

# Increasing Water Availability During Afterschool Snack

## Evidence, Strategies, and Partnerships from a Group Randomized Trial

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**Background:** Providing drinking water to U.S. children during school meals is a recommended health promotion strategy and part of national nutrition policy. Urban school systems have struggled with providing drinking water to children, and little is known about how to ensure that water is served, particularly in afterschool settings.

**Purpose:** To assess the effectiveness of an intervention designed to promote water as the beverage of choice in afterschool programs.

**Design:** The Out of School Nutrition and Physical Activity Initiative (OSNAP) used a community-based collaboration and low-cost strategies to provide water after school. A group RCT was used to evaluate the intervention. Data were collected in 2010–2011 and analyzed in 2011.

**Setting/participants:** Twenty afterschool programs in Boston were randomized to intervention or control (delayed intervention).

**Intervention:** Intervention sites participated in learning collaboratives focused on policy and environmental changes to increase healthy eating, drinking, and physical activity opportunities during afterschool time (materials available at [www.osnap.org](http://www.osnap.org)). Collaboration between Boston Public Schools Food and Nutrition Services, afterschool staff, and researchers established water-delivery systems to ensure children were served water during snack time.

**Main outcome measures:** Average ounces of water served to children per day was recorded by direct observation at each program at baseline and 6-month follow-up over 5 consecutive school days. Secondary measures directly observed included ounces of other beverages served, other snack components, and water-delivery system.

**Results:** Participation in the intervention was associated with an increased average volume of water served (+3.6 ounces/day;  $p=0.01$ ) during snack. On average, the intervention led to a daily decrease of 60.9 kcals from beverages served during snack ( $p=0.03$ ).

**Conclusions:** This study indicates the OSNAP intervention, including strategies to overcome structural barriers and collaboration with key actors, can increase offerings of water during afterschool snack. OSNAP appears to be an effective strategy to provide water in afterschool settings that can be helpful in implementing new U.S. Department of Agriculture guidelines regarding water availability during lunch and afterschool snack.

**Trial registration:** This study is registered at [clinicaltrials.gov](http://clinicaltrials.gov) NCT01396473.

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## Introduction

An estimated one third of children aged 6–11 years in the U.S. are overweight or obese,<sup>1</sup> and growing evidence indicates that the calories children consume via beverages contribute substantially to this problem.<sup>2–5</sup> Replacing sugary beverages with non-caloric beverages such as water can result in reduced caloric intake,<sup>6</sup> and increasing water access could reduce the prevalence of child overweight.<sup>7</sup>

National data indicate that many children consume less water than recommended<sup>8,9</sup> and recent experimental research suggests that increasing water intake may improve children's cognition and memory.<sup>10</sup> Promoting water and reducing sugar-sweetened beverage consumption among children have emerged as important topics among researchers and public health professionals focused on obesity prevention. Studies have documented increases in water consumption following targeted interventions in middle and elementary schools during regular school hours,<sup>7,11,12</sup> and a ban on sugary drinks in Boston Public Schools (BPS) led to reduced sugar-sweetened beverage intake among high school students.<sup>13</sup>

Tap water is an inexpensive option for providing hydration to children in school settings. However, many schools have difficulty accessing safe, potable water.<sup>14</sup> In Boston, 32% of public schools provide access to municipal water through plumbed drinking fountains; the remaining schools provide bottled water (ALC and HMF, unpublished data, 2011). This history of limited water access in BPS necessitated the development of innovative strategies in the current study. Afterschool programs are important, but understudied, places for promoting children's healthy-beverage consumption. According to the Afterschool Alliance, approximately 8.4 million children participate in afterschool programs<sup>15</sup>; in Boston, nearly half of school-aged children participate.<sup>16</sup> More than 1 million children at nearly 25,000 afterschool programs are provided with snacks via the National School Lunch Program (NSLP) and the Child and Adult Care Feeding Program (CACFP).<sup>17</sup> Although a few recent obesity-prevention studies have been situated in afterschool settings,<sup>18–20</sup> these interventions have been limited in duration and scope and have not addressed beverages specifically. The one study to date that focused on promoting water in afterschool settings relied on menu analysis.<sup>21</sup>

The Out of School Nutrition and Physical Activity Initiative (OSNAP), a community-based intervention, was designed to improve nutrition- and physical activity-related policies, environments, and practices in afterschool settings. The current study evaluates the impact of the intervention on the frequency with which water was served to children during afterschool snack.

