



# International Journal of Health Sciences Education

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Volume 2 | Issue 1

Article 2

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2014

## A Coordinated School Health Approach to Obesity Prevention among Appalachian Youth: Middle School Student Outcomes from the Winning With Wellness Project

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### Recommended Citation

Dalton, William T. III; Schetzina, Karen; and Conway-Williams, Elizabeth (2014) "A Coordinated School Health Approach to Obesity Prevention among Appalachian Youth: Middle School Student Outcomes from the Winning With Wellness Project," *International Journal of Health Sciences Education*, 2(1).

Available at: <https://dc.etsu.edu/ijhse/vol2/iss1/2>

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## Introduction

Pediatric overweight ( $\geq 85^{\text{th}}$  and  $< 95^{\text{th}}$  age- and sex-percentile) and obesity ( $> 95^{\text{th}}$  age- and sex-percentile) is an ongoing health problem in the United States (Ogden, Carroll, Kit, & Flegal, 2012) and is especially rampant in rural areas (Lutfiyya, Lipsky, Wisdom-Behounek, & Inpanbutr-Martinkus, 2007). The Appalachian region has been found to have some of the highest rates of overweight/obesity nationwide. For example, children in rural Appalachian regions are more likely to be overweight compared to national averages (Montgomery-Reagan, Bianco, Heh, Rettos, & Huston, 2009). Physical and psychosocial health consequences of pediatric obesity including impaired health-related quality of life (HRQoL) have been well documented in the literature (e.g., Dietz, 1998; Griffiths, Parsons, & Hill, 2010; Tsiros et al., 2009; Ul-Haq, Mackay, Fenwick, & Pell, 2013) and continue to direct the need for effective prevention and intervention programs.

Several systematic reviews and meta-analyses of school-based obesity prevention programs have been published (see Khambalia, Dickinson, Hardy, Gill, & Baur, 2012, and Sobol-Goldberg, Rabinowitz, & Gross, 2013, for examples of recent reviews). Overall, school-based obesity prevention programs have demonstrated mixed success in improving health outcomes and body mass index [(BMI); Khambalia et al., 2012; Kropski, Keckley, & Jensen, 2008; Sobol-Goldberg et al., 2013; Stice, Shaw, & Marti, 2006]. Reviews of obesity prevention programs identify the need for more studies with preadolescents and adolescents (Stice et al., 2006; Waters et al., 2011). Other reviews have also suggested the involvement of community members or stakeholders in program development and delivery with an emphasis on sustainability (Budd & Volpe, 2006; Franks et al., 2007; Summerbell et al., 2005). Community involvement may be especially important in rural areas where there are higher rates of obesity and less access to healthcare resources (Jones, Parker, Ahearn, Mishra, & Variyam, 2009).

*Winning With Wellness* (WWW) was a school-based obesity prevention project that aimed to promote healthy eating and physical activity in youth residing in rural Appalachia. The project, described previously (Schetzina et al., 2009a), was based on the Coordinated School Health (CSH) model (Centers for Disease Control and Prevention (CDC), 2013a) and used a community-based participatory research (CBPR) approach with an emphasis on feasibility and sustainability. The program was designed by a community coalition of educators, health care providers, parents, community members, and researchers (Schetzina et al., 2009a). In addition to the latest obesity prevention research and expertise from coalition members, focus group findings (Schetzina et al., 2009b) were used to inform program development. A pilot study was conducted and found that the WWW intervention led to positive healthy eating and physical activity changes in elementary students up to four years after implementation (Schetzina et al., 2009a, 2011). Because of preliminary success with elementary students, the WWW program was adapted for use with middle school students.

The purpose of this study was to examine whether WWW was effective in improving self-reported health behaviors and outcomes for middle school students in rural Appalachia, specifically Northeast Tennessee. The current study assessed changes in fruit and vegetable servings per day, number of physically active days per week, number of hours of screen time per day, and HRQoL, across the course of the intervention. It was hypothesized that students would show improvements across each of these areas across the course of the intervention.

