



HHS Public Access

Author manuscript

J Acad Nutr Diet. Author manuscript; available in PMC 2018 July 01.

Published in final edited form as:

J Acad Nutr Diet. 2017 July ; 117(7): 1097–1103. doi:10.1016/j.jand.2017.01.026.

What do children eat in the summer? A direct observation of summer day camps that serve meals

Erica L. Kenney, ScD, MPH,

Research Fellow, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115, Telephone: 617-384-8722, Fax: 617-384-8730

Rebekka M. Lee, ScD, MS,

Research Associate, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115, Telephone: 617-384-5457, Fax: 617-384-8730

Carolyn J. Brooks, MA,

Doctoral Student, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115, Telephone: 617-432-1135, Fax: 617-384-8730

Angie L. Cradock, ScD, MPE, and

Senior Research Scientist, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115, Telephone: 617-384-8933, Fax: 617-384-8730

Steven L. Gortmaker, PhD

Professor of the Practice of Health Sociology, Harvard T.H. Chan School of Public Health, 677 Huntington Avenue, Boston, MA 02115, Telephone: 617-432-1029, Fax: 617-384-8730

Abstract

What do children eat in the summer? A direct observation of summer day camps that serve meals

Background—Over 14 million children in the United States attend summer camp annually, yet little is known about the food environment in day camps.

Objectives—Describe the nutritional quality of meals served to, brought by, and consumed by children attending summer day camps serving meals and snacks; describe camp water access.

Design—Cross-sectional study.

Participants/settings—One hundred forty-nine children attending five summer camps in Boston, Massachusetts in 2013.

Main outcome measures—Foods and beverages served were observed for five consecutive days. For two days, children's dietary intake was directly observed using a validated protocol.

Corresponding Author: Erica Kenney, ScD, MPH.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Conflict of Interest Disclosure

None of the authors report a conflict of interest.

Outcome measures included total energy (kcal) and servings of different types of foods and beverages served and consumed during breakfast, lunch, and snack.

Statistical analyses performed—Mean total energy, *trans* fats, sodium, sugar, and fiber served per meal were calculated across the camps, as were average weekly frequencies of serving fruits, vegetables, meat/meat alternates, grains, milk, 100% juice, sugar-sweetened beverages, whole grains, red/highly processed meats, grain-based desserts, and salty snacks. Mean consumption was calculated per camper per day.

Results—On average, camps served 647.7 (SD: 134.3) kcal for lunch, 401.8 kcal (149.6) for breakfast, and 266.4 (SD: 150.8) kcal for snack. Most camps served red/highly processed meats, salty snacks, and grain-based desserts frequently, and rarely served vegetables or water. Children consumed little (for example, at lunch, 36.5% of fruit portions, 35.0% of meat/meat alternative portions, and 37.6% of milk portions served), except for salty snacks (66.9% of portions) and grain-based desserts (64.1% of portions). Sugar-sweetened beverages and salty snacks were frequently brought to camp. A quarter of campers drank nothing throughout the entire camp day.

Conclusions—The nutritional quality of foods and beverages served at summer day camps could be improved. Future studies should assess barriers to consumption of healthy foods and beverages in these settings.

Keywords

Children; dietary intake; direct observation; summer camp; hydration

INTRODUCTION

In recent years, public health efforts to improve child nutrition and prevent obesity have focused on many of the spaces where children learn and play, including schools, afterschool programs, and child care centers.^{1–7} Less attention has been given to summer camps, a crucial source of child care and enrichment during the summer months for an estimated 14.3 million United States (U.S.) school-aged children.⁸

The summer months may be a critical period for excess weight gain,^{9–12} especially for overweight children and for Black and Hispanic children.^{9, 11} Improvements in weight loss, percent body fat, cardiovascular fitness, and fasting insulin conferred by school-based interventions may be lost during the summer months.¹⁰ Ensuring that children have access to healthy eating environments during these vulnerable summer months is essential, and attending camp may promote healthier eating and physical activity opportunities, particularly for low income youth.¹³ However, little is known about the food and beverage environment in the summer camp setting.^{14, 15} A recent observation of foods and beverages brought in by campers for lunch in a sample of summer day camps that did not provide meals found that sweets, salty snacks, and sugary drinks were common.¹⁴ To the authors' knowledge, no studies have documented the food environment or dietary intake in summer day camps that provide meals to children.

