

# CANCER DISPARITIES

CAUSES AND EVIDENCE-BASED SOLUTIONS



RONIT ELK  
HOPE LANDRINE  
EDITORS



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## **5-a-Day and Fit-for-Life Badge Programs for Cancer Prevention in Boy Scouts<sup>1</sup>**

*Amy Shirong Lu, Janice Baranowski, Debbe Thompson,  
Karen W. Cullen, Tom Baranowski, Russ Jago, and Richard Buday*

Overweight children are at increased risk of becoming overweight adults, and this risk increases throughout childhood (Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). The odds ratio of becoming an obese adult is 1.3 for overweight 1- to 2-year-olds, 4.1 for overweight 3- to 5-year-olds, and up to 28.3 for overweight 10- to 14-year-olds (Whitaker et al., 1997). Parental obesity is a strong predictor of adult obesity among children less than 10 years old; but among children 10 years old or greater, the child's weight status is the stronger predictor of adult obesity (Whitaker et al., 1997). Adult obesity is associated with an increased incidence of several cancers, including colon (Murphy, Calle, Rodriguez, Khan, & Thurn, 2000), breast (Carmichael & Bates, 2004; Harvie, Hooper, & Howell, 2003), and endometrial (Kaaks, Lukanova, & Kurzer, 2002) cancers. Insulin-like growth factor 1 (IGF-1), a polypeptide that enhances tumor development by stimulating cell proliferation and inhibiting apoptosis (Kaaks & Lukanova, 2001), is associated with increased adiposity in both children (Ong, Kratzsch, Keiss, & Dunger, 2002; Wabitsch et al., 1996), and adults (Nam et al., 1997; Voskuil et al., 2001). Elevated levels of IGF-1 have been associated with an increased risk of colon (Giovannucci, 2001), prostate (Chan, Rimm, Colditz, Stampfer, & Willett, 1994), and breast cancer (Hankinson et al., 1997). Increased levels of certain cytokines such as adiponectin (Mantzoros et al., 2004; Miyoshi et al., 2003) and IL-6 (Fontanini

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et al., 1999; Onuma, Bub, Rummel, & Iwamoto, 2003; Schneider et al., 2000), and the cytokine-like protein leptin (Hardwick, Van Den Brink, Offerhaus, Van Deventer, & Pepelenbosch, 2001), are elevated with adiposity and increased cancer risk. Elevated insulin levels, as in obesity-related metabolic syndrome and type 2 diabetes, are also a risk for cancer mortality (Borugian et al., 2004). Some breast cancers likely initiated during puberty, with the rapid growth in breast tissue (Colditz & Frazier, 1995). Obese girls may be at greater risk of breast cancer, due to the earlier development (Freedman et al., 2002) and the larger accumulation of breast tissue (Freedman et al., 2003). Thus, childhood obesity increases the risk of a number of cancers.

Disparities in mortality and health outcomes have been established by socioeconomic status and ethnicity both worldwide and in the United States (Kumanyika et al., 2008). Among the many factors contributing to these health disparities in obesity and cancer risks are differences in lifestyle practices, including diet (Kranz et al., 2009) and physical activity (Kumanyika & Yancey, 2009), and the increased adiposity resulting from energy unbalance (Kumanyika et al., 2008). Fruit and vegetable (FV) intake within the context of lower caloric intake (Ledoux, Hingle, & Baranowski, 2010) and physical activity are behaviors directly related to childhood obesity prevention (Roblin, 2007). Helping children to eat more fruits and vegetables and to participate in more physical activity should have long-term health benefits (Baranowski et al., 2000).

Commonly, children consume well below the recommended minimum of five servings of fruits and vegetables per day (Baranowski, Smith, et al., 1997; Domel et al., 1993) and perform physical activity for much less than the recommended 60 minutes per day standard (Troiano et al., 2008). Of particular concern are minority populations with lower income (Taylor, Baranowski, & Young, 1998), who are more sedentary (Taylor, Beech, & Cummings, 1997) and more likely to develop chronic diseases related to sedentary lifestyles than the general population (U.S. Department of Health and Human Services, 1990). Black adolescents and females also report lower preferences for vegetables than their White counterparts (Granner et al., 2004). Since lifestyle interventions have generally not worked among ethnic-minority children (Whitt-Glover & Kumanyika, 2009), effective interventions are needed for low-income and minority populations (Taylor et al., 1998). Since dietary and physical activity habits form in early childhood and are usually maintained into adulthood (Kelder, Perry, Klepp, & Lytle, 1994; Malina, 2008), early intervention should help to reduce multiple health risks. An important related issue is whether interventions initially designed to meet the needs of one specific ethnic minority can be employed across a wider audience.

Behavioral interventions induce changes in mediating variables (i.e., factors that causally influence the behavior, such as the home environment

or self-efficacy to perform behavior). Changes in the mediating variables change the behavior (Baranowski et al., 1997). Behavioral interventions need to identify and work in channels appropriate to specific kinds of children to optimize their effect on the mediating variables. Previous research has shown that a badge program could change behaviors among Girl Scouts (Cullen, Bartholomew, & Parcel, 1997). Almost 3 million boys were involved in scouting in the United States in 2008 (Boy Scouts of America, 2008). Scouts are encouraged to take responsibility for developing good health habits, a component of physical fitness (Cullen et al., 1998). "Urban Boy Scouts" provides a promising opportunity to reach inner-city ethnic-minority children (Cullen et al., 1998). Boy Scouts thus provide a promising channel to enable boys to adopt a healthier lifestyle. In light of this opportunity, we built a relationship with the Urban Boy Scout program of the Sam Houston Council in 1998, to enhance their fitness badge programs. The leaders of Urban Scouting were interested in providing meaningful experiences for their scouts, who were at high risk for obesity and consequent cancer. They participated in the program design.