## Methods

### Participants

The current study included participants with baseline and follow-up data on at least one variable of interest (Table 1). This resulted in 144 out of an approximate 300 sixth grade students (52% girls) from four middle schools with 24% aged 11 years and 76% aged 12 years or older. The majority (89%) of participants were White and 38% attended an economically disadvantaged school (i.e., >50% of students receiving free or reduced price lunch). A convenience sample of a total of 75 teachers (91.7% female) ranging in age from 24 to 62 years ( $M = 43.74$ ;  $SD = 10.39$ ) completed confidential surveys on the level of WWW implementation. All of the teachers were White and a majority (53.3%) reported working at the respective school for 10 or more years.

**Table 1. Sample Characteristics**

	<i>n</i> (%)
Age (years)	
11	35 (24.3)
12 years and older	109 (75.7)
Gender	
Boys	69 (47.9)
Girls	75 (52.1)
Race	
White	124 (88.6)
Non-white	16 (11.4)
Ethnicity	
Hispanic/Latino	10 (7.1)
Other	131 (92.9)
School Economic Designation	
Non-disadvantaged school	90 (62.5)
Disadvantaged school	54 (37.5)
Fruit/vegetable servings per day (Baseline)	
$\leq 4$	108 (80.0)
$\geq 5$	27 (20.0)
Physically active days per week (Baseline)	
$\leq 4$	43 (41.0)
$\geq 5$	62 (59.0)
Hours screen time per day (Baseline)	
$\leq 2$	52 (49.5)
$\geq 3$	53 (50.5)

*Note.* *n*, number. %, percent. Percentages are reported as “Valid %”. Total *n* may not equal 144 due to missing data.

### *Research Design*

The current study utilized pre- and post-evaluations of student-reported health behaviors and HRQoL to examine the effectiveness of *WWW*, a school-based obesity prevention program. Additionally, teacher-reported levels of implementation were utilized to assist in interpreting the findings. A call for schools to participate in this project was disseminated to CSH in Northeast Tennessee regional school systems. CSH directors then recommended specific schools to participate based on need and expressed interest. Four middle schools agreed to participate following a one-day forum with interested school personnel during which the pilot evaluation results were presented, pilot materials were adapted/updated, and dissemination plans were discussed.

### *Intervention*

*WWW* was a comprehensive school-based obesity prevention program modeled after and delivered in conjunction with the CSH project in Tennessee. The curriculum was also designed to help meet the Tennessee Department of Education standards, specifically Tennessee's K-8 Healthful Living Curriculum Standard 4.1, 4.2 and 4.3, which were active at the time of the study. The eight program areas of the CSH model (i.e., nutrition services, health education, physical education, school health services, counseling and psychological services, healthy school environment, school site health promotion for staff, and family and community involvement) were emphasized in the program. Additional details of the *WWW* project components have been described previously and are summarized in Table 2 (adapted from Schetzina et al., 2011) along with a description of how the pilot materials were adapted for use in middle schools based on pilot findings and feedback collected during the forum.

A project overview, classroom curricula, and instructions for using a grade-specific toolkit were compiled in three-ring binders for school administrators, cafeteria personnel, and individual teachers. Toolkits provided to each school included *Go, Slow, Whoa* posters, clings, and analyzed menus for use in the school cafeteria as well as *WWW* banners, indoor walking trail kits, and resource information. Teacher toolkits included classroom posters, pedometers with tracking charts, shoelace charm incentives to use with students, copies of the activity-promoting "theme song" on CD for students, and a copy of *Move It Moments* on DVD. Teachers, administrators, and cafeteria personnel at participating schools were provided copies of the *WWW* curricula and tools and trained in their use during 30-minute in-services conducted by the project coordinator in August 2008. As in the pilot study, project components were designed to be implemented by school personnel themselves, not by study personnel.