This research brief describes foods and beverages served to and consumed by children at five Boston summer day camps that provided meals. Because recent studies have

demonstrated that foods from outside of school and out-of-school meal programs can be less healthy,^{16–18} the study also examined the extra foods and beverages children brought into the summer camp. Lastly, because drinking water access is a crucial component of a healthy beverage environment, this study evaluates access to drinking water at the camps.

METHODS

Sample and Study Design

The convenience sample for this cross-sectional study included 149 children attending 5 summer day camps in Boston, Massachusetts in July–August of 2013. The camps' directors were originally recruited by the Boston Public Health Commission (BPHC) to participate in a modified version of the Out of School Nutrition and Physical Activity (OSNAP) initiative.^{5, 19, 20} Camps were eligible if they were located in Boston, served snacks and meals, were open Monday to Friday for July and August, provided full-day general programming, and served children from Boston in kindergarten through 5th grade. BPHC identified seven initial potential camps for participation in the OSNAP initiative that were located in low-income neighborhoods throughout Boston. Between 33–137 children were enrolled in each participating camp; children could enroll for up to six weeks. The meals were provided by the same contracted food service vendor, which supplies meals for a large share of Boston summer camps; the vendor provided all pre-prepared and packaged items. Participating camps served similar foods and beverages, but items varied by camp.

Prior to camps participating in the summer OSNAP initiative, research staff visited the camps for five consecutive weekdays to collect information about nutrition, screen time, and physical activity practices and policies. Five of seven camps that were approached agreed to participate in data collection (71.4%); the two nonparticipating camps had competing programs during the proposed data collection period. Parents/guardians provided written consent for child participation, while children verbally assented. Dietary intake at camp was assessed on two of the five observation days (randomly selected) due to resource constraints; this observation strategy has been used previously.¹⁷ Out of 228 eligible children, 186 consented to participate (82%). All participating children present during meals and snacks on the observation days (n=149) were observed for dietary intake at summer camp; absent children did not differ from observed children by age, sex, or race/ethnicity. Study procedures were approved by the Harvard T.H. Chan School of Public Health Office of Human Research Administration Institutional Review Board.

Measures

Foods and Beverages Served: Prior to visiting the camps, research assistants (RAs) were trained on the use of a previously validated protocol for studying foods served and children's dietary intake in out-of-school settings.²¹ On each of the five days observed, prior to each meal (breakfast, lunch, and afternoon snack), RAs coordinated with camp staff to photograph and record each food and beverage that would be served. RAs recorded each item's name, size, brand, and flavor and noted whether any items were presented to children as a choice between several items (e.g. a choice between chocolate and plain milk). Across

the entire day, RAs also recorded the same information for each food or beverage item brought in by children to the summer camp.

Dietary Intake: On two of the observation days, RAs digitally photographed the leftovers of each food and beverage item—including both items provided by the camp and items brought by the child—for each participating child at every meal. Leftovers were photographed after children had moved on to a different camp activity. RAs also observed participating children during meals to note whether any items had been consumed that were not shown in the leftover photograph. Later, RAs compared the photograph of each child's leftovers with the corresponding picture of the foods and beverages served for that meal, and estimated how much the child consumed of each item in increments of 10%. Comparison to standard serving sizes was possible because all of the items were pre-packaged foods and beverages or whole fruits. This method was found to have excellent criterion validity when compared to weighed estimates of consumption.²¹ For this component of the protocol, RAs underwent one hour of initial training and also completed 20 practice estimations in order to ensure accuracy.

Nutrient Information: For each food and beverage item observed, nutrient information for a standard serving was collected. Nutrient information was obtained from food service vendors and manufacturer's websites. For generic items (such as whole apples), nutrient information from the United States Department of Agriculture (USDA)'s National Nutrient Database for Standard Reference was used.²²

Water access: Research assistants recorded the type (e.g., water fountain, insulated cooler), location, functional status, and perceived cleanliness for each drinking water source in the camp space.

Demographic data: Participating children's age, grade level, sex, and race/ethnicity were reported by parents or guardians on consent forms.

