



Cost and Cost-Effectiveness of Students for Nutrition and eXercise (SNaX)

Joseph A. Ladapo, MD, PhD; Laura M. Bogart, PhD; David J. Klein, MS; Burton O. Cowgill, PhD, MPH; Kimberly Uyeda, MD, MPH; David G. Binkle, MPA; Elizabeth R. Stevens, MPH; Mark A. Schuster, MD, PhD

From the Department of Medicine, New York University School of Medicine, New York, NY (Dr Ladapo); Department of Population Health, New York University School of Medicine, New York, NY (Dr Ladapo and Ms Stevens); Division of General Pediatrics, Department of Medicine, Boston Children's Hospital, Boston, Mass (Drs Bogart, Schuster and Mr Klein); Department of Pediatrics, Harvard Medical School, Boston, Mass (Drs Bogart and Schuster); RAND Corporation, Santa Monica, Calif (Drs Bogart and Mr Klein); Department of Health Policy and Management, UCLA Fielding School of Public Health, Los Angeles, Calif (Dr Cowgill); Student Medical Services, Los Angeles Unified School District, Los Angeles, Calif (Dr Uyeda); and Food Services Branch, Los Angeles Unified School District, Los Angeles, Calif (Mr Binkle) Dr Ladapo's work is supported by a K23 Career Development Award (K23 HL116787) from the National Heart, Lung, and Blood Institute (NHLBI). There are no other financial disclosures to report. The authors declare that they have no conflict of interest. Address correspondence to Joseph A. Ladapo, MD, PhD, Department of Population Health, New York University School of Medicine, 550 First Ave, VZ30 6th Fl, 614, New York, NY 10016 (e-mail: joseph.ladapo@nyumc.org). Received for publication May 16, 2015; accepted July 26, 2015.

ABSTRACT

OBJECTIVE: To examine the cost and cost-effectiveness of implementing Students for Nutrition and eXercise (SNaX), a 5-week middle school-based obesity-prevention intervention combining school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education.

METHODS: Five intervention and 5 control middle schools (mean enrollment, 1520 students) from the Los Angeles Unified School District participated in a randomized controlled trial of SNaX. Acquisition costs for materials and time and wage data for employees involved in implementing the program were used to estimate fixed and variable costs. Cost-effectiveness was determined using the ratio of variable costs to program efficacy outcomes.

RESULTS: The costs of implementing the program over 5 weeks were \$5433.26 per school in fixed costs and \$2.11 per student in variable costs, equaling a total cost of \$8637.17 per school, or \$0.23 per student per day. This investment yielded

significant increases in the proportion of students served fruit and lunch and a significant decrease in the proportion of students buying snacks. The cost-effectiveness of the program, per student over 5 weeks, was \$1.20 per additional fruit served during meals, \$8.43 per additional full-priced lunch served, \$2.11 per additional reduced-price/free lunch served, and \$1.69 per reduction in snacks sold.

CONCLUSIONS: SNaX demonstrated the feasibility and cost-effectiveness of a middle school-based obesity-prevention intervention combining school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education. Its cost is modest and unlikely to be a significant barrier to adoption for many schools considering its implementation.

KEYWORDS: adolescents; cost; cost-effectiveness; fruits; health promotion; nutrition; schools; vegetables

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WHAT'S NEW

SNaX demonstrated the feasibility and cost-effectiveness of a middle school-based obesity-prevention intervention combining school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education. Program aims were achieved at a cost of \$0.23 per student per day.

Hunger-Free Kids Act (S.3307)—and local school-environment programs.^{1,2} In recent years, several local programs have proven effective in promoting healthier dietary choices such as reducing sugar-sweetened beverage (SSB) consumption and increasing children's fruit and vegetable consumption^{5–12}; some have improved body mass index.^{9–12} However, with few exceptions,^{13–16} the cost and cost-effectiveness of implementing these programs are unknown.

