facilitated by the low cost. • Other leaders said that the unstructured nature of the physical activity facilitated its implementation, since it provided kids with free play time and gave the adults a break.	*I think the fact that you gave such good resources, you know; it gave me something to work with, I didn't have to reinvent the wheel, or come up with my own ideas.* *And they will listen to (name) when – just that peer thing and that she's a junior in high school – and they look up to her, and she is just – I really think that's the biggest thing. Because she had it presented to her, and she brought it back to all of us.*
Barriers	
• About half of program leaders indicated that there were no barriers to making changes and everything was easy. • Several other leaders noted that parents, while expressing support, might resist efforts. • Leaders reported some pushback from kids, mostly regarding not being allowed sports drinks, not liking vegetables, and not receiving treats as they used to. However, this was relatively short-lived and children grew accustomed to the changes relatively quickly. Leaders also reported that if they had new children participating, they accepted the changes as usual practice, and didn't receive this pushback. • 4-H leaders mentioned seasonality and weather as barriers to both "snack smart" and "move more". They also mentioned the cost of fruits and vegetables. • Only one leader (4-H) said that "snack smart" was the easiest principle, and about half of those interviewed identified it as the hardest, since healthy snacks take more effort and time and may cost more. • Most 4-H leaders said that "moving more" was the most difficult to implement for a number of reasons, including weather and space.	*Well, the kids, you know, having to learn a new system, and having to give up things, that's hard for them… You know, a couple of times, the – one of the kids goes "No, my mom lets me eat like that." And I said, "Well that's OK, that's your mom's choice. But here, this is what we're going to do."* *Oh yeah, [the children have] gotten used to it, they're fine with it now.*

from successful implementers to inform future dissemination efforts; as a result barriers less successful implementers may have encountered were not systematically evaluated. During screening less successful implementers indicated barriers of lack of time and lack of perceived need for changes. There are also a number of strengths to the study, including the mixed-methods approach and involvement of OST leaders who serve children in urban, rural, and suburban communities.

While there was demographic representativeness of children based on the two organizations' enrollment data, there was low racial/ethnic diversity in the present sample overall, reflecting demographics of the states in which the study was conducted. This highlights the need for further research to understand how these interventions can expand into more diverse communities nationally. Findings from this study can inform such future research. For instance, effectiveness data for snacks suggested that the snack principle may not be as broadly relevant, since many programs did not offer snacks. In addition, qualitative data indicated that healthy snacks were perceived to take more time to prepare and to cost more, highlighting the need to reconsider when and how to promote the snack principle. The beverage and PA principles seem more universally applicable for extensive implementation. Future research using randomized designs and comprehensive assessments of implementation could also provide further insights as to whether observed changes were due to implementation of the interventions.

Overall this study suggests that intervention strategies developed with stakeholder input at an early stage and disseminated with training across OST organizations can facilitate healthy environments for children. Systematic organizational changes to adopt these strategies can allow evidence-based recommendations that support healthy behaviors to potentially reach millions of children.

5. Conclusions

After training, BSA and 4-H OST programs were able to adopt and successfully implement evidence-based principles and effectively increased offering of water and PA. Systematic changes at volunteer-led OST organizations allow for broad reach to children and have potential to positively influence behavior to prevent obesity.

Conflicts of interest statement

This study was funded with support from the Harvard Pilgrim Health Care Foundation. Strategic funding for ChildObesity180 was provided by the Robert Wood Johnson Foundation and The JPB Foundation. The funders were not involved in the study design, data collection, analysis, manuscript writing, or in the decision to submit the manuscript for publication. The authors report no conflicts of interest.

Financial disclosure

No financial disclosures were reported by the authors of this paper.

Acknowledgements

The authors would like to thank Molly Newman, Heather Angstrom, Teresa Hofer, Anna Marie Finley, Emily Lynn and Megan Halmo for their contributions to study design, data collection, data cleaning, and data analysis. We would also like to thank the out-of-school-time staff and volunteers for their time participating in this study.

This study was funded with support from the Harvard Pilgrim Health Care Foundation. Strategic funding for ChildObesity180 was provided by the Robert Wood Johnson Foundation and The JPB Foundation. The funders were not involved in the study design, data collection, analysis, manuscript writing, or in the decision to submit the manuscript for publication.

CDE designed and oversaw the study as PI, interpreted analyses, conceived the manuscript, wrote and edited the manuscript. SAF oversaw study data, conducted and interpreted analyses, conceived, and edited the manuscript. AHK managed the study including data collection, interpreted analyses, conceived, and edited the manuscript. PJB conducted and interpreted analyses, and edited the manuscript. CB conducted and interpreted analyses. DB executed the study, collected data, and edited the manuscript. SCF designed the study, conducted and interpreted analyses, wrote and edited the manuscript. KF executed the study, collected data, and edited the manuscript. JMS designed the study and edited the manuscript. SS designed the study, wrote and edited the manuscript. MEN designed the study and edited the manuscript. All authors read and approved the final manuscript.

References

4-H, 2014. 4-H Reports. https://reeis.usda.gov/reports-and-documents/4-h-reports, Accessed date: 25 March 2016.

Anzman-Frasca, S., Boulos, R., Hofer, T., et al., 2015. Validation of the out-of-school-time snacks, beverages, and physical activity questionnaire. Childhood Obesity 11 (4), 439–448.