Comparison to national standards: To evaluate the nutritional quality of the meals served, foods and beverages were compared to a set of best practice standards. This approach was used in order to help identify easily interpretable, actionable changes to menu planning that camps could make, as this is an approach that has been shown to be effective in other out-of-school settings.^{5,23}

Recently, the Institute of Medicine (IOM) developed science-based recommendations for another USDA meals program for child care programs, the Child and Adult Care Food Program.²⁴ These recommendations provide best practice standards for child care centers and other facilities providing meals to children and adults of different ages. Additionally, these standards identify ideal meal patterns for facilities that serve multiple meals (i.e., breakfast, snack, lunch) each day, making them applicable benchmarks for use in the evaluation of the quality of the meals served and consumed in this study of summer camps. The IOM recommends specific minimum and maximum weekly servings per meal of certain foods and beverages as well as some recommendations across all meals (breakfast, lunch, and snack) over the course of a week (see Table 3). To the authors' knowledge, no other set

of nutritional best practice standards exists specifically for summer camps serving meals. Although the Summer Food Service Program has a basic meal pattern (e.g. serve milk, serve at least one fruit or vegetable with lunch),²⁵ these have not been updated to reflect current nutrition guidance.

The weekly servings of camp-provided foods and beverages and daily amounts of energy (kcal) served per meal were compared to the IOM standards for child care programs serving school-aged children (ages 5–13 years old). Consumption of these items as well as sugars, sodium, fiber, and *trans* fats was also calculated to inform the Boston Public Health Commission's implementation of the summer OSNAP initiative.

Statistical Analysis—The daily average total calories (kcal), *trans* fats (g), sugars (g), sodium (mg), and fiber (g) served per meal were calculated by summing the values of these variables per serving for each food/beverage item served during the meal and averaging across the five days for each meal type (breakfast, lunch, and snack). Ounces of water, 100% juice, milk, and sugar-sweetened beverages (SSBs) served per meal as well as per-meal cups of fruits and vegetables served and ounces of grains and meat/meat alternates served were calculated similarly. To match the IOM's framework, the weekly frequency with which camps served red or highly processed meat (defined as beef, pork, lamb or sausage, bacon, bologna, and other cured meats), whole grains (defined as a product where a whole grain was the first ingredient), grain-based desserts (defined as pancakes and waffles served with syrup, muffins and quick breads, sweet rolls, croissants, toaster pastries, donuts, flour tortillas, granola/cereal bars, cookies, brownies, cake, and pie²⁴), and salty snacks (defined as chips, pretzels, or salted crackers) was also calculated.

The total calories, *trans* fats, sugars, sodium, and fiber consumed per meal per camper was estimated by multiplying the estimated percent consumed of each food and beverage item during the meal by the nutrient information for that food or beverage, then summing the amounts for each item across the whole meal. Mean consumption per child per meal was estimated by adjusting for the clustering of repeated observation days within children; estimates were also stratified by whether the child brought in extra foods or not. The frequencies with which campers brought different types of foods and beverages from outside the camp's meal program for each meal were also calculated. Because consumption was observed on either one or two days, consumption outcomes were calculated per child per day, with means and frequencies adjusted for clustering of observation days within children; estimates also took into account the clustering of children within camps. All analyses were conducted using SAS [computer program] Version 9.4. Cary, NC: SAS Institute; 2014.

RESULTS

The campers attending the five Boston summer camps in this sample were racially and ethnically diverse (Table 1). While most of the campers consumed lunch or snack on at least one of the two days for which dietary intake was observed, fewer (61.2%) consumed breakfast at camp. Nearly half brought in extra foods or beverages from outside the camp for at least one of the meals. All five camps served lunch and snacks; four of the five served breakfast.

Nutritional quality of meals served

The average total kcals served per breakfast was 401.8 (SD: 149.6); the average kcals served per lunch was 647.7 (SD: 134.3), and the average kcals served per snack was 266.4 (SD: 150.8) (Table 2). These were consistent with the IOM target recommendations for breakfasts and lunches served to 5–13 year olds, which specify 418 kcals for breakfast and 608 kcals for lunch.²⁴ The energy content of the snacks served, however, was more than double the recommend 133 kcals.