The cost of school-based nutritional and exercise interventions is important information for school principals, superintendents, and other leaders.^{4,17} These decision-makers often oversee policy and program adoption decisions for schools, and they frequently navigate challenging budget constraints.^{18,19} Furthermore, a recent Institute of

REDUCING THE PREVALENCE of obesity in children is a major public health goal^{1,2} with broad implications for future population health and health care costs.³ Because children consume 35% to 50% of their daily calories at school,⁴ attention has been focused on school nutrition policy changes—such as those spurred by the 2010 Healthy

Medicine report on preventive interventions in children emphasized the role of economic evaluation in providing policymakers with guidance for decision-making.²⁰

In this study, we present the cost and cost-effectiveness of Students for Nutrition and eXercise (SNaX), a 5-week middle school–based obesity-prevention program that combined school-wide environmental changes, multimedia, encouragement to eat healthy school cafeteria foods, and peer-led education.²¹ SNaX was developed using principles of community-based participatory research and was assessed in a randomized controlled trial in public Los Angeles middle schools (grades 6 to 8) from 2009 to 2012. We found that SNaX significantly increased the proportion of students choosing fruit during meals and obtaining lunch from the cafeteria (a program goal because the cafeteria had redesigned its food offerings to exceed national nutritional standards), decreased the proportion of students buying snacks at school, enhanced students' knowledge about obesity-prevention behaviors, and increased tap water consumption.²¹ Our cost and cost-effectiveness analysis of SNaX, focused on diet-related outcomes, aims to inform policymakers and other stakeholders seeking to improve student dietary choices and ultimately student health.

METHODS

PARTICIPANTS

We selected 10 schools from the Los Angeles Unified School District (LAUSD) with >50% National School Lunch Program (NSLP)-eligible students (a proxy for low-income) and <900 seventh graders to participate in a randomized controlled trial evaluating the SNaX program. There were 5 schools in the intervention group and 5 in the control group. Of 4022 eligible students, 2809 (70%) had consent for height, weight, and NSLP data collection; data were obtained for 2606 (93%) and 2693 (96%), respectively.

INTERVENTION

More details about the intervention are available elsewhere.²¹ Seventh graders were recruited through in-class presentations and informational tables to join a peer leader club, where they were trained by facilitators to promote and model healthy behaviors and engage other students in discussions to change eating and physical activity norms. Specifically, they were trained to discuss SNaX messages regarding cafeterias, water, SSBs, fruits/vegetables, and physical activity/inactivity with peers and family using a motivational interviewing style. Peer leaders also learned educational messages and conducted lunchtime giveaways (eg, educational bookmarks, wristbands, pens, key chains, and pedometers) and cafeteria-food taste tests. A different group of peer leaders was recruited and trained each week by trained facilitators, and across schools, 454 peer leaders and partners participated. To control for seasonal variation in students' dietary patterns, we conducted SNaX only in spring semesters, when LAUSD caf-

eteria participation typically declines. In keeping with community-based participatory research principles, school district administrators from Student Health and Human Services, Food Services, and Physical education served on the study leadership team and were integral to the development and implementation of the intervention and analysis and interpretation of results.

As part of SNaX, the SNaX team developed signs and posters promoting water consumption, healthy foods, and physical activity; developed a promotional film for students; and in conjunction with the schools, installed water stations to expand students' access to drinking water. Cafeterias offered chilled, filtered water and a greater variety of healthier options (sliced/bite-sized fruits/vegetables), and posted SNaX-branded signs and banners promoting water consumption and healthy foods in the cafeteria area.

Overall program effects were measured across the entire school population using cafeteria and school store records, although peer leaders were recruited from seventh grade, and seventh graders received a more intensive intervention (eg, peer leader education). Thus, seventh-grade students completed surveys that assessed attitudes about the cafeteria, knowledge about obesity-prevention, tap water consumption, and other outcomes. Additional details about the program's design, content, and dietary and survey outcomes are reported elsewhere.²¹ The institutional review boards of Boston Children's Hospital and RAND Corporation and the LAUSD Committee for External Research Review approved the study protocol.

DATA COLLECTION

We documented the cost of multimedia materials and promotional and marketing items, and program coordinators reported detailed information about water system maintenance costs, time spent training facilitators and peer leaders, teacher wages, and cafeteria employee wages. Multimedia materials and marketing products were procured from local vendors, including a graphic designer and film team; purchasing was centralized, so prices of program components were similar across schools. The cost of developing multimedia materials and marketing products was not included in our analysis because these costs have already occurred and are not recoverable (in economic terminology, "sunk") from the perspective of program dissemination.

Schools provided data on cafeteria participation (number of students obtaining lunch by NSLP eligibility; number of fruits and vegetables served) and school store and vending machine sales (number of snacks sold) for each day of the intervention; we divided these totals by the number of students in attendance. Students eligible for the NSLP received free or reduced-price lunches based on family income. One school did not provide snack sale data because its store was closed due to structural damage.

INTERVENTION COMPONENT CATEGORIES

We classified intervention components into 3 categories using detailed activity and product descriptions provided

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