## Methods

### Study Design

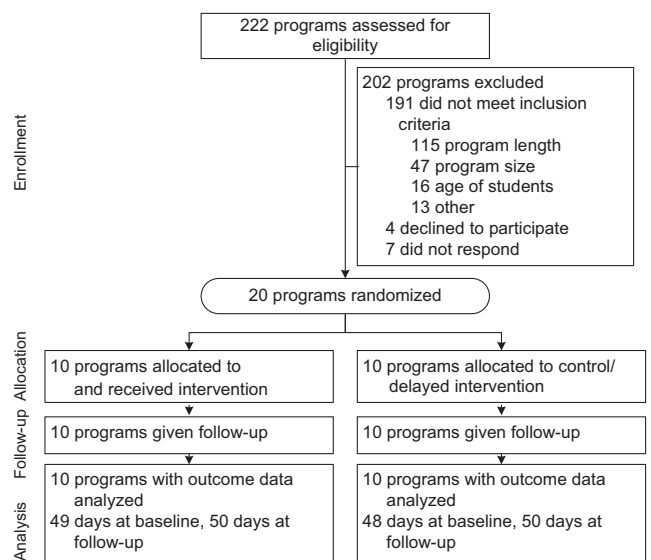
This group RCT occurred in 20 afterschool programs (ten intervention sites paired with ten matched controls) in Boston MA from fall 2010 through spring 2011 (Figure 1). Eligibility requirements for programs included program size (enrollment  $\geq 39$  children); length of the program (lasting mid-October through June 1); and willingness to be randomized to intervention or control (delayed intervention 1 year later) condition. Informed consent procedures were followed for all children. Parents (or guardians) gave permission for their child to participate; verbal assent was obtained from each child. The study was approved by the Harvard School of Public Health Committee on Human Subjects and the Boston Public Schools Research and Evaluation Department.

### Afterschool Sites

Eligible programs were identified through lists obtained from Boston Public Schools Food and Nutrition Services (BPS FNS), BPS Department of Extended Learning Time and Services (DELTA), the Greater Boston Young Men's Christian Association (YMCA), Boston Centers for Youth and Families (BCYF), and the Boys and Girls Club of Boston.

Prior to randomization, sites were matched on the type of agency overseeing the program (such as YMCA), snack provider, physical activity facilities, and school-level racial/ethnic and sociodemographic composition (school-level data obtained from administrative records). Twenty sites were randomized to intervention or control in October/November 2010 following baseline data collection. Control sites received no intervention and were given the opportunity to participate in the intervention the following school year.

The primary study contrast was between observations of water delivered to children in intervention and control programs with respect to changes from baseline (September–November 2010) to follow-up (April/May 2011). The primary endpoint was the aver-



**Figure 1.** Out of School Nutrition and Physical Activity Initiative (OSNAP) flow chart

age change in ounces of water served at snack per day. Secondary measures were the average change in beverage kilocalories served at snack per day and changes in ounces of juice and milk served at snack per day. The average number of times each beverage was served at snack per day also was examined.

## Intervention

The intervention was applied to several levels of influence in the afterschool programs, including food service, program policies, and staff practices. The research team partnered with the primary snack provider for participating programs to implement menu changes and water-delivery systems. Intervention sites participated in three learning sessions between December 2010 and May 2011 focused on setting goals, problem solving, and implementing policy, practice, and communication strategies related to each goal.

## Theoretic Framework

OSNAP is an environmental and policy change intervention based on the social-ecological model and a community-based participatory research (CBPR) approach.<sup>22,23</sup> OSNAP aims to improve physical activity and nutrition practices, policies, and communications in afterschool programs, which, combined with staff participation in collaborative meetings and resulting outreach to parents, aims to lead to improved participant attitudes, behaviors, and health. Community research partners representing BPS, the Boston Public Health Commission, and community and municipal agencies sponsoring afterschool programs advised the OSNAP researchers in establishing nutrition and physical activity goals, adapted from previous work with the YMCA of the U.S.A.<sup>21,24</sup> This initiative also employed a CBPR approach by working with BPS to offer healthier snack options, building the capacity of afterschool staff to be agents of change in their programs, and sharing data with programs.