Fruits (not including juice) were frequently served at breakfast (2.4 cups per week, SD: 1.3) and lunch (4.6 cups per week, SD: 1.6), while less frequently served at snack (0.7 cups per week, SD: 0.4). Vegetables were almost never served at snack or breakfast, and rarely served at lunch (1.3 cups per week, SD: 0.4). Milk was served, on average, about every day at breakfast and lunch but rarely at snack. Water was rarely served at breakfast, never served at lunch, and infrequently served at snack, with an average of 0.6 cups (SD: 0.9) served per week at snack. No camps provided a daily full serving of water as a beverage at each snack. Serving 100% fruit juice was common, with, on average, 3.9 cups (SD: 1.5) served per week. Grain-based desserts were served about 2.3 times per week (SD: 1.9) across all meals, while red and highly processed meats were served about 3.0 (SD: 1.0) times per week.

Nutritional quality of meals consumed

On average, campers consumed little of the foods and beverages served to them. Children who opted to consume breakfast ate far less than the average kcals served; those who only consumed the camp-provided meal ate 271.1 kcals (SE: 22.0), while those who brought extra foods consumed 264.8 kcals (SE: 34.4) (Table 2). At lunch, children eating only the camp-provided foods consumed 275.6 kcals (SE: 18.8), while children who brought extra foods consumed 370.9 kcals (SE: 23.0). Children appeared to be especially less likely to eat healthy foods and beverages (Table 3). For example, children typically ate about a third of the portions of fruit served, while consumption was higher for grain-based desserts (64.1% of portions consumed) and salty snacks (66.9%).

Similarly, many campers did not drink beverages. Nearly half of campers at lunch and 67.7% of campers at snack drank nothing; 41.7% drank nothing at breakfast. Over a quarter of the campers (27.3%) drank no beverage at all at any of the meals across the entire day.

Among the children bringing foods and beverages to the camp to eat alongside the camp-provided meals, salty snacks, SSBs, grain-based desserts, candy, and fruit were popular. While SSBs were rarely brought at snack and never at breakfast, 22.2% of children who brought extra items at lunch had SSBs. Over a third of those who brought outside foods at lunch brought an entrée food (34.7%), either to supplement or replace the main entrée served by the camp. Fruit was observed in 25% of lunches with outside foods and whole grains were observed in 22.2% of these lunches. Candy was observed in 23.6% of lunches among children with outside food), but never served by the camps.

Drinking water access

On average, each camp had about 4 water access points; of these, on average, 2.8 water sources were both functional and clean. The average ratio of campers to functional water sources was 34.3 (SD: 27.0).

DISCUSSION

Little is known about the nutritional quality of meals served in summer day camp settings, which many U.S. children attend. In this pilot study in five Boston summer day camps, summer camps met several “gold standard” dietary benchmarks for serving meals to children, providing recommended levels of energy for breakfast and lunch and frequently providing sufficient quantities of whole grains, fruit, and milk. However, at the same time, camps served more highly processed or pre-fried meats and fewer vegetables than recommended. Meanwhile, campers did not consume much of the foods served to them at breakfast and lunch and often brought in less healthy foods and beverages, resulting in very low intakes of fruits, vegetables, whole grains, milk, and water and higher consumption of salty snacks, grain-based desserts, and sugary drinks.

The reasons for campers consuming little are unclear, particularly given that a previous analysis found this sample of campers to be moderately physically active.²⁶ Palatability was not assessed in this study, but it is possible that children under-consumed some items because they were unappetizing, especially given that the items were not freshly prepared on site. Research assistants noted that most of the lunches, which largely consisted of pre-packaged sandwiches, did not appear appealing to them. In an observation of middle school students eating lunch in four Boston schools, Cohen et al (2013) found similar patterns of under-consumption, with students consuming about 388 kcals out of 660 kcals served and typically consuming 26.7% of vegetables served, 53.2% of fruits served, and 81.5% of entrees served. These authors also found that students consumed more kcals and an overall healthier lunch in schools receiving an intervention to improve palatability, suggesting that the taste and appeal of the foods may play a considerable role.²⁷ Improving the appeal of foods served while maintaining healthfulness is an important goal for improving children’s dietary intake in these settings.

As has been found in school settings^{16, 18, 28} and afterschool programs,¹⁷ the foods and beverages that children brought to camp were generally less healthy than those provided by the camp. Although many campers brought fruit and whole grains to supplement their meals, they also frequently brought candy, sugary drinks, salty snacks, and grain-based desserts and almost never brought vegetables or water. In a study of four summer camps where no program-provided food was served, Tilley et al (2014) also found that campers tended to bring sugary foods and drinks and infrequently brought fruit.¹⁴ Policies to set nutrition standards for foods and beverages brought in by campers and support families in providing healthier options may be an important aspect of ensuring a healthy food environment in summer camps.