### GOAL AND HYPOTHESIS

The goal of this project was to enable Boy Scouts to eat five or more servings of FV and engage in 30 minutes or more of moderate to vigorous physical activity per day. The hypothesis was that a behavior-change program based on social cognitive theory principles and change procedures would help scouts make changes toward these goals.

### CONCEPTUAL FOUNDATION

Behaviors are under the influence of multiple factors, making them difficult to change (Baranowski, Lin, et al., 1997). Most identified behavioral influences (candidate mediators for intervention programs) had low predictiveness (Baranowski, Cullen, & Baranowski, 1999) and only a few significantly predicted behavior (Barrios & Costell, 2004). Most childhood obesity prevention programs do not have the desired effect (Brown, Kelly, & Summerbell, 2007). Thus, a challenge is how to design and implement behavioral change procedures among targeted populations through appropriate implementation channels (Kalakanis & Moulton, 2006; O'Connor, Jago, & Baranowski, 2009).

Simply providing children with the knowledge that eating fruits and vegetables and being physically active will prevent obesity, cancer, heart disease, and diabetes does not necessarily motivate them to actively make healthier choices (Contento, 2008). Thus, providing some knowledge of what

behaviors to change and how to change them may be necessary, but not sufficient, for behavior change. Health behavior interventions are most likely to be effective if guided by relevant behavioral theories (Contento, Manning, & Shannon, 1992). Using the mediating/moderating variable model as the conceptual framework, interventions need to target variables that influence the behavior (Baranowski, Lin, et al., 1997).

Bandura's social cognitive theory (SCT) (Bandura, 1986) described a system of triadic reciprocal determinism of cognitive, environmental, and behavioral factors, that has been a commonly used theoretical foundation for behavior change programs. Observational learning, or the vicarious acquisition of knowledge and skills from watching others, is a primary source of information that promotes both cognitive and behavioral development. By observing other people's behavior, people may acquire information about many challenges, and about the skills needed to overcome them. Self-efficacy is the belief in one's ability to perform specific behaviors (Bandura, 1977) and mediates the application of knowledge and skills to behavior change (Maibach & Cotton, 1995). Outcome expectancy is the expectation that certain behaviors produce outcomes (Bandura, 1994). People act on their beliefs about what they are capable of doing and about the outcome of their behavior. Linking healthy behaviors to attaining something that kids want (i.e., rewards), such as achievement badges for Boy Scouts, and delivering the message in a fun, interactive way, such as logging into an interactive website to read comics and play online games, should motivate them to improve their diet and physical activity (Baranowski et al., 2002; Jago et al., 2006).

### **THE INITIAL PROGRAM**

The 5-a-Day achievement badge for Urban Boy Scouts was a preliminary intervention designed to help African American Boy Scouts to increase their fruit and vegetable consumption. To ensure that the intervention materials were culturally sensitive (Resnicow, Baranowski, Ahluwalia, & Braithwaite, 1999), focus group discussions were conducted (Cullen et al., 1998). The focus groups (Cullen et al., 1998) found that the urban Boy Scouts' preference for vegetables was low; their FV-preparation skills were limited; and they did not purchase FV for snacks. Although FV were available at home, they were not in easily accessible forms, and the boys reported low participation in food preparation. They reported setting only global goals (e.g., general aims such as getting good grades or being popular at school) and did not understand self-monitoring their progress toward achieving their goals. Although African American (AA) boys were likely to consume FV as often as corresponding European American boys, there were ethnic differences regarding the type of FV consumption. For example, African American boys

were more likely to have eaten potato salad, whereas European American boys were more likely to have consumed bananas, strawberries, watermelon, other white potatoes, corn, salsa, and vegetable soups.

A pilot test (Baranowski et al., 2002) was conducted with Boy Scouts and their families to assure clarity of message, relevance, and acceptance by the target group. Although the pilot test resulted in a 0.8 FV serving increase (Baranowski et al., 2002) among African American Boy Scout troops in Houston, Texas, the research team learned that the 1-hour educational session during every week's troop meeting conflicted excessively with other troop responsibilities. As a result, many of the in-troop behavioral components were transferred online, so as to minimize troop time.

Two innovative Boy Scout badge programs were developed, each with 9-session in-troop activities, plus corresponding weekly Internet activities. Troop leaders led the weekly in-troop sessions, which focused on fun (as an outcome expectation) and interactive skill-building activities that taught the scouts related functional knowledge and skills to enhance the scouts' self-efficacy, and allowed them to achieve their behavior change goals. The online components incorporated fun and interactive role modeling, goal-setting, goal review, and problem-solving elements that allowed the scouts to set and review their behavioral change goals, and solve potential problems throughout that process. Each week, the in-troop interactive activities took about 20–30 minutes, and the online program activities took about 10–20 minutes to complete, giving a total of about 30–50 minutes of program activities. The completion of goals took additional time at home during the week, depending on the goals that the scouts set, for which the scouts received goal points toward earning their respective badges (5-a-Day or Fit-for-Life).