School administrators were invited to attend bimonthly meetings of the coalition to discuss project implementation and evaluation during the study period. Project reminders, community resources and events, and highlights from the baseline evaluation results were sent as electronic newsletters to all school personnel on two occasions during the study period by the project coordinator. In addition, teachers were provided with parent information sheets including nutrition and physical activity education to send home with students. Finally, *Go, Slow, Whoa* aprons for cafeteria personnel and *WWW* t-shirts for teachers were provided to encourage project participation. A copy of the *WWW* curricula and list of tools is available from the second author.

**Table 2. Coordinated School Health Program Areas and Winning with Wellness Components**

<b>CSH Program Area</b>	<b>2005 Overview of Major Components</b>	<b>2007 Adaptation for Middle School</b>
Nutrition services	Go, Slow, and Whoa classroom educational modules, cafeteria menu labeling based on RD analysis  Use of mobile kitchens to teach healthy eating	Grade-specific lesson plans with hands-on skill-building activities developed  Mobile kitchens no longer being used  Age-appropriate nutrition materials provided (ie, posters, models)
Health education	America on the Move's Balance First curriculum  Kits of pedometers for all teachers and students to wear during school	Pedometers worn by teacher and students in PE classes  Poster-style tracking charts, with tips on goal-setting and incentives (plastic foot charms) provided
Physical education	School established indoor and outdoor walking trails  5-minute desk-side exercises (Move-It Moments)  ETSU Fit Kids' graduate students supplemented physical education	New indoor walking trail kit provided  Prerecorded grade-specific Move-It Moments provided on DVD to all teachers  Move-It Moments theme song provided on CD to all students
School health services/counseling and psychological services	CSH body mass index screening with referrals made to primary care providers  Behavioral pediatrician in on-site primary care clinic	CSH screening continued for even grades annually  Behavioral Pediatrician available within school system
Healthy school environment	Suggestions for healthy classroom parties, rewards, incentives, and fundraisers	Updated list of suggestions/resources
School site health promotion for staff	Education and resources provided via face-to-face training  School started "Biggest Loser" program for personnel	In addition, electronic newsletter with resources/activities to support project sent to school personnel twice annually by project coordinator
Family and community involvement	Coalition meetings included community representation  Community provided resources  Parent partners invited for lunch in cafeteria	Developed parent information sheets for teachers to distribute

*Note.* References for select resources outlined in the curricula above may be found in Schetzina et al. (2009a). Abbreviation: CSH, coordinated school health; ETSU, East Tennessee State University; PE, Physical Education; RD, Registered Dietitian.

### *Procedure*

A 66-item survey including questions on demographics, health behaviors, and HRQoL was administered to all sixth graders at participating schools by the project coordinator prior to WWW implementation (April/May 2008). During the week prior to survey administration, permission letters were sent home to parents describing the study and asking parents to indicate and return the form if they did not want their child to participate. On the day of survey administration, informed assent forms were administered to students. Surveys were labeled with a unique student identification number but included no names. Surveys were then re-administered following the same procedures approximately nine months after project implementation in Spring 2009. Additionally, surveys assessing project implementation and perceived effectiveness were administered to teachers at participating schools at the time of student post-intervention surveys (2009). Informed consent was obtained from participating teachers who were provided a \$5 incentive for completing surveys. Both student and teacher surveys took approximately 30-45 minutes to complete. The study procedures were approved by the university Institutional Review Board.

### *Measures*

*Demographics.* Demographic variables of interest included age, gender, race, ethnicity, and school economic designation.

*Health Behaviors.* Three health behavior item scores were developed from six questions on health behaviors. Questions were adapted from Glasgow et al. (2005) and scoring instructions from Fernald et al. (2008) and Dalton et al. (2011). Item scores included: Fruit and Vegetable Servings Per Day (*In a typical day, how many servings of fruit do you eat?, In a typical day, how many servings of vegetables do you eat?*; Cronbach  $\alpha = .602$ ); Physically Active Days Per Week (*Over the past 7 days, on how many days were you physically active for at least 60 minutes per day?, Over a typical or usual week, on how many days were you physically active for a total of at least 60 minutes per day?*; Cronbach  $\alpha = .902$ ) and Hours of Screen Time Per Day (*On an average school day, how many hours do you watch TV?, On an average school day, how many hours do you play video or computer games or use a computer for something that is not school work?*; Cronbach  $\alpha = .471$ ). The two responses pertaining to fruit and vegetable consumption as well as the two for hours of screen time were summed whereas the average was taken for the two responses pertaining to physical activity.