The low levels of fluids consumed by children is concerning for children’s hydration status. Nearly half of campers drank nothing at lunch on a given day, and over a quarter drank

nothing at any meal. This is particularly concerning given that these children were physically active during the camp day.²⁶ These findings are consistent with several studies that have found that, on average, children's fluid intake is below what is recommended for maintaining wellbeing.²⁹⁻³¹ Given that inadequate water intake and poor hydration status may be associated with worse mood, wellbeing, and cognitive functioning,³² strategies to increase water access and consumption of healthy beverages during the day in summer camp settings are urgently needed.

Strengths of this study include its use of direct, valid observation methods. Methods that rely on child self-report are subject to substantial random measurement error.³³ The study is also unique in its ability to measure children's dietary intake across multiple meals. Limitations include the study's inability to measure dietary intake outside of the camp, which precludes drawing firm conclusions about how camp food service may be impacting children's energy balance over the whole day. The fact that children were aware that they were being observed during the study may have impacted their behavior, although we attempted to minimize disruption by only photographing leftovers after children had moved onto another activity. Children could have consumed foods and beverages in between meals, in which case consumption estimates would not have been recorded. However, RAs did take note of whether or not they saw children with foods outside of meal times as part of their daily observation protocol, and mostly observed a few students with small items like candy outside of meal times, which would not have changed the total consumption estimates substantially. The small number of summer camps studied, in just one pilot city, is another limitation. Additionally, the results may not be generalizable to all summer day camps that serve meals; because the meals were served through a food service vendor that also has several contracts to provide National School Lunch Program meals to school districts, and thus is accustomed to providing foods and beverages that meet USDA standards, the meals in this study may have had higher nutritional quality than what might be observed at camps not utilizing food service vendors. Consumption could also differ if other food service vendors provided more appealing foods and beverages.

Conclusion

Summer camps providing meals to children served adequate calories and met some national recommendations for healthy meal service to children. However, highly processed meats were served more frequently than suggested by national guidelines, and healthier options such as lean protein sources, vegetables, and water were not served enough. Children consumed relatively little in this setting, especially fluids, and tended to consume less healthy options when bringing in foods and beverages from outside the camp. Future research should focus on improving the healthfulness and appeal of the meals served to children in the summer; efforts to promote water consumption should be considered as well.

Acknowledgments

Funding/Support Disclosure

This research was supported by Cooperative Agreement number 1U58DP004726-01 from the Centers for Disease Control and Prevention. Additional support came from Cooperative Agreement number 1U48DP001946 (including

the Nutrition and Obesity Policy Research and Evaluation Network) from the CDC, Prevention Research Centers Program as well as support from the Donald and Sue Pritzker Nutrition and Fitness Initiative. Additional support for EL Kenney and SL Gortmaker was provided by an anonymous donation in memory of Melvin R. Seiden. CJ Brooks was also supported by NIH training grant T32 HL098048 (CVD Epidemiology Training Program in Behavior, the Environment and Global Health). This work is solely the responsibility of the authors and does not represent official views of the Centers for Disease Control and Prevention.

