



Fruit and vegetable intake among rural youth following a school-based randomized controlled trial

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ABSTRACT

Objective. We implemented a theory-based randomized controlled trial (Living Free of Tobacco, Plus (LIFT+)) in ten rural middle schools and assessed impact on tobacco use and fruit/vegetable (F/V) intake in 2008–2010. Data on F/V intake at baseline, immediate post intervention, and 1-year follow-up are presented.

Methods. Schools were randomized to intervention or control groups. Goal setting, peer leaders, and class workshops with parent involvement, were intervention features; community partners were supportive. Seventh graders filled out surveys on health behaviors, psycho-social variables, and demographic characteristics. Adjusted models comparing intervention and control conditions were analyzed.

Results. Sample (n = 1119) was 48.5% female, 50% White, with a mean age of 12.7 years. Mean F/V servings were significantly higher in intervention schools at immediate post (3.19 servings) and at 1-year (3.02 servings) compared to controls (2.90, 2.69 respectively). Knowledge of 5-a-day recommendation was significantly higher in intervention schools at immediate post test (75.0%) versus controls (53.8%) but not at 1-year follow-up.

Conclusions. Intervention schools reported significantly higher mean F/V servings at post intervention and 1-year, and for knowledge of F/V recommendations at immediate post compared to controls. Higher levels of parent and community involvement may further increase F/V intake in future interventions.

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Introduction

Fruits and vegetables are among the best food sources of antioxidant vitamins, soluble fiber, phytochemicals, and other nutrient constituents (Steinmetz and Potter, 1996). Further, some of these foods have been shown to be protective related to chronic disease risk reduction (World Cancer Research Fund, 2007). Yet, research shows that less than half of adults and youth meet the recommendations for consuming at least five fruits/vegetables (F/V) servings daily (Guenther et al., 2006; Kimmons et al., 2009; Munoz et al., 1997).

Poor diet and sedentary behaviors, including physical inactivity and high levels of screen time, are associated with 38% of U.S. adult deaths (Mokdad et al., 2004). Currently, 34% of adults (Flegal et al., 2010) and 17% of youth in the U.S. are obese, (Ogden et al., 2010) placing them at greater risk for shorter life expectancy (Olshansky et al., 2005). Healthy eating and increasing physical activity can help offset these patterns. Since chronic diseases develop over time,

the single best way to improve health and save lives is to address unhealthy behaviors in youth (Van Duyn and Pivonka, 2000).

A substantial number of school-based interventions for youth, focused on F/V intake, have been tested and published over the last decade including three systematic reviews (Delgado-Noguera et al., 2011; French and Stables, 2003; Knai et al., 2006). A current editorial on the importance of healthy eating in youth states that additional research is warranted given few studies met the review articles methodological standards (Morabia and Costanza, 2011).

Among studies reviewed, few school-based interventions targeted middle school students (Gortmaker et al., 1999) and only a small number simultaneously tested multiple behaviors such as smoking prevention and F/V intake. Yet, youth who smoke are less likely than non-smokers to consume healthy foods such as fruits and vegetables (Wilson et al., 2005). Additionally, it appears that these behaviors may share common predictors and protective factors such as the status of parental relationships (Tilson et al., 2004; Wilson et al., 2007) and health behaviors modeled by friends and family (Simons-Morton et al., 2001).

We designed and tested a novel theory-based randomized controlled intervention (Living Free of Tobacco Plus; LIFT+) for seventh graders in ten rural Virginia schools and tested its impact on tobacco use and F/V intake. This report presents data on F/V intake in the

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intervention versus control groups measured at three time points. Knowledge of and interest in 5-a-day F/V recommendations, and confidence in ability to increase daily servings are also reported.

Methods

Study design

This study was a school-based randomized controlled trial, which assessed the efficacy of an intervention to prevent tobacco use and increase F/V consumption among rural youth. Evaluation occurred at baseline, immediate post-intervention, and one-year follow-up. In 2008–2009, ten middle schools located in non-contiguous rural Central Virginia counties, were randomly assigned to an intervention ($n=5$) or control (delayed intervention, $n=5$) condition. Unique districts and distance between schools made participant contamination unlikely. Students completed self-administered questionnaires in the classroom. Questionnaires assessed various health behaviors, knowledge, psychosocial variables (e.g. confidence and intentions), parent/guardian-related information, and demographic characteristics.

Description of the study

Data for this study were collected as part of the LIFT+ program. The LIFT+ program, based on Social Cognitive Theory and the Theory of Reasoned Action, consisted of eight one-hour workshops focusing on the negative effects of tobacco use and the benefits of eating the recommended F/V servings daily. The intervention incorporated goal setting to increase potential for improving health behaviors. The curriculum was delivered to seventh graders by academically sound high school students in their school district who had sufficient time and interest in serving as peer leaders to implement LIFT+. Research staff conducted a day-long skill-building training with the peer leaders. During the next academic year, eighth grade students who received LIFT+ as seventh graders participated in an intervention “booster” activity by presenting a summarized version of LIFT+ to sixth graders in their respective schools. Students in the five control schools received the usual health education curriculum, from their respective teachers.