Response options for questions assessing fruit and vegetable servings per day ranged from “0” to “4 or more”, whereas response options for questions assessing hours of screen time per day ranged from “0” to “5 or more”. Therefore, it was possible that total fruit/vegetable servings per day could be underestimated if there were cases in which a student ate “4 or more” (coded as 4) of either fruits or vegetable servings. Similarly, a student’s full range of screen time may have not been captured due to the response of “5 or more” (coded as 5) being the highest response option a student could endorse on television or video/computer hours per day. Due to this approach, mean and standard deviations on these two variables should be interpreted with caution, especially in comparisons to other published literature. These issues in calculating item scores were not present when calculating number of days of physical activity per week that

allowed for the full range of responses (i.e., “0” to “7”). Higher scores across all health behavior items indicate greater engagement in health behaviors in context of the previous clarifications.

*Health Related Quality of Life (HRQoL).* The *Pediatric Quality of Life Inventory (PedsQL)* Version 4.0 Generic Core Scales is a 23-item self-report instrument assessing health-related quality of life and yielding three summary scores (Total, Physical, and Psychosocial) and three subscale scores (Emotional, Social, and School Functioning). Reliability and validity of the PedsQL has been documented (Varni, Burwinkle, & Seid, 2006; Varni, Burwinkle, Seid, and Skarr, 2003; Varni, Seid, & Kurtin, 2001). Due to a data collection error (i.e., exclusion of PedsQL item #7 “I hurt or ache”) only 22 items were administered for the current study and item #7 was treated as missing when calculating Total and Physical summary scores. Cronbach’s  $\alpha$  for the three summary and subscale scores were .859, .721, .819, .750, .702, and .687, respectively. Higher scores on the six HRQoL domains (3 summary and 3 subscale) indicate greater perceived HRQoL.

*Teacher Program Implementation Survey.* A survey developed by the coalition was used to assess teacher involvement in the program, including questions on degree of implementation and perceptions of the efficacy of the *WWW* project components. The more comprehensive survey, which was developed solely for the purposes of this study, is described in detail elsewhere (Schetzina et al., 2009a, 2011).

### *Data Analysis*

Survey data was scanned into SPSS using Remark Office software. Data analysis was completed using SPSS version 19.0 statistical software (IBM SPSS, Chicago, Illinois). Simple descriptive statistics including means and frequencies were used to detail the entire sample. Health behavior item scores were dichotomized based on national recommendations (previously indicated in Fernald et al., 2008) to further describe the sample. In consideration of the issues related to response options for fruit and vegetable servings and hours of screen time described above, there was only one instance where this approach to scoring may have misrepresented a student’s response related to whether or not the student met national recommendations. In that case, one student endorsed “4 or more” servings of fruits and “0” servings for vegetables so it is unclear whether or not this student was eating the recommended “5 or more” fruit and vegetable servings per day. Further, all cases of .50 or higher were rounded up to the next whole number when determining whether or not students were meeting physical activity recommendations. HRQoL scores were compared to existing samples utilizing one-sample t-tests. Nine paired t-tests were used to evaluate pre-post health behavior and HRQoL changes among participants who provided both baseline and follow-up data. These analyses were then conducted separately for boys and girls.

## **Results**

The findings regarding student health behavior and HRQoL change over the course of the intervention are presented below. Additionally, teacher reports of *WWW* project implementation and perceived usefulness/helpfulness are reported.

