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Impact of a youth advocacy policy, systems and environmental change program for physical activity on perceptions and beliefs

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1. Introduction

Programs to combat childhood obesity have grown in scope over the past decade, yet childhood obesity continues to be a problem especially for minority and low-income youth (Koplan et al., 2005; Ogden et al., 2014). Rising obesity prevalence for American Indian and Asian American youth is concerning for future incidence of Type 2 diabetes (Fujimoto, 1995; MJ and Boyko, 2004). African Americans at 22.0% and Hispanics at 25.8% have the highest percentage of obese youth (Hales et al., 2017). Native American youth obesity rates are higher earlier in life than in other groups (Schell and Gallo, 2012), with 31.2% of Native American preschoolers classified as obese compared to 18.2% of all preschoolers (Anderson and Whitaker, 2009). Lack of access to healthy foods and poor community design contribute to these uneven health outcomes among populations (Marmot, 2005). These social determinants of health are exacerbated by structural racism as it codifies unequal distribution of goods into society's customs, practices, and laws, thus challenging communities of color from achieving health equity (Jones, 2000). The Institute of Medicine recommends environment and policy changes as essential components of equitable obesity prevention because of their population-wide reach and long-term effectiveness.

Urban communities and cities have been the focus of most health studies, leaving rural communities understudied (Glickman et al., 2012; Koplan et al., 2005; Kohl, 2013; U.S Department of Health and Human Services, 2015). Rural environments are not designed to promote active living and lack the resources for recreational and utilitarian physical activity options (Hansen et al., 2015; MRU et al., 2016). Urban, suburban and rural geographies are all areas of concern because while disparities are widening overall, children living in rural areas are between 5% and 25% more likely than those in metropolitan areas to be overweight or obese (Lutfiyya and Lipsky, 2007; Patterson et al., 2004; Davis et al., 2011), with rural minority children at highest risk for obesity (Kenney et al., 2014). From middle to high school, sex is most correlated with a decrease in moderate-to-vigorous physical activity, correlated with higher rates of youth obesity (Nader et al., 2008).

Minority youth obesity prevention programs that focus on individual-level short-term solutions may be less sustainable (Fialkowski et al., 2014; Summerbell et al., 2005) given the complexity of obesogenic environments that powerfully influence individual choices and health outcomes (Popkin et al., 2005). The challenges to advance obesity interventions for low-income racial and ethnic minority youth are complex, requiring alternative strategies to those that have yet to produce results for this vulnerable group. An underutilized option that can promote youth empowerment and improved health behaviors is advocacy training (Millstein and Sallis, 2011). Programs designed around racial equity that create policy, systems, and environmental (PSE) changes are necessary, especially when working with marginalized youth (Summerbell et al., 2005). Youth advocacy, initially documented in the research literature on tobacco control, is one intervention that has shown improvements in youth attitudinal and behavioral changes, including self-efficacy and overcoming barriers to prevention in urban and rural settings (Holden et al., 2004; Kulbok et al., 2008; Ribisl et al., 2004). Similarly, pilot studies on youth advocacy for obesity-related PSE change report positive short-term outcomes on youth participants (Martin, 2010; Millstein et al., 2016a; World Health Organization, 1992).

Besides the potential to improve physical activity and diet, advocacy acts to empower youth, which can have positive social and emotional development outcomes (Linnenbrink and Pintrinch, 2002). Opportunities for marginalized youth to actively address inequalities help them gain agency, efficacy, and hope (Whitehead, 2009). However, further evaluation is necessary to interpret the youth advocacy training program central to these results.

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Table 1
Youth Subscales by dimensions, pre- and post-intervention and post-only measures.

Theme	Subtheme	Subscales (number of representative questions)	Questions used for each subscale	Pre-post measures	Post-only measures
Intervention processes (IP)		Group cohesion (2)	1. Members of our group do not spend time together outside of Meetings or events. 2. I'm unhappy with my group's level of commitment to its goals for creating healthier communities		X
		Roles and participation (2)	1. When I attended meetings, I took part in the discussions. 2. I took responsibility for things that the group needs to have done		X
		Opportunities for control in group work (2)	1. This group allowed me to have a say in planning events or activities. 2. This group had specific leadership roles for youth		X
		Coordinator/leader characteristics (3)	1. Our leader(s) provided help whenever we needed it. 2. Our leader(s) did not force his or her ideas and opinions on the group 3. Our leader(s) let us work through our disagreements to decide what was best for the group		X
		Group resiliency (2)	1. This group does not give up during tough times. 2. If this group failed to accomplish one of our goals, we kept trying to find a way to reach it.		X
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF)	Perceptions	Self-efficacy for health and advocacy behaviors (3)	1. I am sure that I can tell my friends to eat healthy. 2. I am sure that I can tell my friends to be physically active. 3. I am confident that I can work to make my school or community a better place for being physically active and eating healthy.	X	
		Active participation (2)	1. I like to wait and see if someone else is going to solve a problem. 2. I find it very hard to talk in front of a group.	X	
		Optimism for change (2)	1. If I tell someone "in charge", like a leader, about my opinions, they will listen to me. 2. I enjoy participation because I want to have as much say as possible in my school or community.	X	
		Peer support for healthy behaviors (2)	1. How many of your five closest friends are physically active at least 5 days a week? 2. How many of your five closest friends eat at least 5 servings of fruits and vegetables a day?	X	
		Advocacy outcome efficacy (1)	1. This project can make a difference in making our school or community a better place for being physically active and eating healthy.	X	
		Group resiliency (2)	1. This group does not give up during tough times. 2. If this group failed to accomplish one of our goals, we kept trying to find a way to reach it.		X
	Knowledge and skills	Assertiveness (3)	1. I can talk with adults about issues I believe in. 2. I can ask others to help work on making our school or community healthier. 3. I can start discussions with others about how to change our school or community to make it healthier.	X	
		Participatory competence and decision-making (2)	1. If I have a problem when working toward a goal, I usually do not give up. 2. I can influence the decisions my group makes.	X	
		Pride in group work (2)	1. I am proud of the work our group did. 2. Our work was worth the time and effort we put into it.		X
		Group outcome efficacy (2)	1. This group can influence how adults in the community feel about nutrition and physical activity. 2. This group can influence how people my age, who are not in this group, feel about nutrition and physical activity.		X
		Health advocacy history (2)	1. In the last year, how many times have you tried to tell other students, your family, or friends to think more about eating healthy or being physically active. 2. In the last year, how many times have you tried to tell school leaders, people in your community, or politicians to be more interested in making your school or community a better place for being physically active and eating healthy	X	
Proximal outcomes: Individual youth changes (PO)				X	

(*continued on next page*)

Table 1 (*continued*)