References

1. Evans CE, Christian MS, Cleghorn CL, Greenwood DC, Cade JE. Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 y. *Am J Clin Nutr.* Oct; 2012 96(4):889–901. [PubMed: 22952187]
2. Sobol-Goldberg S, Rabinowitz J, Gross R. School-based obesity prevention programs: a meta-analysis of randomized controlled trials. *Obesity (Silver Spring).* Dec; 2013 21(12):2422–2428. [PubMed: 23794226]
3. Sisson SB, Krampe M, Anundson K, Castle S. Obesity prevention and obesogenic behavior interventions in child care: A systematic review. *Prev Med.* Feb 12.2016 87:57–69. [PubMed: 26876631]
4. Cradock AL, Barrett JL, Giles CM, et al. Promoting Physical Activity With the Out of School Nutrition and Physical Activity (OSNAP) Initiative: A Cluster-Randomized Controlled Trial. *JAMA Pediatr.* Feb 1; 2016 170(2):155–162. [PubMed: 26641557]
5. Giles CM, Kenney EL, Gortmaker SL, et al. Increasing water availability during afterschool snack: evidence, strategies, and partnerships from a group randomized trial. *Am J Prev Med.* Sep; 2012 43(3 Suppl 2):S136–142. [PubMed: 22898163]
6. Dziewaltowski DA, Rosenkranz RR, Geller KS, et al. HOP’N after-school project: an obesity prevention randomized controlled trial. *Int J Behav Nutr Phys Act.* 2010; 7:90. [PubMed: 21144055]
7. Beets MW, Weaver RG, Turner-McGrievy G, et al. Making policy practice in afterschool programs: a randomized controlled trial on physical activity changes. *Am J Prev Med.* Jun; 2015 48(6):694–706. [PubMed: 25998921]
8. America After 3PM: Special Report on Summer: Missed Opportunities, Unmet Demand. Washington, DC: Afterschool Alliance; 2010.
9. Franckle R, Adler R, Davison K. Accelerated Weight Gain Among Children During Summer Versus School Year and Related Racial/Ethnic Disparities: A Systematic Review. *Preventing Chronic Disease.* Jun.2014 11
10. Baranowski T, O’Connor T, Johnston C, et al. School Year Versus Summer Differences in Child Weight Gain: A Narrative Review. *Childhood Obesity.* Feb; 2014 10(1):18–24. [PubMed: 24367922]
11. Moreno JP, Johnston CA, Chen TA, et al. Seasonal Variability in Weight Change During Elementary School. *Obesity.* Feb; 2015 23(2):422–428. [PubMed: 25557689]
12. von Hippel PT, Workman J. From Kindergarten Through Second Grade, U.S. Children’s Obesity Prevalence Grows Only During Summer Vacations. *Obesity (Silver Spring).* Nov; 2016 24(11): 2296–2300. [PubMed: 27804271]
13. Tovar A, Lividini K, Economos CD, Folta S, Goldberg J, Must A. School’s out: what are urban children doing? The Summer Activity Study of Somerville Youth (SASSY). *BMC Pediatr.* 2010; 10:16. [PubMed: 20334661]
14. Tilley F, Beets MW, Jones S, Turner-McGrievy G. Evaluation of compliance to national nutrition policies in summer day camps. *Public Health Nutr.* Jun; 2015 18(9):1620–1625. [PubMed: 24909716]
15. Tilley F, Weaver RG, Beets MW, Turner-McGrievy G. Healthy eating in summer day camps: the Healthy Lunchbox Challenge. *J Nutr Educ Behav.* Mar-Apr;2014 46(2):134–141. [PubMed: 24440737]
16. Caruso ML, Cullen KW. Quality and cost of student lunches brought from home. *JAMA Pediatr.* Jan; 2015 169(1):86–90. [PubMed: 25419622]