### THE 5-A-DAY BADGE PROGRAM

The goal of the 5-a-Day badge program was to help scouts learn to eat at least five servings of FV a day, by setting weekly goals to eat FV at a specific meal or snack, and establishing skills and an environment supportive of that. Each week during the troop meeting, the scouts participated in the 5-a-Day badge skill-building activities, which were focused on learning FV preparation skills (by preparing meal-specific, quick, and easy FV recipes that had been taste tested with boys prior to the program). Such in-troop preparation of simple recipes taught scouts recipe preparation skills, and the tasting should have enhanced their preference for FV (Birch, McPhee, Shoba, Pirok, & Steinberg, 1987). The scouts received a 5-a-Day recipe book with all the troop recipes, and additional ones to prepare later at home.

*Week 1 in-troop activities:* At the initial troop meeting, troop leaders announced the new 5-a-Day achievement badge and explained the requirements

for earning the badge, including attending meetings, preparing FV recipes, logging onto the badge website, and completing goal-setting and monitoring tasks. The scouts were given rules and safety tips to follow during recipe preparation, including always to wash their hands before handling or eating food, the fundamentals of collecting ingredients, and cooking utensils, knife, and other kitchen equipment safety information; they were instructed to always have an adult present to supervise them, since most boys around 10–14 years old do not have enough experience to prepare recipes by themselves. The weekly recipe preparation assignment chart and the rotation of duties were explained and the scouts were given their first recipe to prepare for tasting. The food preparation process was completed solely by the scouts, but was closely supervised by the troop leader. The scouts were given a “My Way to 5-a-Day” motto, to help them remember how to find and prepare FV they liked to eat. At the end of each session, the troop leader reminded the scouts to go to the badge website that evening or the next day, to set their badge goal to eat FV for an after-school snack.

*Week 2 in-troop activities:* At the beginning of each subsequent week, the troop leader met with each scout, prior to the formal troop meeting, to review his web log-in and goal achievement. This week, the scouts played a “SOLVE IT” game (based on the TV game show *Family Feud*) to problem-solve ways to overcome barriers to meeting their badge goal. The game scenarios included common problems that scouts have in meeting their goal to eat FV for a meal or snack. Then the scouts discussed the next week’s goal, to eat a fruit or drink a 100% fruit juice for breakfast, and prepared two breakfast fruit smoothie recipes to taste.

*Week 3 in-troop activities:* The scouts talked about what they usually ate for an after-school snack and how they could incorporate FV snacks into their usual routine. They discussed the next week’s goal, to eat FV for an after-school snack, and prepared two fruit snack recipes to taste.

*Week 4 in-troop activities:* The scouts talked about what they usually ate for school lunch and how they could incorporate a vegetable snack into their usual lunch. They discussed the next week’s goal—to eat a vegetable at school lunch—and prepared two vegetable lunch recipes to taste.

*Week 5 in-troop activities:* The scouts talked about what vegetable they usually ate for dinner. Since increased availability and accessibility of FV at home has been correlated with intake (Jago, Baranowski, Baranowski, Cullen, & Thompson, 2007), scouts used role-playing activities to learn asking and negotiating skills so that they could ask for FV at home. This prepared them for setting their next week’s goal, to eat a vegetable at dinner. The scouts then prepared two vegetable dinner recipes to taste.

*Week 6 in-troop activities:* The scouts talked about what they usually ate at their favorite fast-food restaurant and how they could incorporate FV into

their selections, using real fast-food restaurant menus to find appropriate choices. They also discussed the next week's goal, to eat FV at a fast-food restaurant. Next the scouts prepared two 100% fruit juice drink recipes to taste.

*Week 7 in-troop activities:* The scouts reviewed what they learned about eating FV for meals and snacks, and completed a worksheet to create their own "My Way to 5-a-Day" plan for their goal to eat five servings of FV on Saturday and Sunday during the upcoming weekend. Next, the scouts prepared two vegetable snack recipes to taste.

*Week 8 in-troop activities:* The scouts reviewed what they had learned about eating FV for meals and snacks while working on the 5-a-Day badge. They played a "Top 10" game to help them create their own "My Way to 5-a-Day" plan to meet next week's goal, to eat five servings of FV every day after they received their 5-a-Day badge. Next, the scouts prepared their own combination of vegetables in a "That's a Wrap" sandwich recipe to eat.

*Week 9 in-troop activities:* The 5-a-Day achievement badge award ceremony was held. Troop leaders repeated the purpose of the badge program, then congratulated and recognized all scouts who had successfully completed the 5-a-Day achievement badge requirements and earned their badge. Each scout's name was called as he was presented with the 5-a-Day achievement badge, given a handshake, and told that he should wear it with pride, knowing that he had achieved the goal of learning how to eat five servings of FV a day, every day. The troop leader ended the ceremony by reminding the scouts to continue to eat five servings of FV every day.

In addition to the weekly troop meeting activities, scouts logged onto the badge website each week, where they set their badge requirement goals to eat FV and make FV recipes at home. To ensure that the badge goals only included FV, scouts played video games on the website to learn what foods counted as FV, and what food items—such as juice drinks, Kool-aid, apple pie, French fries, and so on—were excluded, either because they did not have enough FV or because they were too high in fat and sugar. To be counted, a FV goal must include at least a full serving of FV and must be cooked without fat. The goals on the badge website had the scouts clearly state what behavior they would do, as well as when and how they would do it (i.e., action implementation intentions). Scouts had one week in which to complete each badge requirement goal. The troop leader monitored the scouts' weekly log-ons and accumulated points.