## Food and Nutrition Services Change

Prior to the intervention, the OSNAP team partnered with BPS FNS to review snack menus and provide nutritional and price analyses to support modifications that were consistent with the OSNAP goals, while also feasible for school system implementation. These changes included decreasing the days per week juice was on the menu, serving water as a primary beverage, and increasing weekly offerings of whole fruits and vegetables. This menu was given to snack providers at intervention sites for implementation following baseline data collection.

Water beverage serving plans for each site were determined based on information provided by BPS FNS on site-level infrastructure issues, program size, and applicable costs. Six intervention sites had access to plumbed drinking water; four were dependent solely on bottled-water dispensers. Given these constraints, the intervention focused on two water-delivery systems: (1) filling insulated jugs with water from the tap and (2) filling pitchers with bottled water from water coolers.

When necessary, school-based BPS FNS staff placed jugs on food service carts to transport the insulated jugs from the water source to the program area and utilized pitchers to help fill jugs. The revised snack menus specified that BPS FNS staff purchase 8-ounce recyclable cups; their price (less than \$0.01 each) was factored into the overall cost of the snack. In programs using insulated jugs, school-based BPS FNS staff sanitized and filled the insulated jugs each day.

Afterschool staff members were responsible for sanitizing and filling the pitchers and serving water to children in their program.

## Learning Collaborative

Over the 6-month intervention period, program directors and staff working directly with children from the intervention sites were invited to participate in a series of three learning-collaborative sessions. Staff were recruited to participate immediately following baseline data collection, and the first collaborative was held 1 month after baseline collection was complete. The meetings were hosted at participating sites and held at various times of the day to ensure participation; staff received a \$40 stipend for attending. The meetings were led by the OSNAP research team, lasted approximately 3 hours, and followed the approach of the Institute for Healthcare Improvement Breakthrough Series<sup>25,26</sup> and the model for professional development used by DELTAS. Afterschool staff reviewed reports of baseline data related to water provision and other OSNAP goals at their programs.

After assessing their programs' current environments, staff set actionable goals to improve program practices, write relevant policies, and communicate changes using resources, including sample language and templates for parent communications, provided by the OSNAP team. These materials are available free of charge at [www.foodandfun.org](http://www.foodandfun.org) and [www.osnap.org](http://www.osnap.org). Afterschool staff shared successes and challenges in completing goals with each other, received nutrition and physical activity skill development, and were offered training to implement the Food & Fun Afterschool Curriculum.<sup>24</sup> Sites received technical assistance, activity updates, and reminders via phone, newsletters, and e-mail between sessions.

## Measures

**Program and participant characteristics.** The type of food service provider for each site (onsite BPS cafeteria, BPS outside vendor or program provided) was obtained from school administrative records. Program enrollment and staffing were reported by site directors on a questionnaire at baseline. Child age, race/ethnicity, and gender were reported by parents on informed consent forms at baseline.

**Assessment of beverages served during snack periods.** Trained observers recorded all beverage items served during snack, including information on volume, type, and brand, for 5 consecutive school days (the observation week) during designated snack time in each program at baseline and follow-up. When multiple beverages were offered during snack time, observers noted whether children were served all beverages or if they were instructed to choose one. Water was considered "served at snack" when data collectors observed that pitchers and cups or insulated jugs with water were provided by staff and delivered in small cups, bottles, or pitchers on the table or was available from a central cooler in the snack area, but was not considered served if it was available only via drinking fountains. Volume (in ounces) of beverage served was calculated based on package labeling for juice and milk and cup size for water.