Beets, M.W., Glenn Weaver, R., Turner-McGrievy, G., et al., 2017a. Evaluation of a statewide dissemination and implementation of physical activity intervention in afterschool programs: a nonrandomized trial. Transl. Behav. Med. 7 (4), 690–701.

Beets, M.W., Weaver, R.G., Turner-McGrievy, G., et al., 2017b. Two-year healthy eating outcomes: an RCT in afterschool programs. Am. J. Prev. Med. 53 (3), 316–326.

Boy Scouts of America BSA Annual Report. http://www.scouting.org/filestore/annualreport/2014/2014_Annual_Report.pdf, Accessed date: 28 March 2016.

Braun, V., Clarke, V., 2006. Using thematic analysis in psychology. Qual. Res. Psychol. 3 (2), 77–101.

Brown, T., Summerbell, C., 2009. Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. Obes. Rev. 10 (1), 110–141.

Economos, C.D., Anzman-Frasca, S., Koomas, A.H., et al., 2017. Snacks, beverages, and physical activity during volunteer-led out-of-school-time programs: a cross-sectional analysis. BMC Public Health 17 (1), 125.

Folta, S.C., Koomas, A., Metayer, N., et al., 2015. Engaging stakeholders from volunteer-led out-of-school time programs in the dissemination of guiding principles for healthy snacking and physical activity. Prev. Chronic Dis. 12, E225.

Girl Scouts of the USA Annual Report: Girl Scouts of the USA. http://www.girlscouts.org/content/dam/girlscouts-gsusa/forms-and-documents/about-girl-scouts/facts/2014_annual_report.pdf, Accessed date: 28 March 2016.

Glasgow, R.E., Vogt, T.M., Boles, S.M., 1999. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. Am. J. Public Health 89 (9), 1322–1327.

4th H for Health Challenge pin at the 4-H online shop. http://www.4-hmall.org/Product/award-pins/4th-h-for-health-pin/HKOS.aspx.

SCOUTStrong Healthy Unit Award promoted nationally on the BSA website. http://www.scouting.org/scoutstronghealthyunit.aspx.

Jilcott, S., Ammerman, A., Sommers, J., Glasgow, R.E., 2007. Applying the RE-AIM framework to assess the public health impact of policy change. Ann. Behav. Med. 34 (2), 105–114.

King, D.K., Glasgow, R.E., Leeman-Castillo, B., 2010. Reaiming RE-AIM: using the model to plan, implement, and evaluate the effects of environmental change approaches to enhancing population health. Am. J. Public Health 100 (11), 2076–2084.

McLeroy, K.R., Bibeau, D., Steckler, A., Glanz, K., 1988. An ecological perspective on health promotion programs. Health Educ. Q. 15 (4), 351–377.

National Parks and Recreation Association website HEPA Standards. http://www.nrpa.org/our-work/partnerships/initiatives/commit-to-health/, Accessed date: June 2018.

Ogden, C.L., Carroll, M.D., Lawman, H.G., et al., 2016. Trends in obesity prevalence among children and adolescents in the United States, 1988–1994 through 2013–2014. JAMA 315 (21), 2292–2299.

Ryan, R.M., Deci, E.L., 2000. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am. Psychol. 55 (1), 68–78.

Saldana, J., 2009. The Coding Manual for Qualitative Researchers (online). SAGE Publications.

Schafer, J.L., Graham, J.W., 2002. Missing data: our view of the state of the art. Psychol. Methods 7 (2), 147–177.

Skinner, A.C., Perrin, E.M., Skelton, J.A., 2016. Prevalence of obesity and severe obesity in US children, 1999–2014. Obesity 24 (5), 1116–1123.

Sliwa, S.A., Sharma, S., Dietz, W.H., et al., 2014. Healthy kids out of school: using mixed methods to develop principles for promoting healthy eating and physical activity in out-of-school settings in the United States. Prev. Chronic Dis. 11, E227.

US Department of Agriculture, US Department of Health and Human Services, 2015. Dietary Guidelines for Americans, 2015–2020. US Government Printing Office, Washington, DC.

US Department of Health and Human Services, 2008. 2008 Physical Activity Guidelines for Americans. US Department of Health and Human Services, Washington, DC.

Vos, M.B., Kaar, J.L., Welsh, J.A., et al., 2017. Added sugars and cardiovascular disease risk in children: a scientific statement from the American Heart Association. Circulation 135 (19), e1017–e1034.

Weaver, R.G., Moore, J.B., Turner-McGrievy, B., et al., 2017. Identifying strategies programs adopt to meet healthy eating and physical activity standards in afterschool programs. Health Educ. Behav. 44 (4), 536–547.

Wiecha, J.L., Hall, G., Gannett, E., Roth, B., 2012. Development of healthy eating and physical activity quality standards for out-of-school time programs. Childhood Obesity 8 (6), 572–576.

Wolfenden, L., Nathan, N.K., Sutherland, R., et al., 2017. Strategies for enhancing the implementation of school-based policies or practices targeting risk factors for chronic disease. Cochrane Database Syst. Rev. 11, CD011677.

YMCA of the USA website HEPA Standards. http://www.ymca.net/hepa/standards/, Accessed date: June 2018.

Yuan, Y., 2011. Multiple imputation using SAS software. J. Stat. Softw. 45 (6), 1–25.