17. Kenney EL, Austin SB, Cradock AL, et al. Identifying sources of children's consumption of junk food in Boston after-school programs, April–May 2011. *Prev Chronic Dis.* 2014; 11:E205. [PubMed: 25412028]
18. Farris AR, Misyak S, Duffey KJ, et al. A Comparison of Fruits, Vegetables, Sugar-Sweetened Beverages, and Desserts in the Packed Lunches of Elementary School Children. *Childhood Obesity.* Jun; 2015 11(3):275–280. [PubMed: 25747503]
19. Kenney EL, Giles CM, deBlois ME, Gortmaker SL, Chinfatt S, Cradock AL. Improving nutrition and physical activity policies in afterschool programs: results from a group-randomized controlled trial. *Prev Med.* Sep.2014 66:159–166. [PubMed: 24941286]
20. Cradock AL, Barrett JL, Giles CM, et al. Promoting Physical Activity With the Out of School Nutrition and Physical Activity (OSNAP) Initiative: A Cluster-Randomized Controlled Trial. *JAMA Pediatr.* Dec 7.2015 :1–9.
21. Kenney EL, Davison KK, Austin SB, et al. Validity and Reliability of a Simple, Low-Cost Measure to Quantify Children's Dietary Intake in Afterschool Settings. *Journal of the Academy of Nutrition and Dietetics.* Mar; 2015 115(3):426–432. [PubMed: 25596895]
22. United States Department of Agriculture ARS. USDA National Nutrient Database for Standard Reference: Release 28. 2016. Available at: <http://www.ars.usda.gov/Services/docs.htm?docid=8964>. Accessed 1/22/16
23. Beets MW, Turner-McGrievy B, Weaver RG, et al. Intervention leads to improvements in the nutrient profile of snacks served in afterschool programs: a group randomized controlled trial. *Transl Behav Med.* Sep; 2016 6(3):329–338. [PubMed: 27528522]
24. Murphy, SP., Yaktine, AL., West Suito, C., Moats, S. Child and adult care food program: aligning dietary guidance for all. Washington: National Academies Press; 2010.
25. United States Department of Agriculture FaNS. Summer Food Service Program (SFSP). 2016. Available at: <http://www.fns.usda.gov/sfsp/summer-food-service-program-sfsp>. Accessed 1/22/16
26. Barrett, JL., Cradock, A., Gortmaker, SL., Lee, RM., Giles, CM., Malsberger, R. Accelerometer Assessment of Children's Physical Activity Levels at Summer Camps. Active Living Research Annual Conference; San Diego, CA. 2014.
27. Cohen JFW, Richardson S, Austin SB, Economos CD, Rimm EB. School Lunch Waste Among Middle School Students Nutrients Consumed and Costs. *American Journal of Preventive Medicine.* Feb; 2013 44(2):114–121. [PubMed: 23332326]
28. Farris AR, Misyak S, Duffey KJ, et al. Nutritional Comparison of Packed and School Lunches in Pre-Kindergarten and Kindergarten Children Following the Implementation of the 2012–2013 National School Lunch Program Standards. *Journal of Nutrition Education and Behavior.* Nov-Dec;2014 46(6):621–626. [PubMed: 25457731]
29. Kenney EL, Long MW, Cradock AL, Gortmaker SL. Prevalence of Inadequate Hydration Among US Children and Disparities by Gender and Race/Ethnicity: National Health and Nutrition Examination Survey, 2009–2012. *Am J Public Health.* Aug; 2015 105(8):e113–118. [PubMed: 26066941]
30. Stookey JD, Brass B, Holliday A, Arieff A. What is the cell hydration status of healthy children in the USA? Preliminary data on urine osmolality and water intake. *Public Health Nutr.* Nov; 2012 15(11):2148–2156. [PubMed: 22281298]
31. Drewnowski A, Rehm CD, Constant F. Water and beverage consumption among children age 4–13y in the United States: analyses of 2005–2010 NHANES data. *Nutr J.* 2013; 12:85. [PubMed: 23782914]
32. Popkin BM, D'Anci KE, Rosenberg IH. Water, hydration, and health. *Nutr Rev.* Aug; 2010 68(8): 439–458. [PubMed: 20646222]
33. Livingstone MB, Robson PJ, Wallace JM. Issues in dietary intake assessment of children and adolescents. *Br J Nutr.* Oct; 2004 92(Suppl 2):S213–222. [PubMed: 15522159]

Table 1

Sociodemographic characteristics of 149 child study participants attending five Boston summer day camps, 2013

	Mean (SD) or n (%)
Age (years)	7.7 (1.4)
Sex^a	
Male	79 (54.9%)
Female	65 (45.1%)
Race/ethnicity	
Black/African-American, non-Hispanic	49 (32.9%)
Latino or Hispanic, any race	42 (28.2%)
White, non-Hispanic	12 (8.1%)
Other ^b	14 (9.4%)
Not reported	32 (21.5%)
Number consuming:	
Breakfast	91 (61.2%)
<i>With outside foods/beverages</i>	23 (14.7%)
Lunch	142 (95.3%)
<i>With outside foods/beverages</i>	72 (48.3%)
Snack	144 (96.6%)
<i>With outside foods/beverages</i>	52 (34.9%)

^aData on camper's sex was missing for 5 participants.

^b“Other” includes parent-reported Cape Verdean, Asian American, Multiracial, Arabic, and Haitian.

Table 2

Average total energy and other nutrients provided to and consumed by 149 children during summer camp breakfast, lunch, and snack among five Boston summer day camps, 2013.