Nutrition information, including kilocalories, was obtained from BPS FNS (37%); manufacturer's websites (43%); or from similar product listings in the U.S. Department of Agriculture (USDA) Nutrient Database.<sup>27</sup> If children had a choice among multiple beverages, the average volume in ounces, frequency of serving of each type of beverage

**Table 1.** Baseline characteristics of participating out-of-school programs (N=20), M (SD) unless otherwise noted

|  | Intervention | Control     | p-value |
|--|--------------|-------------|---------|
| Average child age per site, years                  | 8.0 (0.6)    | 7.7 (0.7)   | 0.36    |
| Average percentage of boys per site                | 48.5 (0.7)   | 51.1 (10.8) | 0.58    |
| Average percentage of Non-Hispanic whites per site | 5.6 (6.6)    | 15.5 (17.5) | 0.11    |
| Average percentage of Non-Hispanic blacks per site | 37.2 (36.2)  | 38.3 (25.4) | 0.94    |
| Average percentage of Hispanics per site           | 43.1 (34.5)  | 32.7 (21.3) | 0.43    |
| Number of staff per site                           | 7.6 (6.8)    | 10.6 (11.4) | 0.48    |
| Number of children enrolled per site               | 62.1 (36.7)  | 83.0 (91.1) | 0.51    |
| Food service, n (%)                                |              |             | 0.99    |
| Onsite BPS cafeteria                               | 4 (40)       | 3 (30)      |         |
| Outside BPS vendor                                 | 5 (50)       | 6 (60)      |         |
| Program-provided                                   | 1 (10)       | 1 (10)      |         |
| Sponsoring agency, n (%)                           |              |             | 0.66    |
| YMCA   | 4 (40)       | 4 (40)      |         |
| Boys & Girls Club                                  | 1 (10)       | 3 (30)      |         |
| Boston Center for Youth and Families               | 2 (20)       | 2 (20)      |         |
| None   | 3 (30)       | 1 (10)      |         |
| Program has a policy supporting water, n (%)       | 2 (20)       | 4 (40)      | 0.63    |
| Ounces of water served per day                     | 0.7 (1.0)    | 0.8 (2.0)   | 0.85    |
| Servings of water per day                          | 0.2 (0.3)    | 0.2 (0.3)   | 0.94    |

BPS, Boston Public Schools

age, and kilocalories were calculated across the beverage options. Data were collected during the 2010–2011 school year.

### Data Analysis

The primary outcome, average daily ounces of water served, was calculated by averaging the volume of water served per day observed across the observation week and then dividing by the number of valid observation days. Secondary outcomes of average daily volume of juice and milk (in ounces) and average number of times per day each type of beverage was served were calculated similarly. Both primary and secondary outcomes were calculated for baseline and follow-up periods, and differences from baseline to follow-up were calculated for both intervention and control sites.

Linear regression models, accounting for multiple observations per site, were used to evaluate the impact of the intervention on change in the primary and secondary outcomes. To adjust for the matched design, nine indicator variables were included for the ten randomized pairs. The SAS (version 9.3) procedure PROC REG was used to estimate all models. Analyses were conducted on the basis of initial assignment to control or intervention status regardless of observed level of water delivery at the site (intent-to-treat). Data were analyzed in 2011.

The outcome variables were averages over the 5 days of observation (4 days in a few cases as noted). The day-to-day measures

within sites were substantially correlated, averaging 0.73 at baseline among intervention and control programs. Previous research has found that direct visual observation can assess validly the serving of beverages during meals.<sup>28</sup>

## Results

### Number of Valid Observation Days

At baseline, 97 days of snacks served were observed across the 20 sites; 17 programs were observed for 5 days, and three programs were observed for 4 days, because of holiday schedules. At follow-up, 5 days of snacks and beverages were observed across the sites, resulting in 100 days of beverage observations.

### Baseline Characteristics

Study programs served racially, linguistically, and economically di-

verse populations. Schools at which the programs were located were 37.7% black, 10.6% white, and 37.9% Hispanic. On average, 81.2% of children qualified for free/reduced-price lunch. The mean enrollment across after-school programs was 72.0 children and the mean child age was 7.8 years. There were no differences in any of the demographic or primary and secondary outcome variables at baseline (Table 1).

### Intervention Implementation

Eight programs participated in all three learning-collaborative sessions. One program missed the first two learning sessions and met with study staff to review the intervention materials; a second program missed the third learning session. One to three staff members from each site participated.

All ten intervention sites chose providing water as a beverage at snack every day as a primary goal. Action steps set to achieve this goal included creating policies in family handbooks requiring serving water at snack, announcing new practices at staff meetings and assemblies,

communicating beverage changes with families via newsletters and during program events, and increasing child enthusiasm for drinking water with art activities and weekly water-helper duties.