The Virginia Commonwealth University Institutional Review Board approved this study. Parents were asked to sign a form or call a toll-free number to reach study staff if they did not wish for their child to participate. The LIFT+ intervention was offered during class time when students routinely received the school health education curriculum. Asking parents to opt-out by signing a form, if they did not want their child to receive the LIFT+ intervention,

was the standard procedure for student activities in these rural schools. No parents refused student participation and all students gave assent to complete the baseline surveys ($N=1119$); thus, no children were excluded. Questionnaires were collected by research staff and securely stored.

LIFT+ content description

Peer leaders presented the eight LIFT+ workshops to intervention students during health class for eight weeks. Workshops included didactic and interactive content related to both tobacco prevention and the benefits of eating healthy foods, specifically fruits and vegetables. Given that parents are often responsible for purchasing and preparing food (Slusser et al., 2011), most workshops included an activity for the student to complete with their parent/guardian. Parents were asked to sign off on the activity acknowledging that their child had completed it. Approximately 75% of students returned homework. Table 1 shows the content of the curriculum workshops focused on increasing F/V intake and the booster session. Goal setting related to health is a main feature of the intervention.

The LIFT+ student questionnaire was an aggregate of demographic variables and multiple measures of health beliefs, knowledge, attitudes, and behaviors compiled from the 2005 Youth Risk Behavior Surveillance System (YRBSS) survey (Center for Disease Control and Prevention, 2005) and the 2005 Virginia Youth Tobacco Evaluation Project survey (Virginia Tobacco Settlement Foundation, 2005). This paper reports on daily F/V consumption (primary outcome), and on knowledge of and interest in following national recommendations to eat five or more F/V servings daily, and confidence in ability to eat five or more F/V a day, (secondary outcomes), as well as demographic characteristics.

F/V consumption was assessed by asking students “In a typical day, how many servings of fruits and vegetables do you eat?” which had fixed response categories (zero to five or more servings a day). Knowledge of current F/V consumption guidelines was assessed by reporting the percent of students who correctly identified the recommended number of five or more F/V servings per day. One question each was used to assess, interest in following dietary guidelines, “How interested are you in following national recommendations for eating fruits and vegetables?” and confidence, “How confident are you that you could eat more fruits and vegetables each day?”. The respective responses for these two variables were on a 5-point Likert-like scale ranging from not at all interested to very interested and not at all confident to very confident. Students reported how close they felt to their parents using a 5-item scale previously tested in a middle school population (score range: 5–20; 20 indicates the highest level of closeness) (Wilson et al., 2007). Parents’ opinion on the importance of consuming recommended F/V

Table 1
Lift+ curriculum content description: workshops focused on increasing fruit/vegetable intake.

Introduction and vision	Students learn the differences between dreams and goals and are encouraged to start thinking about their futures in terms of school, career, family, and health.
Workshop 2. “The Easy Way to 5-a-Day”	<ul style="list-style-type: none"> • Benefits of healthy eating, how fruits and vegetables provide protective factors (antioxidants, vitamins and minerals, high fiber, low fat and low calorie). • Food Guide Pyramid; activity focused on serving sizes. • Student/parent activity: create a day’s meal plan that includes ≥ 5 servings of F/V
Workshop 3. “Setting a Reachable Goal”	<ul style="list-style-type: none"> • A primer on setting goals. • Students received a challenge to set personal goals related to F/V consumption. • Student/parent activity: students interview parents on their opinions on healthy eating.
Workshop 6. “Tools to Achieve 5-a-Day Health Goals”	<ul style="list-style-type: none"> • Roadblocks/strategies to reach 5-a-day goals. • Reading nutrition labels (calories, fat, fiber, and vitamins per serving). • Taste test samples of F/Vs at school. • Student/parent activity: students to go grocery shopping with parents and talk about potential to try new F/Vs at home.
Workshop 7. “Advertising to Youth: Media Influence on Tobacco Use and Diet”	<ul style="list-style-type: none"> • Students evaluate ads, marketing techniques, and identify methods of persuasion in advertising. • Student/parent activity: discuss fast-food advertising with parents. Students to develop a health promotion advertisement.
Workshop 8. “Spreading the word, Eating Healthy and Staying Tobacco-Free”	<ul style="list-style-type: none"> • Groups present their ad campaigns to classmates, teachers, LIFT+ staff, and parents. Peer leaders meet individually with students to check goal progress, provide motivation. • Take-home assignment: encourage students to reflect on the program with parents and discuss plans for continued progress on their goals.
Lift+ booster session (90 minute session)	<ul style="list-style-type: none"> • Eighth graders (who received program in 7th grade) teach 6th graders about health behaviors, F/V consumption, goal setting, and the influence of media on health behaviors. • 6th graders create health-promotion posters.

Workshop numbers not listed (1, 4, 5) are focused on tobacco use prevention/cessation.

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