Theme	Subtheme	Subscales (number of representative questions)	Questions used for each subscale	Pre-post measures	Post-only measures
	Nutrition and physical activity	Meeting physical activity recommendations (2)	1. Over the past seven days, how many days were you physically active for at least 60 min per day? 2. Over a typical week, on how many days are you physically active for at least 60 min per day?		
		Sports/enjoyment of physical activity (2)	1. Not counting PE classes, how many days per week do you play or practice a team sport, or take a physical activity class? 2. I enjoy physical activity.	X	
		Active transportation (2)	1. In a typical week, how many days do you walk or bike TO school? 2. In a typical week, how many days do you walk or bike FROM school?	X	
		Servings of fruits and vegetables (2)	1. In a typical day, how many servings of fruit do you eat? 2. In a typical day, how many servings of vegetables do you eat?	X	
		Fast food servings/week (1)	1. Outside of school, how many times per week do you eat fast-food?	X	
	Advocacy related	Intent to remain involved (2)	1. I plan to continue to work for change in my school or community after this project is over. 2. If I had a chance to join a similar group in the future, I would do it.		X
		Group advocacy (6)	1. The decision-maker(s) listened carefully to our group. 2. The decision-maker(s) seemed to understand what we were asking for. 3. The decision-maker(s) seemed to learn something new from what we were saying. 4. The decision-maker(s) would have listened to us more if we were adults instead of youth. 5. The decision-maker(s) were impressed by our group's work. 6. The decision-maker(s) are going to make some changes based on the information from our group.		X
		Personal advocacy activities since starting YEAH! (2)	1. Since I started this project, I have talked to my parents or family members about changes needed to make my school or community a better place for being physically active and eating healthy. 2. Since I started this project, I have talked to my friends about changes needed to make my school or community a better place for being physically active and eating healthy.		X

This paper expands the original Youth Engagement and Action for Health (YEAH!) curriculum, building upon the importance of addressing youth overweight and obesity among historically underserved populations that vary by these factors: place/geography, race/ethnicity, and sex (Linton et al., 2014; Millstein et al., 2016b). The prior study built a conceptual model that targets youth advocacy for health behavior change (Cain et al., 2014). The model includes the themes and subscales used in the present study. Further, the present study builds upon the prior one by specifically targeting diverse communities around place/geography, race/ethnicity, and sex of youth participants. We use the prior study's model to evaluate how training youth to be advocates for physical activity, environment, and policy changes can also create positive individual changes in youth participating in the YEAH! Curriculum (World Health Organization, 1992). Table 1 shows the adapted conceptual framework that includes three broad themes related to advocacy success: (1) Intervention processes; (2) Youth psychosocial factors, participation, hypothesized drivers of change (YPF); and (3) Proximal outcomes (PO) assessing individual youth changes. YPF is broken into subthemes: perceptions and knowledge, and skills. PO also has subthemes: nutrition and physical activity, and advocacy related. These themes represent the framework for the present study's analysis.

The primary aim of this exploratory study was to assess the impact of youth advocacy training on participants' attitudes and beliefs about their ability to be advocates, self-efficacy for health behavior change, and their role in changing the built environment to support physical activity. Both student and adult leaders were surveyed, but the youth response is the subject of this paper. The study is considered exploratory with the overall aim of assessing differences in advocacy training impact across multiple diverse low-income youth subgroups of place/geography, race/ethnicity, and sex using the emerging strategy of youth advocacy for PSE change.

2. Methods

2.1. Study design

The YEAH! Curriculum, initially designed by the San Diego County Childhood Obesity Initiative, was a 10-week program that worked with youth groups and their leaders to teach advocacy for improving physical activity and nutrition assets in their communities (Cain et al., 2014). It guided groups through neighborhood assessments of facilities they select (e.g., parks, schools) based on their own community needs. Over the course of the program, youth focused on understanding the problems that arose in the neighborhood assessments, brainstorming solutions, and presenting their recommendations for improvements to school, community, and other relevant decision-makers.

For this study, the research team focused on the physical activity dimensions of the original curriculum, removing nutrition assessments and adding the Microscale Audit of Pedestrian Streetscapes (MAPS) (Cain et al., 2014) to assess neighborhood walkability. Participants completed one to four of these physical activity-focused assessments included in the curriculum. Incorporation of more than one assessment led several clubs to extend their participation period from 10 to 12 weeks.

The study team recruited youth-focused organizations located in low-income communities that served primarily youth of color. In all cases, the selected groups were pre-existing, established for the larger organization's purpose, and may have included youth who were not members of the target study population. No youth were excluded from participating in the YEAH! program activities by the larger host organizations. Only data from those in the target populations were included in the analysis.

While the YEAH! program was scheduled to be a 10-week curriculum, the flexible design allowed clubs to cater the timing to fit what was best for their youth. For example, some YEAH! clubs located in schools took a break from the curriculum while students were in testing. Other clubs extended their timelines based on decision-maker availability. Some afterschool programs had summer participation. All of the clubs followed the structure of the YEAH! curriculum.

2.2. Recruitment

Organizations were recruited from low-income urban, suburban, and rural neighborhoods in California, Florida, Georgia, Hawaii, Maine, Maryland, Virginia, and Washington, DC. Low-income communities were defined in this study as census tracts with more than 20% of the population living below poverty. Host organizations were located in communities where a large proportion of the study's target race/ethnicity population resided.

Initial recruitment focused on Boys and Girls Clubs (BGC) with support from a local BGC staff member who served as the study liaison and lead recruiter. The study team mailed flyers to target BGCs, then followed up with phone calls explaining the program to organizational leadership. This recruitment method proved ineffective given the high value placed on relationships and trust by these organizations. Few groups joined as a result of these initial recruitment efforts. The study team revised the recruitment plan by working with leadership and youth advocates from BGC National, local youth-serving organizations, community leaders in areas with high percentages of the target population, and through contacts made available to us through our advisory board. The final list of participating organizations included BGCs, Big Brothers and Big Sisters, YMCAs, schools, and umbrella youth-serving organizations that have multiple service locations. Botchwey et al. provides additional details on the recruitment strategies and results (Botchwey et al., 2020).

Once organizations agreed to participate, their designated club leader(s) attended either a 3-h in-person or online training, after which they completed the necessary paperwork to begin recruiting students. In addition to the initial training, adult leaders received weekly guidance videos on what to expect in the next session and how to prepare, along with weekly phone calls from the project manager to support consistent delivery of the curriculum. Club adult leaders were responsible for recruiting youth and collecting all forms and surveys, as well as executing the YEAH! curriculum. The project required signed consent forms from youth, parents and adult leaders. In addition to English, the parental consent forms were available in Spanish and Chinese. All forms and procedures were approved by the study team's home institution's IRB (Protocol H16465). Participating clubs received $1500 in funding to administer YEAH!, while youth participants and adult leaders received a $50 stipend at the end of the project.

2.3. Retention

The study experienced retention challenges early in the implementation period. Two clubs dropped out of the study when the adult leaders left their organizations. This caused a drop in study participants with 190 at baseline and 137 participants at completion. YEAH! study researchers felt comfortable with this 72% retention rate as each demographic group (race/ethnicity, place, sex) saw similar attrition to that of the overall dropout (see Table 2).

2.4. Participants

The sample used in this analysis included $n = 137$ middle school aged (range 11–14 years old; mean = 12.2; SD = 0.95) minority youth attending 18 youth-serving organizations (e.g., schools, Boys and Girls Clubs, Big Brothers Big Sisters) located throughout the U.S. Youth completed pre- and post-intervention assessment surveys allowing a matched-pair comparison of differences over time. As shown in Table 3, the analysis sample included 59 boys and 78 girls; the five race/ethnic groups compared were African American/Black ($n = 43$), Latino

Table 2
Retention by YEAH! Club.