	Mean (SE) ^a daily amount served by camps, across 5 days	Mean (SE) daily amount consumed, across 2 days, among those without non-program foods	Mean (SE) daily amount consumed, across 2 days, among those who also brought non-program foods
BREAKFAST	n=4 camps	n=112 child-days ^b	N=27 child-days
Total energy (kcal)	401.8 (149.6)	271.1 (22.0)	264.8 (34.4)
Trans fats (g)	0.01 (0.05)	0.01 (0.004)	0.02 (0.02)
Sodium (mg)	363.9 (135.8)	255.7 (19.8)	357.9 (91.0)
Sugar (g)	47.0 (23.6)	27.1 (2.2)	18.2 (2.6)
Fiber (g)	4.1 (2.6)	1.9 (0.1)	1.7 (0.4)
LUNCH	n=5 camps	n=142 child-days	n=101 child-days
Total energy (kcal)	647.7 (134.3)	275.6 (18.8)	370.9 (23.0)
Trans fats (g)	0.3 (0.2)	0.17 (0.02)	0.12 (0.02)
Sodium (mg)	1269.3 (396.6)	512.1 (42.3)	603.4 (54.1)
Sugar (g)	43.5 (13.3)	19.9 (1.7)	26.7 (2.3)
Fiber (g)	7.5 (3.3)	3.2 (0.3)	3.0 (0.3)
SNACK	n=5 camps	n=159 child-days	N=67 child-days
Total energy (kcal)	266.4 (150.8)	148.4 (6.3)	224.0 (17.5)
Trans fats (g)	0.02 (0.06)	0	0.02 (0.01)
Sodium (mg)	297.4 (244.7)	195.3 (12.4)	279.4 (31.2)
Sugar (g)	28.1 (22.4)	11.5 (0.8)	18.4 (2.1)
Fiber (g)	2.9 (3.5)	0.72 (0.06)	1.4 (0.2)

^aStandard Error

^b“Child-days” refer to repeated observation days within child participants.

Table 3

Average weekly frequency of serving various foods/beverages at five Boston summer day camps and average percent of each food/beverage consumed when served to 149 child participants.

	IOM recommendation for weekly total for ages 5–13 years old, CACFP ^a	Mean (SD) ^b weekly total observed as served at summer camps	Mean (SE) ^c percentage of servings consumed by campers when offered
BREAKFAST	n=4 camps		n=91 children
Fruit	2.5 cups	2.4 (1.3) cups	21.1% (4.0)
Grains	9.5 oz ^d	8.5 (2.9) oz	72.8% (6.2)
Meat or meat alternative	3 oz	2.3 (4.7) oz	10.6% (7.3)
Milk, any kind	3.75 cups	5.0 (0.01) cups	33.8% (3.7)
LUNCH	n=5 camps		n=144 children
Fruit	2.5 cups	4.6 (1.4) cups	36.5% (4.5)
Vegetables	5 cups	1.3 (0.4) cups	11.7% (2.4)
Grains	10 oz	12.0 (1.5) oz	31.2% (2.9)
Meat or meat alternate	10 oz	14.7 (1.6) oz	35.0% (3.7)
Milk	5 cups	5.0 (0.03) cups	37.6% (4.0)
SNACK	n=5 camps		n=142 children
Fruit	1 cup (served in 2 half-cup servings)	0.7 (0.4) cups	28.8% (5.8)
Vegetables	1 cup (served in 2 half-cup servings)	0.03 (0.06) cups	0
Grains	2 one-ounce servings	5.8 (2.8) oz	48.0% (8.1)
Meat or meat alternate	2 one-ounce servings	1.2 (1.6) oz	59.0% (9.2)
Water	5 cups	0.6 (0.9) cups	62.6% (13.8)
Milk, any kind	1 cup (served in 2 half-cup servings)	0.6 (0.5) cups	4.1% (2.4)
ACROSS ALL MEALS			
100% juice	5 cup maximum	3.9 (1.5) cups	36.9% (3.7)
Sugar-sweetened beverages	0 maximum	0	0
Flavored milk	0 maximum	2.7 (2.5) cups	43.9% (6.2)
Whole grains	50% of all grains	70.7% (6.7)	21.3% (1.9)
Red meat and highly processed meats	1 time maximum	3.0 (1.0) times served	28.5% (3.4)
Baked or fried grain products high in solids fats and added sugars (grain-based desserts)	1 time maximum	2.3 (1.9) times served	64.1% (6.2)
Salty snacks	No recommendation	2.0 (1.2) times served	66.9% (3.6)

^aChild and Adult Care Food Program

^bStandard Deviation

^cStandard Error

^dOunce