The welcome page featured four cartoon images of the "Troop 5 Alive" scouts of different racial and ethnic groups, with a black background color. Each participating scout had his own username and password to log into the website, and was encouraged to log in at least twice a week. The initial login was to set their goal, and the second was to record achievement of their goal before the next week's troop meeting. Once logged in, the badge website page contained three sections. At the top was a "5-a-Day" bar, showing

the scout's progression across the week's goals. On the left navigation panel there were different tabs, containing the various games and goal sections for the 5-a-Day badge.

The scouts set their 5-a-Day badge goal by clicking on "Go for the Goal" button on the left. That week's goal (e.g., after-school veggie snack for 3 days plus prepare 5-a-Day badge recipe at home) and goal statement (e.g., this week, your goal is to eat one more serving of veggies than you usually eat for an after-school snack on three different days) would appear in the middle of the screen. By clicking on the "start" button, the scouts were directed to "Go for the Goal," where they selected the dates and the targeted FV for each week's goals. At the end, the scouts would see a summary page with the days and FV that they had chosen to meet those goals. Next, they set the Snack Down Recipe Goal by clicking on the recipe that they wanted to prepare at home for their family for the goal. They could also view recipes before making the selection. After selecting the day on which they wanted to make the recipe, they could print their detailed goal to post on the refrigerator, as a reminder of what they needed to do for the week.

When the scouts had completed their goals, before they came back to the troop meetings next week, they logged onto the website to review their goals, and to indicate the completion of the goals by checking the boxes under each goal. Those who did not meet their weekly goals participated in online and in-person problem-solving (i.e., coping implementation intentions). The in-person problem-solving session would be conducted by the troop leader just prior to the weekly meetings.

In addition to the goal-setting component, the badge website contained a number of activities (Real Times 5, Make Your Mark, Add 'Em Up, Snack Down Recipe, Are You Game? and SOLVE IT) with which the scouts could interact during the week.

Real Times 5 was a weekly comic strip about how the "Troop 5 Alive" scouts, Jason, Jamal, Carlos, and David, met their weekly goals to earn their 5-a-Day badge. Each weekly comic described how these scouts achieved goals similar to those of the real scouts, as well as overcoming problems through self-regulatory and asking skills. Self-monitoring and problem-solving elements were included for the real scouts, to enhance their self-regulatory skills. Each episode ended with a cliff-hanger, or an unresolved problem likely to keep one of the scouts from achieving his dietary goal (e.g., a scout told his friends that he wanted to drop out of the program because his mother did not keep fruits and vegetables at home). As in a soap opera, this was intended to attract the real scout to return to the website, to find out what happened next.

Make Your Mark was a weekly problem-solving poll that asked scouts how they would solve the cliff-hanger to the problem that "Troop 5 Alive"

encountered in meeting their badge requirements. The scouts read the problem and chose what they thought was the best solution for the comic character to meet the 5-a-Day badge goal. The poll provided various solutions, including both good and bad ones. After selecting a solution, a scout was given feedback on whether or not the selected solution would likely work, and why.

In the Add 'Em Up section, a scoreboard displayed each scout's current total of 5-a-Day badge points toward receiving their badge.

Snack Down Recipes was the online archive that stored the weekly troop and web recipes as part of the 5-a-Day badge.

In the Are You Game? section, scouts used the FV skills and knowledge learned during troop meetings to play games for additional knowledge points toward their badge. The scouts competed against other scouts in their troop in this section, and could earn "Elite 5" status if they obtained one of the top five scores on a particular game. Due to the competition factor, this was one of most visited sections of the badge website.

SOLVE IT helped a scout who experienced problems meeting his goals to find a workable solution to meet his next goal. A tailored step-by-step plan to identify the barriers and ways to overcome the barriers was created. The scout was able to print the solutions to help meet his goals. Scouts received points for completing the SOLVE IT activity. To make the process easy to remember and interesting, a SOLVE IT Rap was included:

"S" Solvin' problems / won't take long  
"O" Once I know / what went wrong  
"L" Look at ways / write them down  
"V" Vote for one / works all round  
"E" Eager to try / my new plan

In the event that the troop members needed to contact the troop leader or had some problems with the website, they could click the "Contact Us" button and type in the message through an online form. The intervention staff answered questions within 24 hours.

Each week, the scouts earned points toward the 5-a-Day badge for participating in the in-troop activities, logging onto the badge website, setting their behavioral goals, and completing their weekly goals. Scouts had to earn at least 10,200 of the total 17,600 possible points, to earn the 5-a-Day achievement badge. Scouts earned 100 points per week by attending weekly troop meetings, and participating in the badge activities during the troop meetings; 100 points per week by logging onto the website to set the weekly goals; 100 points per week by viewing the online comics; 100 points per week by participating in problem-solving polls; 100 points per week by recording how they did on their goals at the end of the week; 1,000 points per week by

achieving the 5-a-Day goal; and 500 points per week by preparing a 5-a-Day web recipe for their families. The participants could also earn an extra 100 points by returning completed problem solutions to help meet their 5-a-Day goals, and an additional 100 points by cleaning up after the troop meetings each week.

### **THE FIT-FOR-LIFE ACHIEVEMENT BADGE PROGRAM**

The goal of the Fit-for-Life badge program was to increase the scouts' moderate to vigorous physical activity (PA) levels to 30 minutes a day, 5 times per week by setting weekly goals to do PA while wearing a pedometer to track their steps. Like the 5-a-Day badge program, the Fit-for-Life program combined offline weekly troop meetings with online sessions.