Club	Data collection period	Pre-surveys	Pre-post paired surveys
Club 1	March – May	6	6
Club 2	March – May	12	9
Club 3	July – September	17	17
Club 4	December – February	4	4
Club 5	April – June	9	7
Club 6	January – March	8	7
Club 7	December – February	24	4
Club 8	March – May	3	2
Club 9	April – June	9	4
Club 10	April – June	9	9
Club 11	April – June	8	7
Club 12	December – February	10	10
Club 13	March – May	12	11
Club 14	February – April	7	7
Club 15	February – April	14	14
Club 16	March – May	18	12
Club 17	February – April	6	5
Club 18	December – February	3	2
Club 19	April - …	3	–
Club 20	March - …	8	–

Table 3
Demographics of youth (N = 137) who completed both pre- and post-intervention surveys by place, race/ethnicity, and sex.

Demographic	Count (percentage)
Rural	16 (11%)
Suburban	59 (43%)
Urban	62 (45%)
African American/Black	43 (31%)
Latino	19 (13%)
Asian American, Pacific Islander/Native Hawaiian	33 (24%)
Multiracial	25 (18%)
Non-identified	17 (12%)
Boy	59 (43%)
Girl	78 (56%)

(n = 19), Asian American, Pacific Islander/ Native Hawaiian (n = 33), multiracial (n = 25), and non-identified (no race/ethnic response or prefer not to answer) (n = 17). Based on the location of their club or school, participants were also classified by 'place' as living in urban (n = 62), suburban (n = 59) or rural (n = 16) geographic areas using the National Center for Health Statistics Classification Scheme for Counties (Ingram and Franco, 2013). Youth participants self-identified their sex (male or female) and race/ethnicity on both the pre- and post-intervention assessment survey.

2.5. Data collection

During the first and last YEAH! Club sessions, students filled out pre- and post-intervention surveys that were based on validated YEAH! questionnaires (Cain et al., 2014). Students filled out surveys with paper and pencil, taking approximately twenty minutes to complete. Paper and pencil were used rather than a web-based interface due to varied internet access challenges and availability across participating YEAH! clubs, and our desire to standardize data collection. The pre-intervention survey had forty questions as well as basic descriptive data including race/ethnicity, sex and age. Students had the option to choose more than one race/ethnic category. A majority of the "attitudes and beliefs" questions used this 5-point Likert scale response options: 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree), or 5 (strongly agree). The "active participation" subscale was reverse coded, 1 (strongly agree) to 5 (strongly disagree), so that higher scores reflected better responses to negatively worded items. Reported scores for physical activity and nutrition questions were based on days per week, servings, or counts as appropriate for the question. The post-intervention survey included items from the pre-intervention questionnaire for pre-post comparisons, and additional questions regarding group and advocacy outcome efficacy, group resiliency, and intent to remain involved (Cain et al., 2014).

2.6. Study measures

Based on the previously validated youth advocacy measures (Cain et al., 2014) twenty-three scale scores were constructed by computing means of relevant item responses. There were 13 pre-post intervention scales to assess changes in student responses over time, and 10 post-only scales to measure student attitudes and behavior that were only relevant post intervention. The scales can be categorized conceptually into five categories of measures (see Table 1): (1) Intervention Process: 'group resiliency', 'group cohesion', 'roles and participation', 'group members shared beliefs', 'group belief in positive outcome', 'opportunities for control in group work', and 'coordinator/leader characteristics', (2) YPF perceptions: 'self-efficacy for health and advocacy behaviors', 'active participation', 'optimism for change', 'peer support for healthy behaviors', 'group resiliency' and 'advocacy outcome efficacy', (3) YPF Knowledge and Skills: 'assertiveness', 'participatory competence and decision making', 'pride in group work', 'group outcome efficacy', and 'health advocacy history', (4) PO Nutrition and Physical Activity: 'meeting physical activity recommendations', 'sports/physical activity enjoyment', 'active transportation', 'servings of fruit and vegetables', and 'fast food servings a week', and (5) PO Advocacy Related: 'intent to remain involved', 'group advocacy', and 'personal advocacy activities since starting YEAH!' (see Table 1) (Cain et al., 2014).

2.7. Statistical analyses

All data analyses were done using SPSS v.25. Descriptive statistics were used to examine distributional characteristics of all measures to ensure there were no improbable outliers. To examine the impact of the YEAH! curriculum on student attitudes and behaviors by place, race/ethnicity, and sex subgroups, the SPSS Mixed procedure was used so that participant clustering within club organizations could be adjusted for as a random effect and within-person clustering over time (i.e., pre- and post-assessments) could be tested for as a repeated measures effect. "Age" was used as a covariate to adjust for potential differences in outcomes related to participant age.

Dependent variables in the repeated-measures models were the 13 scales measured both pre- and post-advocacy training. Models contained three between-group factors (place, race/ethnicity, sex) and one within-group repeated measures "time" factor (pre- versus post-measures). The interaction effects for place*time (i.e., changes by place type: rural, suburban, urban from pre- to post-assessment), race/ethnicity group*time, and sex*time were tested in all 13 models as fixed effects, age was included as a covariate, and club/organization was adjusted for as a random effect. Interaction effects between "time" and each of the three between-group factors were tested in each model to assess whether any mean changes from pre- to post-training differed across the place (rural, suburban, urban), race/ethnicity, or across sex (girls and boys). For the 10 post-only outcomes, the Mixed analysis procedure also was used to adjust for participant clustering within organizations as a random effect. Place, race/ethnicity, and sex subgroup measures were the independent variables (with age as a covariate), and the main effects for each independent variable were tested to examine subgroup differences in the post-only scale means. Adjusted post-hoc pairwise comparisons were examined to inform description of significant ($p < .05$) subgroup differences. Per the overall aim of this paper and to simplify presentation, interpretation, and discussion of findings, only significant effects ($p < .05$) for "time" (pre-post changes) and "interactions" (group-by-time effects) are presented in tables and figures.

Table 4
Estimated marginal means (standard errors) and model effects across subscales by place.