### Health Behavior and HRQoL Outcomes

Across the course of the intervention, there were no statistically significant changes from baseline to follow-up in number of fruit and vegetable servings per day ( $t = 1.393$   $df = 132$ ,  $p = .166$ ), physical activity days per week ( $t = -.223$ ,  $df = 99$ ,  $p = .824$ ), or hours of screen time per day ( $t = -1.145$   $df = 101$ ,  $p = .255$ ). Previous research on school-based obesity prevention programs has found gender-specific differences (Khambalia et al., 2012); therefore, we also ran analyses separate for boys and girls. However, there were no significant changes in any of the three health behavior dimensions for either boys or girls.

Total HRQoL did not change significantly from baseline to follow-up (see Table 3). The only HRQoL domain to have a significant change from baseline to follow-up was School HRQoL, which decreased over time ( $t = 2.996$ ,  $df = 117$ ,  $p = .003$ ). For boys, our results mirrored those of the overall sample, in that we found no significant changes in any dimension of HRQoL except for School HRQoL, which decreased over time ( $t = 2.436$ ,  $df = 50$ ,  $p = .018$ ). For girls, there were significant declines in total HRQoL ( $t = 2.090$ ,  $df = 68$ ,  $p = .040$ ) and psychosocial HRQoL ( $t = 2.148$ ,  $df = 67$ ,  $p = .035$ ).

**Table 3. Changes in Health Related Quality of Life (HRQoL) from Baseline to 9-Month Follow-Up**

HRQoL Domain	<i>n</i>	Baseline		Follow-Up		Change		<i>t</i>	<i>DF</i>	<i>p</i>
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>			
Total	129	81.70	11.89	80.05	11.70	1.65	10.75	1.745	128	.083
Physical	132	88.10	12.36	86.58	13.33	1.52	12.55	1.387	131	.168
Psychosocial	121	78.66	13.45	76.65	13.39	2.00	12.91	1.708	120	.090
Emotional	130	76.35	17.13	75.53	17.94	.82	19.43	.483	129	.630
Social	121	83.32	15.56	82.78	15.59	.54	16.81	.354	120	.724
School	118	76.50	15.93	72.02	17.52	4.48	16.25	2.996	117	.003

*Note.* *n*, number. *M*, mean. *SD*, standard deviation. Higher domain scores indicate greater perceived HRQoL. Possible scores range from 0-100.

### Level of Teacher Implementation

Based on teacher report, level of program implementation for specific *WWW* components varied (see Table 4). Reported implementation, to any degree, ranged from 40% to 65.7%. However, a closer examination of responses suggests there may be variation in the intensity in which teachers implemented program components. For example, although 40% ( $n = 28$ ) of teachers reported using their school's indoor walking trail with their students during the past month, only 1.4% ( $n = 1$ ) and 5.7% ( $n = 4$ ) of the total reported using it "Almost daily" or "Once or twice per week," respectively, whereas 32.9% ( $n = 23$ ) reported using it "Occasionally". Additionally, although 65.7% ( $n = 44$ ) of teachers reported participating in *Move it Moments* classroom exercises to any degree, only 22.4% ( $n = 15$ ) of the total sample participated in it for 10 or more minutes per day with another 22.4% ( $n = 15$ ) endorsing "5 minutes per day" and 20.9% ( $n = 14$ ) endorsing "Less than 5 minutes per day". These implementation reports suggest that teachers varied in the degree to which they incorporated the *WWW* program components into their



everyday practices. In addition to implementing specific *WWW* components, teachers were also asked about communication with parents. Findings revealed that 60.9% ( $n = 42$ ) of teachers reported that they had not communicated with parents about the *WWW* program; 34.8% ( $n = 24$ ) reported they sent home the provided materials, while 4.3% ( $n = 3$ ) reported that they sent home their own information about the program.

**Table 4. Teacher-Reported Implementation of *WWW* Components**

<i>WWW</i> Intervention Components	$n$ (%)
Completed a lesson about <i>Go Slow Whoa</i> system for categorizing foods	Yes: 37 (50.7) Never/Unknown: 36 (49.3)
Participated in <i>Move It Moments</i> classroom exercises during past month	Yes: 44 (65.7) Never/Unknown: 23 (34.3)
Used pedometers and recorded steps with students during past month	Yes: 29 (41.4) Never/Unknown: 41 (58.6)
Used the school's indoor walking trail with students during past month	Yes: 28 (40.0) Never/No Walking Trail: 42 (60)

*Note.*  $n$ , number. %, percent. Percentages are reported as "Valid %". Percentages endorsed as "Yes" represent any degree of implementation. Total  $N$  may not equal 75 due to missing data across items.