Each week during the troop meeting, the scouts participated in the Fit-for-Life badge skill-building activities to promote PA skills such as flexibility, strengthening, and cardiovascular fitness through sports such as basketball, football, baseball, and soccer, played during troop meetings and later at home, using a pedometer to record their steps during these activities.

*Week 1 in-troop activities:* At the initial troop meeting, troop leaders announced the new Fit-for-Life achievement badge, which would help scouts learn to be more physically active by doing PA drills to improve their skills in some sports, doing PA five times a week, and knowing the different components of fitness. Troop leaders explained that PA referred to an activity that kept a person moving continuously, and that doctors usually recommended that everyone do at least 30 minutes of PA a day, 5 days a week. Each scout received a pedometer to record his steps during PA. The scouts were instructed to wear the pedometer during the 8-week badge program, to track the number of steps taken during their PA. They were also instructed how to use the reset button before starting the PA each day. They were encouraged to reach a minimum of 5,000 counts for each activity goal, and to record their pedometer counts on the badge website each week as part of their goal achievement. If a scout lost the pedometer, he would only be able to record what activities he had done for the weekly goal.

Since boys of this age generally are interested in sports (Cardon et al., 2005), troop leaders organized a series of PA drill exercises to build skills to play sports. One scout was chosen to lead the stretches and one scout was chosen to be in charge of the equipment. Each drill lasted around 15–17 minutes. These sport-related drills included baseball stretches, ultimate football, baseball drills, football strengthening drills, soccer strengthening drills, a basketball knockout game, and a soccer drill game, and varied from week to week. The scouts also received a PA drills booklet to help them set and achieve their PA goals. Each of the booklets listed the information about their PA drill requirements and

instructions. It also listed the required activities from each section of the intervention website, as a to-do list. At the end of each troop meeting, the troop leader reminded the scouts to go to the badge website that evening or the next day, to set their badge goal to do 30 minutes (or 5,000 pedometer steps) of PA twice in the next week.

*Week 2 in-troop activities:* At the beginning of each subsequent week, the troop leader met with each scout, prior to the formal troop meeting, to review his web log-in and goal achievement. This week, the scouts played SOLVE IT (designed to resemble the TV program *Family Feud*), but with a PA and health focus that reinforced problem-solving and helped the scouts identify solutions to barriers to meeting their PA badge goal. The game scenarios included common problems that scouts have in meeting their PA or pedometer goal. It echoed the SOLVE IT component on the website, which helped the scouts to identify reasons why they did not meet the goal, and gave step-by-step solutions to overcome the problems. Then the scouts discussed the different types of fitness (flexibility, strengthening, and aerobic activity). Next, the scouts participated in baseball flexibility drills.

*Week 3 in-troop activities:* The scouts discussed PA levels and heart rates, and participated in the ultimate football game.

*Week 4 in-troop activities:* The scouts discussed safety guidelines for a variety of sports and activities, and participated in baseball drills.

*Week 5 in-troop activities:* The scouts discussed safety guidelines for weight lifting, and participated in football strengthening drills.

*Week 6 in-troop activities:* The scouts participated in soccer strengthening drills and a soccer game.

*Week 7 in-troop activities:* The scouts participated in role-playing activities to learn asking and negotiation skills, so that they could ask their parents for help in meeting their PA goals, and participated in the basketball knock-out game.

*Week 8 in-troop activities:* The scouts reviewed what they had learned about PA while working on the Fit-for-Life badge. They played a "Top 10" game to help them create their own plan to continue to do PA every day after they received their Fit-for-Life badge, and participated in an indoor soccer skills game.

*Week 9 in-troop activities:* After 8 weeks of intervention, the scouts were awarded their Fit-for-Life badges during a special badge ceremony. The troop leaders repeated the purpose of the badge program, then congratulated and recognized all scouts who had successfully completed the Fit-for-Life achievement badge requirements and earned their badge. Each scout's name was called as they were presented with the Fit-for-Life achievement badge, given a handshake, and told he should wear it with pride, knowing that he had achieved the goal of learning how to be PA every day. The troop leader ended the ceremony by reminding the scouts to continue to be PA every day.

Like the 5-a-Day badge, scouts logged onto the Fit-for-Life badge website each week, where they set their badge requirement goals to do 30 minutes of PA for a varying number of days each week, and to record the resulting pedometer step counts during those PA.

The welcome page featured the same four "Troop 5 Alive" scouts, but with the Fit-for-Life title. The Fit-for-Life website gave each scout his unique username and password for logging-in purposes, and they were encouraged to log in at least twice a week. The initial log-in was to set their goal, and the second was to record the achievement of their goal before the next week's troop meeting. The Fit-for-Life website's navigation areas and screens were similar to those of the 5-a-Day site, but were related to PA.

The scouts' first log-on was to click on Challenge Yourself, to set their badge requirement goals to do PA for at least 30 minutes for the week. Then they would click "Go set goal," to move to the next section of the page, where they could select the day, PA, and time of day to do their PA for their first day's goal from drop-down boxes (e.g., Thursday, February 20, 2003, After School, Bicycling). They could earn extra points for the week by choosing stretches or strengthening moves in addition to the 30-minute daily PA. After they had set their goal for each day to do PA, they would see a summary page with the days, the PA, and the time of day they had chosen to meet the goals. After that, the scouts could print the page to remind them of the goals that they had set.