Place		Adjusted means (standard errors)				Main effects		Interaction
						F	*F*	*F*
Subscale	Time	Rural	Suburban	Urban	Group average	Time (pre - post)	Place (post-only scales)	Time * place
Pre-post subscales								
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions								
Self-efficacy for health and advocacy behaviors	Pre-intervention	3.69 (0.241)	3.77 (0.141)	3.96 (0.148)	3.81 (0.103)	–	–	–
	Post-intervention	3.75 (0.245)	4.06 (0.142)	3.88 (0.148)	3.90 (0.105)			
	Direction of change	↑	↑	↓	↑			
Active participation	Pre-intervention	3.55 (0.235)	2.98 (0.133)	3.55 (0.136)	3.36 (0.097)	8.63**	–	–
	Post-intervention	2.95 (0.252)	2.96 (0.144)	2.67 (0.149)	2.86 (0.105)			
	Direction of change	↓	↓	↓	↓			
Optimism for change	Pre-intervention	3.68 (0.199)	3.49 (0.113)	3.91 (0.116)	3.69 (0.083)	–	–	11.09***
	Post-intervention	3.76 (0.182)	4.07 (0.101)	3.64 (0.103)	3.83 (0.075)			
	Direction of change	↑	↑	↓	↑			
Peer support for healthy behaviors	Pre-intervention	3.09 (0.337)	2.67 (0.188)	2.59 (0.203)	2.78 (0.140)	7.56**	–	–
	Post-intervention	3.21 (0.323)	3.16 (0.184)	3.10 (0.190)	3.16 (0.135)			
	Direction of change	↑	↑	↑	↑			
Advocacy outcome efficacy	Pre-intervention	4.39 (0.194)	4.15 (0.110)	4.39 (0.112)	4.31 (0.080)	–	–	3.94*
	Post-intervention	3.97 (0.221)	4.33 (0.123)	4.03 (0.125)	4.11 (0.091)			
	Direction of change	↓	↑	↓	↓			
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills								
Assertiveness	Pre-intervention	3.68 (0.224)	3.46 (0.131)	3.99 (0.136)	3.71 (0.096)	–	–	–
	Post-intervention	3.66 (0.216)	3.77 (0.124)	3.84 (0.129)	3.76 (0.092)			
	Direction of change	↓	↑	↓	↑			
Participatory competence and decision-making	Pre-intervention	3.73 (0.179)	3.72 (0.102)	4.07 (0.104)	3.84 (0.074)	–	–	5.11**
	Post-intervention	3.99 (0.191)	4.02 (0.108)	3.86 (0.111)	3.96 (0.079)			
	Direction of change	↑	↑	↓	↑			
Health advocacy history	Pre-intervention	1.84 (0.317)	1.71 (0.186)	1.77 (0.195)	1.77 (0.137)	–	–	–
	Post-intervention	1.48 (0.295)	1.97 (0.174)	1.92 (0.185)	1.79 (0.128)			
	Direction of change	↓	↑	↑	↑			
Proximal outcomes: individual youth changes (PO) nutrition & physical activity								
Meeting physical activity recommendations	Pre-intervention	3.61 (0.561)	3.56 (0.328)	4.26 (0.342)	3.81 (0.240)	5.33*	–	–
	Post-intervention	4.21 (0.522)	4.41 (0.306)	4.25 (0.321)	4.29 (0.225)			
	Direction of change	↑	↑	↓	↑			
Sports/enjoyment of physical activity	Pre-intervention	3.59 (0.346)	3.04 (0.201)	3.26 (0.210)	3.30 (0.148)	–	–	5.81**
	Post-intervention	2.72 (0.334)	3.26 (0.192)	3.37 (0.201)	3.12 (0.142)			
	Direction of change	↓	↑	↑	↓			

(*continued on next page*)

Table 4 (*continued*)

Place						Main effects		Interaction
		Adjusted means (standard errors)				*F*	*F*	*F*
Subscale	Time	Rural	Suburban	Urban	Group average	Time (pre - post)	Place (post-only scales)	Time * place
Active transportation	Pre-intervention	0.56 (0.371)	1.25 (0.212)	0.62 (0.219)	0.81 (0.155)	–	–	3.91*
	Post-intervention	1 (0.412)	0.93 (0.235)	0.99 (0.243)	0.97 (0.172)			
	Direction of change	↑	↓	↑	↑			
Servings of fruits and vegetables	Pre-intervention	2.57 (0.299)	2.1 (0.173)	2.02 (0.180)	2.23 (0.127)	–	–	5.24**
	Post-intervention	1.8 (0.300)	2.24 (0.171)	2.18 (0.180)	2.07 (0.127)			
	Direction of change	↓	↑	↑	↓			
Fast food servings/week	Pre-intervention	4.09 (1.16)	3.1 (0.670)	1.51 (0.678)	2.90 (0.486)	–	–	4.08*
	Post-intervention	1.66 (0.859)	2.14 (0.494)	3.26 (0.513)	2.35 (0.361)			
	Direction of change	↓	↓	↑	↓			
Post-only subscales								
		Adjusted means (standard errors)				*F*	*F*	*F*
Subscale	Time	Rural	Suburban	Urban	Group average	Time (pre - post)	Place	Time * place
Intervention processes (IP)								
Group cohesion	Post-intervention	3.58 (0.306)	3.87 (0.179)	3.63 (0.186)	3.69 (0.131)	N/A	–	N/A
Roles and participation	Post-intervention	2.51 (0.228)	2.24 (0.127)	2.25 (0.130)	2.33 (0.094)	N/A	–	N/A
Opportunities for control in group work	Post-intervention	3.68 (0.209)	3.84 (0.119)	3.69 (0.121)	3.74 (0.086)	N/A	–	N/A
Coordinator/leader characteristics	Post-intervention	3.83 (0.228)	4.38 (0.133)	3.98 (0.139)	4.06 (0.098)	N/A	–	N/A
Group resiliency	Post-intervention	3.69 (0.270)	4.02 (0.152)	3.75 (0.158)	3.82 (0.114)	N/A	–	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions								
Group resiliency	Post-intervention	3.69 (0.270)	4.02 (0.152)	3.75 (0.158)	3.82 (0.114)	N/A	–	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills								
Pride in group work	Post-intervention	3.83 (0.198)	4.55 (0.111)	4.04 (0.114)	4.14 (0.082)	N/A	7.20**	N/A
Group outcome efficacy	Post-intervention	3.78 (0.216)	4.16 (0.124)	3.63 (0.128)	3.86 (0.091)	N/A	4.27*	N/A
Proximal outcomes: individual youth changes (PO) advocacy related								
Intent to remain involved	Post-intervention	3.45 (0.200)	3.91 (0.111)	3.7 (0.114)	3.96 (0.082)	N/A	–	N/A
Group advocacy	Post-intervention	2.86 (0.532)	3.87 (0.321)	3.09 (0.339)	3.28 (0.238)	N/A	–	N/A
Personal advocacy activities since starting YEAH!	Post-intervention	2.82 (0.321)	3.54 (0.188)	3.08 (0.201)	3.15 (0.139)	N/A	–	N/A

$+p < .10$, $*p < .05$, $**p < .01$, $***p < .001$; " – " entered if F not significant.
[a]All outcomes analyzed using mixed regression procedures that adjusted for age as a covariate and participant clustering within club/organization as a random effect.
[b]N/A not applicable because post-only measure.

3. Results

More than half of the twenty-three variables measured showed significant differences when assessed by time, race/ethnicity, place, and/or sex. Results are displayed by demographics and time (pre-post and post-only subscales). Tables 4, 5, and 6 contain the pre- and post-intervention adjusted marginal means, standard errors, F values, and their significance for each subscale measures for pre-post time effects and time-by-group interactions, as well as between-group-effects for the post-only subscales. Table 4 contains the means and effects by place, Table 5 by race/ethnicity, and Table 6 by sex. The tables are organized by pre-post and post-only subscales, then by conceptual theme (intervention process, youth psychosocial factors perceptions, youth psychosocial factors knowledge and skills, participation, hypothesized drivers of change, and proximal outcomes) and by interaction type (pre-post and post-only). Ten of the thirteen pre-post intervention subscales showed statistically significant effects (either pre-post changes across time or group-by-time interactions). Two of the post-only subscales were statistically significantly different across student demographics.

3.1. Pre- and post-intervention effects: time changes across all participants (no group interactions).

The "active participation" subscale, students' willingness to speak in

Table 5
Estimated marginal means (standard errors) and model effects across subscales by race/ethnicity.