Teachers also rated the usefulness/helpfulness of the *WWW* program and its various components (see Table 5). The majority of teachers (88.5%,  $n = 62$ ) found the overall *WWW* program helpful to some degree. However, response options varied across program components. Across all components, teachers most highly endorsed *Move-It Moments* with "Very helpful" for improving health (26.1%,  $n = 18$ ) and school performance (21.7%,  $n = 15$ ). Teachers most frequently reported the *Go Slow Whoa* classroom lessons to be "Somewhat helpful" (30.4%,  $n = 21$ ) and the cafeteria program to be "A little helpful" (35.7%,  $n = 25$ ). Finally, the majority of the teachers rated the pedometers to be either "A little helpful" (26.8%,  $n = 19$ ) or "Somewhat helpful" (26.8%,  $n = 19$ ) and the indoor walking trail to be "Somewhat helpful" (30.6%,  $n = 22$ ). It is also important to note that few (range of 1.4% to 8.3%) endorsed the components as "Not at all useful/helpful" but that several endorsed "I don't know" in response to questions about specific components (range 11.1% to 46.4%).

**Table 5. Teacher's Perception of Usefulness/Helpfulness of WWW Components**

	Responses					
	A little helpful <i>n</i> (%)	Somewhat helpful <i>n</i> (%)	Very helpful <i>n</i> (%)	I don't know <i>n</i> (%)		
Helpfulness of overall WWW program	12 (17.1)	31 (44.3)	19 (27.1)	8 (11.4)		
	Not at all useful/helpful <i>n</i> (%)	A little useful/helpful <i>n</i> (%)	Somewhat useful/helpful <i>n</i> (%)	Very useful/helpful <i>n</i> (%)	Extremely useful/helpful <i>n</i> (%)	I don't know <i>n</i> (%)
Helpfulness of <i>Go Slow Whoa</i> classroom lessons	1 (1.4)	18 (26.1)	21 (30.4)	13 (18.8)	1 (1.4)	15 (21.7)
Helpfulness of <i>Go Slow Whoa</i> cafeteria program	3 (4.3)	25 (35.7)	21 (30.0)	11 (15.7)	1 (1.4)	9 (12.9)
Usefulness of <i>Move-It Moments</i> Classroom DVD	1 (1.4)	9 (13.0)	13 (18.8)	11 (15.9)	3 (4.3)	32 (46.4)
Helpfulness of <i>Move-It Moments</i> for improving school performance	3 (4.3)	13 (18.8)	14 (20.3)	15 (21.7)	2 (2.9)	22 (31.9)
Helpfulness of <i>Move-It Moments</i> for improving health	2 (2.9)	10 (14.5)	14 (20.3)	18 (26.1)	5 (7.2)	20 (29.0)
Helpfulness of pedometers	5 (7.0)	19 (26.8)	19 (26.8)	11 (15.5)	1 (1.4)	16 (22.5)
Helpfulness of indoor walking trail	6 (8.3)	15 (20.8)	22 (30.6)	14 (19.4)	7 (9.7)	8 (11.1)

*Note.* *n*, number. %, percent. Percentages are reported as "Valid %". Total *N* may not equal 75 due to missing data across items.

## Discussion

The current study assessed middle school student health outcomes from the *WWW* project, a school-based obesity prevention program based on the CSH model and utilizing a CBPR approach with an emphasis on feasibility and sustainability. This study adds to the existing literature by including an older age group in rural Appalachia and utilizing a community-based approach with an emphasis on sustainability. Similar to another school-based obesity prevention study that focused on sustainability (Neumark-Sztainer, Story, Hannan, & Rex, 2003), these researchers found no significant changes in fruit and vegetable consumption, physical activity, or screen time across the course of the intervention.