### Primary and Secondary Outcomes

Adjusting for the matched design, the intervention led to an increase of 3.6 ounces of water served per day ( $p=0.01$ , 95% CI=1.3, 5.9) and a decrease in beverage calories served by 60.9 kilocalories ( $p=0.03$ , 95% CI=4.5, 117.4; Table 2). Servings of total ounces of milk and total ounces of 100% fruit juice served were each reduced by 2.5 ounces; however, these reductions were not significant. The frequency with which water was served increased significantly, by an additional 0.6 servings per day ( $p=0.01$ , 95% CI=0.2, 1.0), while there was a nonsignificant decrease of 0.2 servings of juice per day ( $p=0.12$ ) and a borderline nonsignificant decrease of 0.3 servings of milk per day ( $p=0.06$ ).

### Discussion

At the 6-month follow-up, programs that participated in the OSNAP intervention served 3.6 more ounces of water on average per child per day, decreased calories available from beverages, and served water more frequently during snack than did control programs that did not participate in the intervention. Compared to control programs, the water availability increases in intervention programs were equivalent to having served water three additional times over a 5-day school week. At follow-up, intervention programs served 60.9 fewer beverage calories per day than control programs.

The present study, to the authors' knowledge, is the first RCT of an intervention to increase the amount of water in afterschool programs. Previous studies promoting water consumption during school have demonstrated increases in water availability and consumption during the day.<sup>7,12</sup> One intervention focused on increasing water

**Table 2.** Changes in average servings of beverages in intervention and control afterschool programs (N=20)

|   | Baseline,<br>M (SD) | Follow-up,<br>M (SD) | Crude<br>change | Adjusted change <sup>a</sup><br>(95% CI) | p-value |
|---|---------------------|----------------------|-----------------|--|---------|
| <b>Ounces of water per day</b>                    |                     |                      |                 |  |         |
| Intervention                                      | 0.6 (0.9)           | 4.3 (2.1)            | +3.7            | +3.6 (1.3, 5.9)                          | 0.01    |
| Control   | 0.8 (2.0)           | 0.9 (1.3)            | +0.1            |  |         |
| <b>Ounces of 100% juice per day</b>               |                     |                      |                 |  |         |
| Intervention                                      | 3.0 (1.7)           | 2.1 (1.7)            | -0.9            | -1.0 (-2.5, 0.6)                         | 0.19    |
| Control   | 2.8 (1.4)           | 2.9 (1.5)            | +0.1            |  |         |
| <b>Ounces of milk per day</b>                     |                     |                      |                 |  |         |
| Intervention                                      | 3.3 (3.7)           | 1.0 (0.9)            | -2.3            | -2.5 (-5.1, 0.1)                         | 0.06    |
| Control   | 2.0 (1.8)           | 2.2 (2.5)            | +0.2            |  |         |
| <b>Kilocalories from beverages served per day</b> |                     |                      |                 |  |         |
| Intervention                                      | 101.9 (48.4)        | 46.6 (29.1)          | -55.4           | -60.9 (-117.4, -4.5)                     | 0.03    |
| Control   | 75.0 (20.5)         | 80.6 (37.5)          | +5.6            |  |         |
| <b>Times water served per day</b>                 |                     |                      |                 |  |         |
| Intervention                                      | 0.2 (0.3)           | 0.8 (0.3)            | +0.6            | +0.6 (0.2, 1.0)                          | 0.01    |
| Control   | 0.2 (0.3)           | 0.2 (0.3)            | +0.04           |  |         |
| <b>Times 100% juice served per day</b>            |                     |                      |                 |  |         |
| Intervention                                      | 0.6 (0.4)           | 0.5 (0.4)            | -0.2            | -0.2 (-0.5, 0.1)                         | 0.12    |
| Control   | 0.6 (0.3)           | 0.6 (0.3)            | +0.04           |  |         |
| <b>Times milk served per day</b>                  |                     |                      |                 |  |         |
| Intervention                                      | 0.4 (0.5)           | 0.1 (0.1)            | -0.3            | -0.3 (-0.6, 0.01)                        | 0.06    |
| Control   | 0.3 (0.2)           | 0.3 (0.3)            | +0.03           |  |         |