Race/ethnicity								Main effects	Interaction
		Adjusted means (standard errors)						F	F
Subscale	Time	African American/ Black	Latino	Asian American, Pacific Islander & Native Hawaiian	Multi-racial	Non-identified	Group average	Time (pre - post)	Time*race/ ethnicity
Pre-post subscales									
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions									
Self-efficacy for health and advocacy behaviors	Pre-intervention	3.80 (0.156)	3.34 (0.216)	3.9 (0.181)	3.88 (0.175)	4.11 (0.206)	3.81 (0.103)	–	–
	Post-intervention	3.95 (0.156)	3.52 216)	3.86 (0.188)	3.87 (0.176)	4.28 (0.213)	3.90 (0.105)		
	Direction of change	↑	↑	↓	↓	↑	↑		
Active participation	Pre-intervention	3.43 (0.160)	3.00 (0.236)	3.44 (0.191)	3.38 (0.184)	3.54 (0.226)	3.36 (0.097)	8.63**	–
	Post-intervention	2.98 (0.175)	2.62 (0.254)	3.11 (0.204)	2.76 (0.197)	2.81 (0.248)	2.86 (0.105)		
	Direction of change	↓	↓	↓	↓	↓	↓		
Optimism for change	Pre-intervention	3.72 (0.136)	3.36 (0.203)	3.91 (0.161)	3.7 (0.156)	3.76 (0.192)	3.69 (0.083)	–	3.89**
	Post-intervention	4.07 (0.121)	3.77 (0.177)	3.45 (0.148)	3.83 (0.138)	4.02 (0.174)	3.83 (0.075)		
	Direction of change	↑	↑	↓	↑	↑	↑		
Peer support for healthy behaviors	Pre-intervention	3.08 (0.225)	2.54 (0.316)	3.00 (0.258)	2.95 (0.252)	2.34 (0.319)	2.78 (0.140)	7.56**	2.84*
	Post-intervention	3.03 (0.215)	2.77 (0.302)	3.08 (0.257)	3.43 (0.240)	3.48 (0.292)	3.16 (0.135)		
	Direction of change	↓	↑	↑	↑	↑	↑		
Advocacy outcome efficacy	Pre-intervention	4.37 (0.132)	3.7 (0.194)	4.51 (0.158)	4.29 (0.151)	4.68 (0.186)	4.31 (0.080)	–	–
	Post-intervention	4.27 (0.147)	4.04 (0.216)	3.94 (0.181)	3.86 (0.168)	4.43 (0.211)	4.11 (0.091)		
	Direction of change	↓	↑	↓	↓	↓	↓		
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills									
Assertiveness	Pre-intervention	3.67 (0.149)	3.29 (0.212)	3.91 (0.173)	3.62 (0.167)	4.05 (0.201)	3.71 (0.096)	–	–
	Post-intervention	3.74 (0.139)	3.5 (0.195)	3.58 (0.168)	3.86 (0.157)	4.11 (0.192)	3.76 (0.092)		
	Direction of change	↑	↑	↓	↑	↑	↑		
Participatory competence and decision-making	Pre-intervention	3.82 (0.122)	3.37 (0.179)	3.95 (0.144)	3.97 (0.142)	4.09 (0.172)	3.84 (0.074)	–	–
	Post-intervention	3.98 (0.131)	3.80 (0.192)	3.92 (0.154)	4.03 (0.149)	4.06 (0.184)	3.96 (0.079)		
	Direction of change	↑	↑	↓	↑	↓	↑		
Health advocacy history	Pre-intervention	1.71 (0.205)	1.5 (0.283)	1.71 (0.238)	1.94 (0.230)	2.01 (0.274)	1.77 (0.137)	–	–
	Post-intervention	1.75 (0.189)	1.81 (0.261)	1.48 (0.219)	1.89 (0.215)	2.05 (0.250)	1.79 (0.128)		
	Direction of change	↑	↑	↓	↓	↑	↑		
Proximal outcomes: Individual youth changes (PO) nutrition & physical activity									
Meeting physical activity recommendations	Pre-intervention	3.06 (0.366)	2.83 (0.511)	4.12 (0.429)	4.43 (0.413)	4.61 (0.495)	3.81 (0.240)	5.33*	–
	Post-intervention	3.83 (0.338)	3.81 (0.468)	4.40 (0.394)	4.77 (0.380)	4.64 (0.454)	4.29 (0.225)		
	Direction of change	↑	↑	↑	↑	↑	↑		
Sports/enjoyment of physical activity	Pre-intervention	3.57 (0.228)	2.77 (0.319)	3.21 (0.266)	3.58 (0.257)	3.37 (0.310)	3.30 (0.148)	–	–
	Post-intervention	3.12 (0.215)	2.74 (0.301)	3.07 (0.258)	3.54 (0.243)	3.12 (0.292)	3.12 (0.142)		
	Direction of change	↓	↓	↓	↓	↓	↓		

(*continued on next page*)

Table 5 (*continued*)

Race/ethnicity								Main effects	Interaction
		Adjusted means (standard errors)						F	F
Subscale	Time	African American/ Black	Latino	Asian American, Pacific Islander & Native Hawaiian	Multi-racial	Non-identified	Group average	Time (pre - post)	Time*race/ ethnicity
Active transportation	Pre-intervention	1.21 (0.248)	0.668 (0.358)	0.492 (0.293)	0.886 (0.283)	0.799 (0.346)	0.81 (0.155)	–	–
	Post-intervention	1.23 (0.227)	0.334 (0.401)	0.809 (0.327)	0.932 (0.316)	1.59 (0.822)	0.97 (0.172)		
	Direction of change	↑	↓	↑	↑	↑	↑		
Servings of fruits and vegetables	Pre-intervention	2.62 (0.197)	2.16 (0.279)	1.94 (0.231)	2.19 (0.223)	2.23 (0.270)	2.23 (0.127)	–	–
	Post-intervention	2.25 (0.195)	1.87 (0.277)	1.88 (0.236)	2.08 (0.220)	2.29 (0.266)	2.07 (0.127)		
	Direction of change	↓	↓	↓	↓	↑	↓		
Fast food servings/week	Pre-intervention	4.53 (0.785)	5.26 (1.49)	1.20 (0.942)	0.618 (0.899)	2.90 (1.12)	2.90 (0.486)	–	4.75**
	Post-intervention	1.68 (0.577)	1.31 (0.850)	2.62 (0.682)	2.75 (0.671)	3.40 (0.823)	2.35 (0.361)		
	Direction of change	↓	↓	↑	↑	↑	↓		
Post-only subscales									
		Adjusted means (standard errors)						F	F
Subscale	Time	African American/ Black	Latino	Asian american, Pacific Islander & Native Hawaiian	Multi-racial	Non-identified	Group average	Time (pre - post)	Time*race/ ethnicity
Intervention processes (IP)									
Group cohesion	Post-intervention	3.84 (0.194)	3.41 (0.271)	3.54 (0.236)	3.75 (0.224)	3.91 (0.261)	3.69 (0.131)	N/A	N/A
Roles and participation	Post-intervention	2.41 (0.151)	2.44 (0.225)	2.45 (0.189)	2.42 (0.172)	1.96 (0.213)	2.33 (0.094)	N/A	N/A
Opportunities for control in group work	Post-intervention	4.03 (0.142)	3.57 (0.209)	3.65 (0.169)	3.76 (0.165)	3.68 (0.201)	3.74 (0.086)	N/A	N/A
Coordinator/ leader characteristics	Post-intervention	4.05 (0.147)	3.74 (0.205)	4.00 (0.173)	4.1 (0.166)	4.42 (0.199)	4.06 (0.098)	N/A	N/A
Group resiliency	Post-intervention	3.85 (0.171)	3.44 (0.242)	3.85 (0.207)	3.87 (0.191)	4.11 (0.245)	3.82 (0.114)	N/A	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions									
Group resiliency	Post-intervention	3.85 (0.171)	3.44 (0.242)	3.85 (0.207)	3.87 (0.191)	4.11 (0.245)	3.82 (0.114)	N/A	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills									
Pride in group work	Post-intervention	4.3 (0.130)	3.85 (0.192)	4.01 (0.163)	4.24 (0.148)	4.3 (0.183)	4.14 (0.082)	N/A	N/A
Group outcome efficacy	Post-intervention	3.94 (0.143)	3.97 (0.206)	3.62 (0.169)	3.77 (0.164)	3.98 (0.199)	3.86 (0.091)	N/A	N/A
Proximal outcomes: Individual youth changes (PO) advocacy related									
Intent to remain involved	Post-intervention	3.85 (0.132)	3.81 (0.198)	3.49 (0.166)	3.71 (0.151)	3.58 (0.187)	3.96 (0.082)	N/A	N/A
Group advocacy	Post-intervention	3.05 (0.318)	3.14 (0.400)	2.9 (0.371)	3.4 (0.351)	3.9 (0.384)	3.28 (0.238)	N/A	N/A
Personal advocacy activities since starting YEAH!	Post-intervention	3.4 (0.203)	3.07 (0.281)	2.77 (0.251)	3.15 (0.227)	3.35 (0.270)	3.15 (0.139)	N/A	N/A