Scouts had one week to complete the goals. Before returning to the next weekly troop meeting, the scouts were to log on a second time to record completion of their goals. By clicking on the Challenge Yourself page, the scouts were able to see all of the goals they had selected plus three more forms to fill: the time of the activity, the pedometer counts, and whether they had met the goal (check mark). Once they had entered the information, they clicked the "update goal" button to report that to the system.

The participants were to set progressively more difficult PA goals each week. When a scout experienced problems meeting his goals for the week, he would click a button called SOLVE IT, so that he could meet his goals the next week. Like 5-a-Day, the scouts were asked to identify the barriers and ways to overcome them. Similarly, a tailored step-by-step solution to the problem would be created for the scout. He was instructed to print out the final solution to help with achieving the goals. A scout received points toward his badge for completing the SOLVE IT activity. The same SOLVE IT Rap was also placed in the center of the page.

In addition, the badge website contained a number of activities (Real Times 5, Make Your Mark, Add 'Em Up, What Moves You? Are You Game? and SOLVE IT) that the scouts could complete during the week.

Real Times 5 was the weekly animated role-modeling comic book story, that modeled how the same four Boy Scouts, Jason, Jamal, Carlos, and David,

were able to meet their weekly goals to earn their Fit-for-Life badge, as well as overcome problems in meeting their goals. Each session ended with a cliff-hanger designed to attract the scouts to come back next time.

The Make Your Mark was the weekly poll that asked scouts to help solve the problems that the scouts in the comic series were facing in meeting their badge requirements. The problems were ones that the scouts were likely to face themselves when working toward their Fit-for-Life badge goals. The poll provided various possible solutions: some were good, whereas others were not. After the scouts had selected a solution, they were given feedback and suggestions on whether or not that solution would work. If the scouts did not make a good choice, they were prompted to choose another one.

In addition to the web games, What Moves You? was a timed fitness game that challenged the scouts to do timed PA—for example, jumping jacks, running and touching the stove in the kitchen—in front of the computer. The activities encouraged body movement, and the scouts could replay as many times as they liked to beat their time. They could also compete against their fellow scouts to see who got the best score.

To increase log-on rates, there was another, different PA knowledge game, Are You Game? on the website each week. Scouts needed to use their PA knowledge and the skills learned during troop meetings and on the website to play a game each week (e.g., How much do you know about PA, stretching, and strengthening?). If they made a wrong answer, they would lose points. The scouts competed against other scouts in their troop in this section, and could earn “Elite 5” status if they obtained one of the top 5 scores on a particular game.

The scouts could also update their emails by updating their profiles or contact the program leaders via the online forms.

Each week, the scouts earned points toward the Fit-for-Life badge for attending the troop meetings, participating in weekly PA drills or games at their troop meetings, logging onto the Fit-for-Life website and setting their behavioral goals, and completing their weekly goals. To earn the Fit-for-Life achievement badge, scouts had to earn at least 7,900 out of the total 13,600 possible points. Scouts earned 100 points per week by attending weekly troop meetings, and participating in the PA during the troop meetings; 100 points per week by logging onto the website to set the weekly goals; 100 points per week by viewing the online comics; 100 points per week by participating in problem-solving polls; 100 points per week by recording how they did on their goals at the end of the week; 1,000 points per week by achieving the Fit-for-Life goals; and 100 points per week by achieving their Fit-for-Life extra point goals. The participants could also earn an extra 100 points by returning completed problem solutions to help meet their Fit-for-Life goals.

Representing Baylor College of Medicine, each troop leader was asked to abide by the dress code by wearing “professional” (for 5-a-Day badge) or “professional athletic” outfits (for Fit-for-Life badge), to ensure appropriate personal appearance. All project staff signed a confidentiality statement stating that they would respect scouts’ confidentiality during data collection. To minimize troop behavior problems, staff were given tip sheets about child behavior management. Staff were required to have each entire lesson well rehearsed and completely organized, moving quickly between activities. They were encouraged to meet the regular troop leaders to establish rapport and to finalize their troop schedule for implementation of the intervention. At the beginning of the meeting, they were instructed to be friendly, introduce themselves, and engage in small talk about their troop and/or lives as the scouts were checked in for the first time. They were asked to practice the behavioral objectives and expectations before the sessions, and given specific information about communication styles (e.g., use short, goal-directed sentences, and use both verbal and nonverbal gestures to give the scouts instruction and assist them in achieving the goals). Specific instructions were also given to staff regarding common situations and disruptive forms of behavior.

### **SUPPORT FROM THE BOY SCOUTS ORGANIZATION**

The Sam Houston Council of Boy Scouts of America was very receptive and facilitated contacts to recruit troop leaders in several districts. As an efficacy trial, all program staffing was provided by the research grant.

### **OUTCOME EVALUATION**

*Design:* An experiment (treatment vs. control) was conducted with Boy Scout troops in Houston, Texas. One group participated in 5-a-Day badge, which targeted increasing Boy Scouts’ consumption of FV to five servings a day. The other group received a “mirror image” PA intervention, the Fit-for-Life badge, which targeted increasing Boy Scouts’ PA levels to 30 minutes or more per day for 5 or more times a week. The intervention was conducted in two waves in the spring (16 troops) or fall (26 troops) of 2003 as a randomized trial, with troops assigned to intervention or control conditions after baseline data collection.