These results may be due to moderately low levels of teacher implementation. In comparison to the *WWW* pilot study with students in one elementary school (Schetzina et al., 2009a), the current study with students in four middle schools found lower levels of use of *Move It Moments* and pedometers in the classroom, lower utilization of the indoor walking trail, and more communication with parents, although similar reports of completing *Go Slow Whoa* lessons with students.

A barrier to implementation may be that, compared to elementary students, most middle school students change classes and are taught by more than one teacher. Emphasis on feasibility and sustainability may have also contributed to these lower levels of implementation since the level of implementation lies in the school personnel's hands as compared to a more rigorously controlled research study.

Future interventions emphasizing sustainability may examine methods for enhancing implementation such as through school personnel incentives and other efforts to gain "buy in" from teachers. In fact, a recent review of obesity prevention programs (Waters et al., 2011) indicated support for school personnel in implementing health promoting activities to be a promising policy or strategy. The other promising approaches emphasized in this review were also consistent with the majority of the *WWW* program initiatives (e.g., health focused school curriculum, increased physical activity and movement skills during the school week, improving nutritional quality of food, environments supporting healthier eating and more activity throughout the day, and parent support and activities promoting healthy behavior). However, again, the emphasis on ensuring treatment fidelity among school personnel will be important in future work. Ensuring and measuring intervention fidelity among future school-based prevention studies that rely on school personnel involvement is important.

In practice, school adoption of promising approaches for expanding opportunities for healthy eating, physical activity, and healthy weight education may require greater support and time than what was provided in this study. Findings suggest that simply gaining administrator support, providing curricula and tools, and offering brief training to school personnel may not be sufficient to facilitate reliable implementation of changes in a single school year, let alone sustain them.

Another explanation for the lack of significant findings may be that the intervention was not in place long enough to have a measurable effect on health outcomes at the time of the follow-up assessment (approximately 9 months). In fact, interventions shorter than 6 months to a year have

been considered inadequate to lead to changes in BMI and other health outcomes (Zenzen & Kridli, 2009), whereas school-based interventions lasting over one year have been found to have a greater probability of decreasing the prevalence of obesity (Gonzalez-Suarez, Worley, Grimmer-Somers, & Dones, 2009).

Similar to the health behavior findings, the current study found no significant improvements in HRQoL across the course of the intervention. Interestingly, previous research with a population-based sample of youth found HRQoL to significantly decline with age (Palacio-Vieira et al., 2008), so it is possible that the *WWW* project ameliorated this effect for all but school-related HRQoL. Tsiros and colleagues (2009) document studies suggesting that girls have lower HRQoL compared to boys thus partially explaining the statistically significant decline in total and psychosocial HRQoL in girls as compared to only school HRQoL in boys. However, this review also cites other studies that have found no gender-effects. Several weight loss studies have found HRQoL to improve over the course of an intervention (Griffiths et al., 2010; Tsiros et al., 2009). However, the directionality in the relationship between HRQoL and weight status is unclear. Future studies should assess whether specific program components contribute to a change in HRQoL or if additional components that are designed to target HRQoL more specifically should be included.

In terms of sample representativeness, at baseline 20% of students reported eating the recommended five servings of fruits or vegetables per day, 59% reported getting the recommended 60 minutes of physical activity on at least five days per week, and 49.5% reported viewing the recommended two or fewer hours of total screen time per day (see Table 1). These findings are comparable to those reported in the 2005 Youth Risk Behavior Survey (YRBS) Middle School Outcomes (Shanklin, Brener, McManus, Kinchen, & Kann, 2007) and 2011 national YRBS High School Outcomes (Eaton et al., 2012). For example, the YRBS Middle School Outcomes (2005) study found that 67.8% to 82.1% (median 78.2%) of 6<sup>th</sup> graders reported getting 20 or more minutes of vigorous physical activity three of the previous seven days and 28.4% to 48.7% (median: 48.1%) reported watching three or more hours of television on an average school day. The 2011 YRBS High School Outcomes study found that nationwide, 22.4% of high school students reported eating fruit or drinking 100% fruit juices three or more times per day in the previous week, and 15.3% reported eating three or more vegetables per day in the previous week; 49.5% reported being physically active for at least 60 minutes five or more of the previous seven days; and 67.6% reported watching two or fewer hours of television on the average school day whereas 68.9% reported spending two or fewer hours using a computer for something other than school work.