* $p < .05$, ** $p < .01$,*** $p < .001$; "– "entered if F not significant.

[a]All outcomes analyzed using mixed regression procedures that adjusted for age as a covariate and participant clustering within club/organization as a random effect.

[b]N/A not applicable because post-only measure.

[c]There were no post-only main effect (post-only subscale F's) changes for race/ethnicity, therefore, the main effect column was removed.

front of a group and solve problems, declined among YEAH! youth from 3.36 to 2.86 (Fig. 1). Irrespective of subgroups, YEAH! participants reported an increase in peer support for healthy behaviors – the "number of friends physically active at least five days per week and number of friends who eat at least five servings of fruit and vegetables a day" increased from 2.78 to 3.16 people (Fig. 2). A 12.5% increase was seen in meeting physical activity recommendations – i.e., the reported number of days per week participants were physically active for at least sixty minutes, from 3.81 to 4.29 (Fig. 3).

3.2. Pre- and post-intervention effects: time-by-group interactions

3.2.1. Place-by-time interaction

The 'optimism for change' variable that measures youth perception that leaders in their school or community would listen to them and the belief that youth have a say in their community increased for rural (2.17%) and suburban (16.61%) students, and decreased among urban students (−6.90%) (Fig. 4). Suburban YEAH! youth were the only demographic to increase (up 4.33%) their 'advocacy outcome efficacy'

Table 6
Estimated marginal means (standard errors) and model effects across subscales by sex.

Sex					Main effects	Interaction
Adjusted means (standard error)					F	F
Subscale	Time	Boy	Girl	Group average	Time (pre - post)	Time*sex
Pre-post subscales						
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions						
Self-efficacy for health and advocacy behaviors	Pre-intervention	3.83 (0.129)	3.78 (0.127)	3.81 (0.103)	–	–
	Post-intervention	3.9 (0.132)	3.9 (0.128)	3.90 (0.105)		
	Direction of change	↑	↑	↑		
Active participation	Pre-intervention	3.39 (0.130)	3.33 (0.130)	3.36 (0.097)	8.63**	–
	Post-intervention	2.87 (0.141)	2.84 (0.140)	2.86 (0.105)		
	Direction of change	↓	↓	↓		
Optimism for change	Pre-intervention	3.77 (0.111)	3.61 (0.110)	3.69 (0.083)	–	–
	Post-intervention	3.79 (0.101)	3.86 (0.098)	3.83 (0.075)		
	Direction of change	↑	↑	↑		
Peer support for healthy behaviors	Pre-intervention	2.93 (0.181)	2.64 (0.182)	2.78 (0.140)	7.56**	–
	Post-intervention	3.26 (0.177)	3.05 (0.172)	3.16 (0.135)		
	Direction of change	↑	↑	↑		
Advocacy outcome efficacy	Pre-intervention	4.33 (0.107)	4.29 (0.107)	4.31 (0.080)	–	–
	Post-intervention	4.00 (0.122)	4.21 (0.119)	4.11 (0.091)		
	Direction of change	↓	↓	↓		
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills						
Assertiveness	Pre-intervention	3.81 (0.122)	3.61 (0.121)	3.71 (0.096)	–	–
	Post-intervention	3.78 (0.117)	3.73 (0.113)	3.76 (0.092)		
	Direction of change	↓	↑	↑		
Participatory competence and decision-making	Pre-intervention	4.00 (0.099)	3.68 (0.099)	3.84 (0.074)	–	–
	Post-intervention	4.04 (0.106)	3.88 (0.106)	3.96 (0.079)		
	Direction of change	↑	↑	↑		
Health advocacy history	Pre-intervention	1.87 (0.170)	1.68 (0.168)	1.77 (0.137)	–	–
	Post-intervention	1.83 (0.158)	1.76 (0.155)	1.79 (0.128)		
	Direction of change	↑	↑	↑		
Proximal outcomes: Individual youth changes (PO) Nutrition & Physical Activity						
Meeting physical activity recommendations	Pre-intervention	4.26 (0.303)	3.36 (0.299)	3.81 (0.240)	5.33*	–
	Post-intervention	4.77 (0.281)	3.81 (0.276)	4.29 (0.225)		
	Direction of change	↑	↑	↑		
Sports/enjoyment of physical activity	Pre-intervention	3.52 (0.188)	3.08 (0.185)	3.30 (0.148)	–	–
	Post-intervention	3.39 (0.181)	2.84 (0.175)	3.12 (0.142)		
	Direction of change	↓	↓	↓		
Active transportation	Pre-intervention	1.30 (0.204)	0.32 (0.201)	0.81 (0.155)	–	–
	Post-intervention	1.39 (0.227)	0.55 (0.225)	0.97 (0.172)		
	Direction of change	↑	↑	↑		
Servings of fruits and vegetables	Pre-intervention	2.25 (0.163)	2.21 (0.160)	2.23 (0.127)	–	–
	Post-intervention	2.11 (0.165)	2.04 (0.159)	2.07 (0.127)		
	Direction of change	↓	↓	↓		

(*continued on next page*)

Table 6 (*continued*)