*Sample size and power:* The study was powered to detect a difference of 0.5 FV servings a day. A conservative estimate for sample size was calculated (Cohen, 1988) for the two-way analysis of variance (ANOVA), with the change from baseline to post-1 representing the dependent variable and with

group and wave as factors (Cohen, 1988). With an alpha of .01 and a moderate effect size ( $d = .50$ ), 204 participants were needed to achieve 80% power. This number was doubled to include the change from baseline to post-2, and multiplied by a variance inflation factor (Donner & Klar, 1996) to account for the nesting of subjects within troops. Given an intra-class correlation of .01 associated with troop (Baranowski et al., 2002) and approximately 10 scouts per troop, the minimum number of participants needed was 445.

*Inclusionary criteria:* The troop inclusionary criterion was a high likelihood of scouts having a home computer with Internet access. Scout inclusionary criteria included participating troop membership, a home computer with Internet access, and written consent/assent.

*Recruitment:* Permission to conduct the study was obtained from Sam Houston Area Council of Boy Scouts of America. Presentations were then made to troop leaders; scouts were recruited from troops expressing interest in the study. The 5-a-Day and Fit-for-Life badge interventions included 473 10- to 14-year-old Boy Scouts, recruited from 42 troops. The Urban Scouting Program, which served the needs of inner-city boys, was defunct at the time of this badge program evaluation and so could provide no inner-city troops to participate.

## MEASURES

*Demographics:* Scouts' ethnicity and the highest household educational attainment were obtained by parental self-report at the time of consent.

*Anthropometrics:* Anthropometric data (height, weight, and BMI) were collected using standardized protocols, a stadiometer, and an electric scale (Jago et al., 2006).

*FV consumption:* Fruit and vegetable consumption were measured using a modified Food Frequency Questionnaire validated against 24-hours dietary recalls ( $r = .92$ ) with Urban Boy Scouts (Cullen, Baranowski, Baranowski, Hebert, & de Moor, 1999). It included four 100% juice, 17 fruits, and 17 vegetables. The response scale represented the nonaveraged number of servings consumed in the previous 7 days. Fruit juice (FJ) and low-fat vegetables (LV) were analyzed separately. FJ consumption was computed by summing servings of the 4 juice and 17 fruit. LV consumption was determined by removing three high-fat vegetables (i.e., French fries, potato salad, and other potatoes) and computing the servings of the remaining 14 lower-fat items (e.g., carrots, broccoli).

*Social desirability:* Social desirability of response was assessed using the 9-item "Lie Scale" from the Revised Children's Manifest Anxiety Scale (Reynolds & Paget, 1983). The scale has a 5-item response format ("never" to "always"). The "lie" score was determined by summing the responses. The instrument has shown good reliability and validity in children across a variety of ethnic groups (Dadds, Perrin, & Yule, 1998).

*Physical activity:* Physical activity was monitored for three consecutive days at each assessment, using the MTI accelerometer (Manufacturing Technologies Inc., Fort Walton Beach, Florida). The MTI has been shown to be a valid measure of physical activity in adolescents (Puyau, Adolph, Vohra, & Butte, 2002). Each monitor was programmed to begin recording at midnight, after the measurement meeting. The monitors were removed on the fourth morning after data collection. Two hypothesized mediators, self-efficacy and preferences, were measured at each time period, using validated questionnaires (Sherwood et al., 2004).

Accelerometry data for a day were included if the scout met a previously developed MTI inclusion criterion of at least 800 minutes between 6 a.m. and midnight (Treuth et al., 2004). In accordance with previous studies (Jago, Anderson, Baranowski, & Watson, 2005; Treuth et al., 2004), a Statistical Package for the Social Sciences (SPSS) program identified minutes in which the monitor was not worn, using a criterion of 20 or more continuous minutes of zeros. Days with less than 800 minutes of recorded data were considered invalid (Treuth et al., 2004). To maximize the sample size, participants were included in the analysis if they possessed at least one complete day during each measurement period. There were 240 (82.4%) of the participants at baseline who possessed three valid days of data, with 240 (68.2%) and 197 (70.6%) at post-1 and post-2. Forty-four (15.2%), 75 (21.2%), and 43 (15.4%) of participants possessed two valid days at baseline, post-1, and post-2. Seven (2.4%), 37 (10.5%), and 39 (14.0%) participants possessed one valid day at baseline, post-1, and post-2.

Adolescent-specific cutpoints (Puyau et al., 2002) were used to categorize the physical activity in each minute as sedentary ( $< 800$  counts), light (800–3,199 counts), or moderate to vigorous intensity ( $\geq 3,200$  counts). To account for differences in the times for which the monitors were worn, mean minutes of activity at each level were weighted by the inverse of the proportion of time for which the monitor was worn. Mean minutes in each category per day were then calculated. The mean number of counts per minute, an indicator of the total volume of activity in which the participant engaged, was also calculated. There were no significant ( $P < .05$ ) differences in minutes of sedentary, light, or moderate to vigorous physical activity or counts per minute when 1, 2, or 3 valid days were used as inclusion criteria for accelerometer data.

*Incentives for participation:* Troop leaders received a \$1,000 incentive for use for their troop following post-2 data collection. Participating scouts received graduated incentives of \$25, \$30, and \$35 for participating in each of the three assessments. A sewn-cloth badge was awarded to scouts who had accumulated enough points.