Participants reported similar baseline total HRQoL ( $M = 81.70$ ;  $SD = 11.89$ ) to a national healthy sample ( $M = 83.84$ ;  $SD = 12.65$ ), ( $t = 1.9017$ ,  $df = 5607$ ,  $p = .0573$ ), and significantly higher total HRQoL than an obese sample ( $M = 74$ ;  $SD = 14.20$ ), ( $t = 3.9477$ ,  $df = 190$ ,  $p < .0001$ ), (Varni, Limbers, & Burwinkle, 2007). This suggests that this sample of students had overall HRQoL similar to a healthy comparison sample at baseline.

### *Limitations*

A limitation of this study included low levels of teacher implementation making it difficult to ascertain whether the program could be effective in changing health behaviors. Further, the intervention was only in place for nine months at the time of follow-up assessment, and that there were no active control groups as recommended in a recent review (Stice et al., 2006). Greater teacher “buy in”, more time, and a greater treatment dose may be needed for the effects of the intervention to be manifested in health behaviors and/or HRQoL. Finally, limitations inherent in self-report data were present along with limiting response options on health behavior items, a missing item on the PedsQL, and incomplete data from many students due to insufficient time for completing the more comprehensive survey which may be attributed to feasibility and sustainability efforts to work with the school and intrude on school schedules minimally.

### *Implications for Future Research*

The limitations and findings from the current study direct future research in this area. Future studies should include longer term interventions and follow up assessments. An active control group and efforts to more narrowly examine/identify specific program components that may contribute to the greatest amount of health behavior or HRQoL change are also warranted. Future programs emphasizing feasibility and sustainability should continue to include assessments of treatment fidelity and enhance efforts to promote “buy in” from teachers or others involved in program implementation. Qualitative research with school personnel may also assist in better understanding limitations, barriers, motivations, and incentives regarding use of this or similar curricula.

### *Implications for Practice*

High rates of pediatric overweight and obesity (Ogden et al., 2012) continue to drive the need for effective prevention/intervention programs such as those in the school setting. A recent synthesis of existing meta-analyses and systematic reviews of school-based obesity prevention programs (Khambalia et al., 2012) suggests long-term interventions targeting diet and physical activity with a family component to be most effective. However, the authors recognize the importance of tailoring programs to the needs of specific schools and populations. *WWW* provides an example of an effort to engage community members with an emphasis on feasibility and sustainability in middle schools in rural Appalachia. The limitations and implications for future research presented herein provide practical considerations for current school-based efforts.

### *Summary*

This article examined the effectiveness of *WWW*, a school-based obesity prevention program, in improving health behavior and HRQoL outcomes among 6<sup>th</sup> grade middle school students in rural Appalachia. The project was based on the CSH model and utilized a CBPR approach with an emphasis on feasibility and sustainability. There were no significant changes in student reported health behavior or HRQoL outcomes across the course of the intervention.

While the majority of teachers found the overall program helpful levels of teacher implementation varied. Strengths of the study included a focus on middle school students in rural Appalachia, feasibility and sustainability, and examination of HRQoL, which has been

recognized as an important health outcome and goal in obesity research (CDC, 2013b; USDHHS, 2011). Future school-based prevention/intervention programs should continue to attend to feasibility and school/structural support for sustained program implementation at a level that promotes lifestyle change.

## Acknowledgements

This project was supported through funding from a State of Tennessee Department of Health Center for Diabetes Prevention and Health Improvement grant awarded to East Tennessee State University in 2007. Thanks to coalition members and partners, especially Susan Austin, Beth Lowe, and Hazel Fulton-Robinson for assistance with this project.

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