Sex					Main effects	Interaction
Adjusted means (standard error)					F	F
Subscale	Time	Boy	Girl	Group average	Time (pre - post)	Time*sex
Fast food servings/week	Pre-intervention	1.57 (0.642)	4.22 (0.642)	2.90 (0.486)	–	9.42**
	Post-intervention	2.59 (0.477)	2.12 (0.468)	2.35 (0.361)		
	Direction of change	↑	↓	↓		
Post-only subscales						
Adjusted means (standard error)					F	F
Subscale	Time	Boy	Girl	Group average	Time (pre - post)	Time*sex
Intervention processes (IP)						
Group cohesion	Post-intervention	3.63 (0.166)	3.76 (0.159)	3.69 (0.131)	N/A	N/A
Roles and participation	Post-intervention	2.47 (0.127)	2.20 (0.123)	2.33 (0.094)	N/A	N/A
Opportunities for control in group work	Post-intervention	3.71 (0.116)	3.76 (0.115)	3.74 (0.086)	N/A	N/A
Coordinator/leader characteristics	Post-intervention	4.00 (0.123)	4.12 (0.120)	4.06 (0.098)	N/A	N/A
Group resiliency	Post-intervention	3.86 (0.145)	3.79 (0.143)	3.82 (0.114)	N/A	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) perceptions						
Group resiliency	Post-intervention	3.86 (0.145)	3.79 (0.143)	3.82 (0.114)	N/A	N/A
Youth psychosocial factors, participation, and hypothesized drivers of change (YPF) knowledge & skills						
Pride in group work	Post-intervention	4.10 (0.111)	4.19 (0.106)	4.14 (0.082)	N/A	N/A
Group outcome efficacy	Post-intervention	3.91 (0.118)	3.80 (0.117)	3.86 (0.091)	N/A	N/A
Proximal outcomes: individual youth changes (PO) advocacy related						
Intent to remain involved	Post-intervention	3.65 (0.112)	3.73 (0.108)	3.96 (0.082)	N/A	N/A
Group advocacy	Post-intervention	3.20 (0.275)	3.36 (0.270)	3.28 (0.238)	N/A	N/A
Personal advocacy activities since starting YEAH!	Post-intervention	3.02 (0.173)	3.27 (0.166)	3.15 (0.139)	N/A	N/A

* $p < .05$, ** $p < .01$,*** $p < .001$; "– "entered if F not significant.
[a] All outcomes analyzed using mixed regression procedures that adjusted for age as a covariate and participant clustering within club/organization as a random effect.
[b] N/A not applicable because post-only measure.
[c] There were no post-only main effect (post-only subscale F's) changes for sex, therefore, the main effect column was removed.

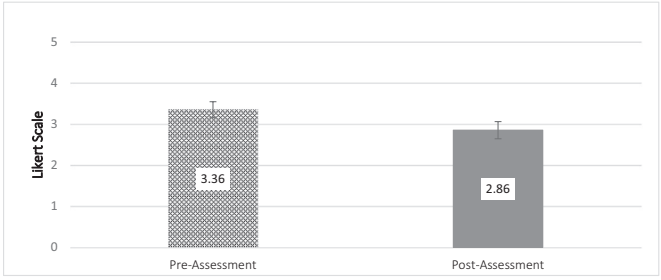

Fig. 1. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Perceptions | Active Participation Across Time All Participants.

measure, i.e., belief that they can make their school or community a better place for eating healthy and being physically active (Fig. 5).

When students were asked about their ability to influence a group and ability to persevere to accomplish a goal, the 'participatory competence and decision-making' subscale, rural and suburban students increased their agreement with these statements (6.90% and 8.00%, respectively) while urban students decreased by 5.15% (Fig. 6).

The 'sports/ enjoyment of physical activity' variable measures students' enjoyment of physical activity and counts the number of days per week involved in outside-of-school activities (Fig. 7). Urban (3.37%) and suburban (7.23%) students increased their likelihood of being physically active from the pre- to post-intervention period, while rural students declined (−24.23%).

After participating in YEAH!, rural and urban students slightly increased their non-motorized or active transportation to commute to school from 0.56 to 1 and 0.62 to 0.99 days/week, respectively. However, suburban students' use of non-motorized or active transportation to commute to school declined from 1.25 to just 1 day/week. (Fig. 8).

Rural students' daily consumption of fruits and vegetables declined after participation in YEAH! from 2.57 to 1.80 servings per day, while suburban and urban consumption increased from 2.10 to 2.24 and 2.02 to 2.18 servings per day, respectively. (Fig. 9). Across place/regional demographics, urban students increased the 'fast food servings per week' from 1.51 to 3.26 days per week while rural and suburban students declined from 4.09 to 1.66 and 3.10 to 2.14 days per week, respectively (Fig. 10).

3.2.2. *Race/ethnicity-by-time interaction*

'Optimism for change' declined among Asian American/Pacific

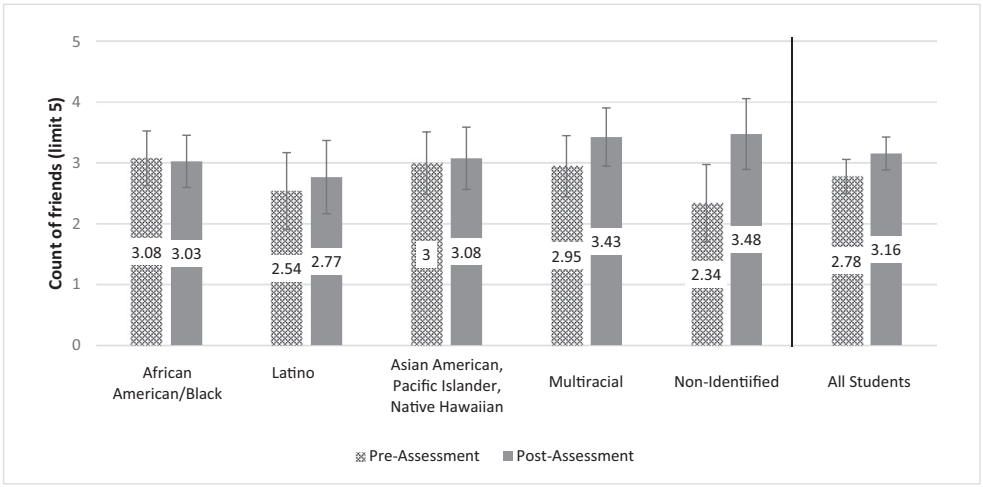

Fig. 2. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Perceptions | Peer Support for Healthy Behaviors Across Time Race/Ethnicity and All Participants.

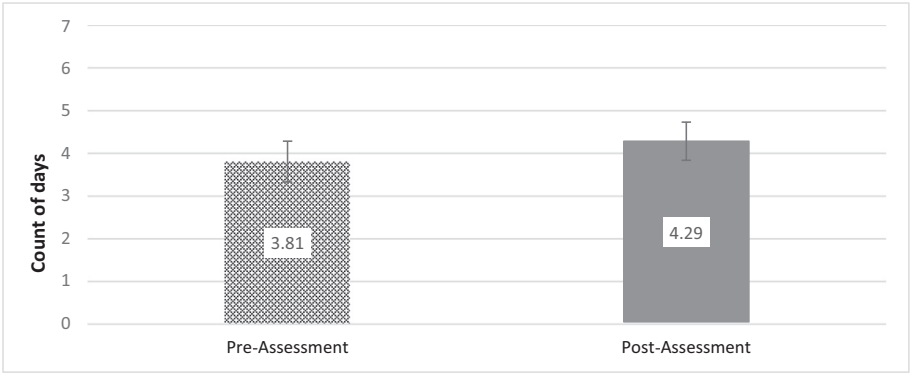

Fig. 3. Proximal Outcomes: Individual Youth Changes, Nutrition and Physical Activity | Meeting Physical Activity Recommendations Across Time All Participants.