*Statistical analyses:* Repeated measures analyses were completed using the Proc Mixed (Little, Milliken, Stroup, & Wolfinger, 1996) procedure in

SAS 9.1, to detect differences in diet or physical activity over time between the intervention and control groups. Main effects for treatment groups (intervention, control), visit time (baseline, post-1, and post-2), wave (spring, fall), and the interactions within groups, visit time, and wave main effects were treated as fixed effects. Scouts were nested within troops and the troop treated as a random effect. Separate analyses were run for each dependent variable. Models were then rerun controlling for BMI, ethnicity, and parental education. Alpha was set at .05.

## RESULTS

Four-hundred seventy-three 10- to 14-year-olds were recruited from 42 Houston-area troops. Participants were 13 years of age in the average, and predominantly Anglo-American (72%) or Hispanic (13%). Approximately 36% of the sample was college graduates; 64% of the eligible sample was enrolled. Parental education, group, and wave were significantly related ( $P = .007$ ), with more participants from the control group in the fall wave living in households in which at least one parent had a college or postgraduate degree (Jago et al., 2006). Average troop attendance was 81%; 76% (78% 5-a-Day and 75% Fit-for-Life) logged onto the study website at least once a week.

Both of the nine-session troop-plus-Internet interventions resulted in behavior change. Baseline FV consumption was approximately 2.5 servings per day (Thompson et al., 2009). Average baseline FJ and LV consumption did not significantly differ between groups. A significant group  $\times$  time interaction was observed for FJ consumption ( $P = .003$ ). Regression estimates representing the change at post-1 yielded significant group differences in FJ consumption ( $P = .028$ ). FJ consumption at post-1 increased by nearly one serving, with a mean increase (and standard error) of 0.94 (0.0) servings in the 5-a-Day group, compared to a mean increase of 0.56 (0.0) servings in the control group. The post-1 changes translated into a positive effect (effect size, 0.4 servings) for the 5-a-Day group. However, the improvement was not maintained. Although not significant, the changes at post-2 from baseline translated into a positive effect (effect size, 0.4 servings) for the control group. There was a significant group  $\times$  time  $\times$  wave interaction for LV consumption ( $P = .014$ ). Regression estimates yielded a significant ( $P = .005$ ) group difference in LV consumption between baseline and post-2 in the spring wave, with the control group reporting a mean increase of 0.85 (0.1) servings and the 5-a-Day reporting a slight mean decrease of  $-0.14$  (0.1) servings. Although not significant, the changes at post-1 translated to a positive effect (effect size, 0.2 servings) for the 5-a-Day group, whereas changes at post-2 translated into a positive effect (effect size, 0.5 servings) for the control group.

The baseline MVPA (moderate to vigorous physical activity) was approximately 25 minutes per day (Jago et al., 2006). There was a three-way interaction term (treatment group  $\times$  time  $\times$  wave), indicating a significant ( $t = 2.54, df = 498, p = .011$ ) increase in light intensity physical activity from baseline to post-1 in the spring intervention group (143.6 at baseline to 155.9 at post-1). There were no significant differences between baseline and post-2 minutes of light intensity physical activity, and no other significant main or interaction terms. There were no significant main effects or interaction terms in the moderate to vigorous or counts per minute models. Rerunning the models controlling for demographics did not significantly change the results. Seventy-nine percent of the participants obtained the Fit-for-Life badge, but there were no significant group (badge vs. no badge) or group by time interactions.

## DISCUSSION

The Boy Scout badge programs offered a unique opportunity to reach boys and their families with a behavioral change intervention which was consistent with the mission of the Boy Scouts of America. The institutionalization of such a permanent badge requirement could provide a stable structure to deliver health activities to youth around the country.

The curriculum was developed through extensive focus-group discussions with African American scouts and their parents. This ensured that the intervention would fit the participants' ethnic and cultural background at both the surface and deeper structures (Resnicow et al., 1999). The lack of ethnic group differences in program outcomes indicated that the programs initially targeted to meet the needs of African American Boy Scouts were effective with a broader group of scouts.

The Boy Scout badge programs were theory-based. Interventions to improve Boy Scouts' dietary and PA behaviors help to address the issue of childhood obesity and early cancer prevention among children, especially ethnic minorities. Due to the difficulties associated with changing dietary and PA behaviors, all possible health education communication channels should be utilized under theoretical guidance. The combination of in-person and Internet-based scouting programs was an effective method of childhood obesity and cancer-prevention-related behavior change.

*Editor's Note:* This program was designed to help Boy Scouts from multiple ethnic groups increase fruit and vegetable consumption and increase vigorous exercise. Deliberate efforts were put into creating a culturally sensitive program, including holding focus groups with African American scouts and their parents, as well as pilot testing of the program among African American troops. Due to strong support from the area Council of Boy Scouts, 470 scouts in 42 troops across several districts were recruited for the evaluation phase of this study. Regrettably and unexpectedly, the Urban

Scouting Program, which served inner-city boys (primarily African American), closed down during this period. As a result, the efficacy of this program was evaluated only among Anglo-American and Hispanic youth. Despite this serious setback, we chose to include this chapter for several reasons: (a) the efficacy of this program, developed for African American youths, was illustrated in youth from other ethnic groups; (b) we hope that these findings will stimulate future research, in which the efficacy of this program in multiple ethnic groups will be tested; (c) as the program was developed with input from, and pilot testing with, African American youth, it can be tried in other African American communities; and (d) it is an illustration of what can happen in the real world—despite all the best intentions, careful, well thought out preparations, and appropriate pilot testing, just as you are ready to implement the program, life gets in the way. All of us will face similar challenges along the way; the key, of course, is not to give up, but find ways to overcome them or develop new strategies. *R.E.*

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