<sup>a</sup>Adjusted change represents the difference in change in outcomes in the intervention compared to the control sites, controlling for randomization pair indicator variables (nine indicators).

at lunch found an increase of 0.8 ounces served per child per meal.<sup>11</sup> Another intervention focused on increasing water at afterschool snacks found a nonsignificant increase of an additional 0.4 servings per day based on menu analysis.<sup>11,21</sup>

The current study takes a replicable, multiple-level approach to changing beverages in afterschool programs. Researchers worked with school food service staff to set up standard operating procedures including water-delivery systems (including cups, pitchers and jugs) and menu changes that would be sustainable after the study was complete. At the program level, afterschool staff implemented action plans to ensure that water would be served with the snack moving forward.

The primary mechanisms for increasing water accessibility included modifications to the snack menu and program environments. Modified menus specified both water and cups daily, and promoted water as the primary beverage, while program-site staff ensured availability of water during snack time. Cups were provided as part of the snack, as previous research has found provision of cups by food service to lead to higher water consumption.<sup>11</sup> The current study noted a high level of compliance in afterschool staff attendance at learning-collaborative sessions, and in staff servings of water at snack, consistent with previous water interventions during schools meals.<sup>7</sup> Food service staff reported that filling and sanitizing the jugs did not interfere with completion of other responsibilities.

The present study adds to the body of evidence that water is a relatively easy target for change and should be a top priority for programs and policy makers.<sup>7,11,12</sup> Recently, new policies at both the state and national levels have required that schools make free, potable water available to children both throughout the school day and at meals served through the NSLP, including the Afterschool Snack Program.<sup>14,29</sup> Nationally, organizations such as the YMCA of the U.S.A. and the Partnership for a Healthier America ([www.ahealthieramerica.org](http://www.ahealthieramerica.org)) and ChildObesity180 have included serving water as a healthy goal.

The current study also indicates that the USDA Afterschool Snack Program can decrease the caloric impact of beverages by promoting water as the beverage served. An additional benefit to this intervention is potential financial savings in serving water instead of other beverages. Previous analyses of afterschool snack menus indicate a potential cost savings of \$0.21 per snack per child by offering water rather than 100% juice.<sup>30</sup> The USDA might therefore consider strengthening its regulations regarding water to recommend water as either the only beverage or as a complementary served beverage to increase children's consumption of water. The present study indicates

that such a strategy can increase access to drinking water for children to help close the gap in drinking water intake.

## Study Considerations and Limitations

The intervention was assessed over 1 school year, so it is unclear whether its effects will be sustained. However, intervention components included food service and policy changes to ensure institutionalization; for example, the provision of recyclable cups was chosen to ensure sustainability, given previous findings related to sustainability concerns of student-brought refillable bottles.<sup>11</sup> The intervention changes made to the BPS FNS afterschool snack menu are being implemented systemwide. Cost-saving strategies identified by Craddock et al. can help ensure sustainability.<sup>31</sup>

The current study has important strengths. By design, RCTs aim to distribute variables that might affect intervention outcomes randomly across sites. Researchers randomized matched pairs after baseline data collection was complete. Trained observers collected data on beverages served rather than relying on self-report or menu analysis; observers were blinded to intervention status at follow-up. The longitudinal follow-up allowed the research team to determine changes in beverages served over time.

Although announcements regarding the Healthy Hunger-Free Kids Act of 2010 and Massachusetts state regulations requiring water availability occurred midway through the intervention, neither policy went into effect until after follow-up data collection. The present study only included programs serving elementary-aged children, mostly school-based; the results of this study may not be generalizable to afterschool programs serving adolescents or programs with specific foci (e.g., the arts, computer training, or seasonal sports programs). As this is a preliminary study on the intervention impacts on serving water, future studies can build on this work by measuring changes in children's consumption of water and other beverages.

## Conclusion

The current study provides evidence for the potential to make systematic changes to afterschool snack to offer children a no-calorie healthy beverage: water. The results demonstrate that the policies and systems implemented to encourage water as a beverage during afterschool snack can be implemented successfully in a large urban school district.

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