Islander/Native Hawaiian students by 11.76% but increased in all other subpopulations (Fig. 4). The number of friends who are physically active and eat healthy, 'peer support for healthy behaviors', increased among all races/ethnicities except African American/Black students for which it declined by 1.62% (Fig. 2).

African American/Black and Latino students reported the most 'fast food servings/week' at the beginning of the YEAH! program yet they were the only demographic group to decline in fast food consumption by the end of the YEAH! program, by 2.85 and 3.95 servings, respectively. African American/Black students' fast food consumption declined from 4.53 servings per week to 1.68 servings per week. YEAH! Latino students' 'fast food servings/week' declined from 5.26 servings per week to 1.31 servings per week. Asian American, Pacific Islander/Native Hawaiian students increased their number of 'fast food servings/week' from an average of 1.20 to a post-intervention average of 2.62 servings (Fig. 10).

3.2.3. Sex-by-time interaction

Boys increased the number of 'fast food servings/week' from 1.57 to 2.59, while girls declined from pre- to post-assessment, from 4.22 to 2.12 servings (Fig. 10).

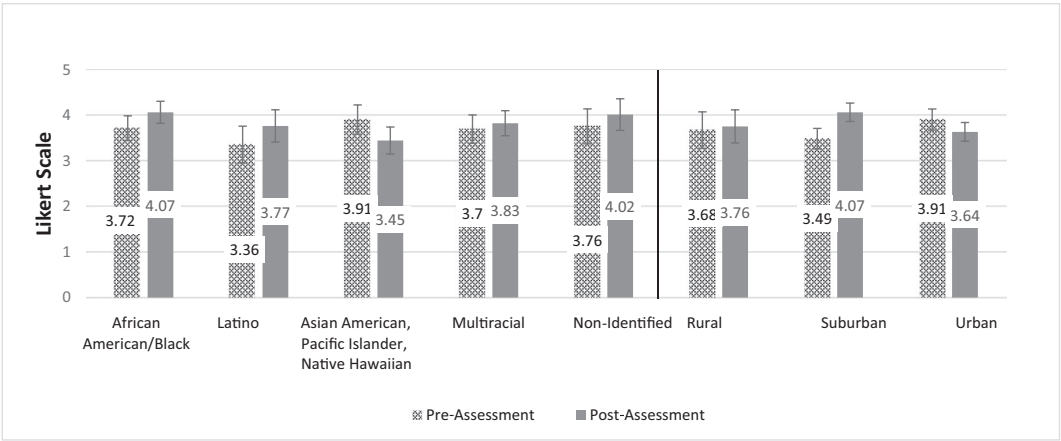

Fig. 4. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Perceptions | Optimism for Change Across Time Race/Ethnicity and Place.

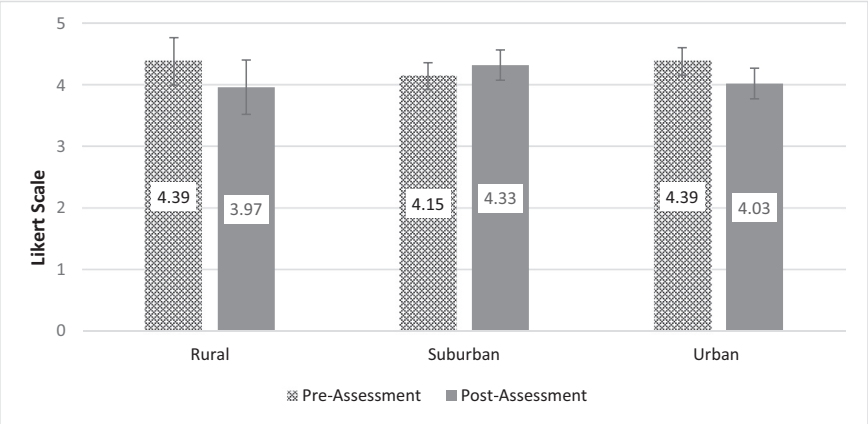

Fig. 5. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Perceptions | Advocacy Outcome Efficacy Across Time by Place.

3.3. Post-only subgroup effects

A total of ten variables were used to measure student attitude only after participating in YEAH; two produced significant place differences. Students in rural, suburban, and urban regions differed in their responses to 'pride in group work' and 'group outcome efficacy'.

The 'pride in group work' variable asks students to rank their agreement with the following statements: "I am proud of the work my group did" and "Our work was worth the time and effort we put in." Rural students had the lowest feelings of pride (3.83) while suburban students had the highest pride (4.55), with an average of 4.14 across all students (Fig. 11).

The 'group outcome efficacy' subscale (Fig. 12) measures how well students believe their work could influence adults' and other students' feelings toward healthy eating and physical activity. Suburban students had the highest efficacy about their group's impact (4.16) while urban students had the lowest (3.63).

4. Discussion

This study is the second evaluation of YEAH! and the first expansion of this advocacy training program beyond one county to include broader diversity by race/ethnicity and geographic location/place. This study followed a multi-state program implementation and analysis within the cohort by place, race/ethnicity and sex. The present evaluation found mixed results compared to the conceptual model from the initial study (World Health Organization, 1992). The current study shows two variables in agreement with the initial evaluation. The 'peer support for healthy behaviors' subscale increased 13.9% in the previous evaluation and 13.6% in the current study. The 'meeting physical activity recommendations' subscale increased 10.5% in the initial evaluation and 12.5% in the present study. However, this study found different results for 'active participation' decreasing 14.8%, yet increasing 11.1% in the previous evaluation.

This analysis found thirteen subgroup significant results not previously identified. This research identified seven pre- to post-assessment changes among place/region, three among race/ethnicity, and one among sex. For the post-only subscales, there were two place differences, and none found with race/ethnicity or sex demographics. These results suggest that the study should be repeated to expand the sample size and clarify these findings. This would entail following the current YEAH! study implementation practices across multiple communities and with various hard to reach race/ethnicity subpopulations. These results continue to support youth advocacy as a strategy that holds much promise for health promotion. This research provides an opportunity to better understand implementation of this advocacy training program to promote childhood obesity prevention outcomes and overall youth well-being.

4.1. Youth psychosocial factors (YPF) perceptions by place, race/ethnicity and sex

Five of the hypothesized youth drivers of change for YPF perceptions resulted in pre-post differences for 'optimism for change', 'peer support for healthy behaviors', and 'advocacy outcome efficacy.' These are considered most important for confidence and individual social benefits based on social cognitive theory (Bandura, 1977). The subpopulation differences exist across these drivers of change including place and race/ethnicity. Youth from urban communities and Asian American/Pacific Islander/Native Hawaiian groups reported a decrease in 'optimism for change.' African American/Black youth reported a decrease in 'peer support for healthy behaviors.' Only youth from

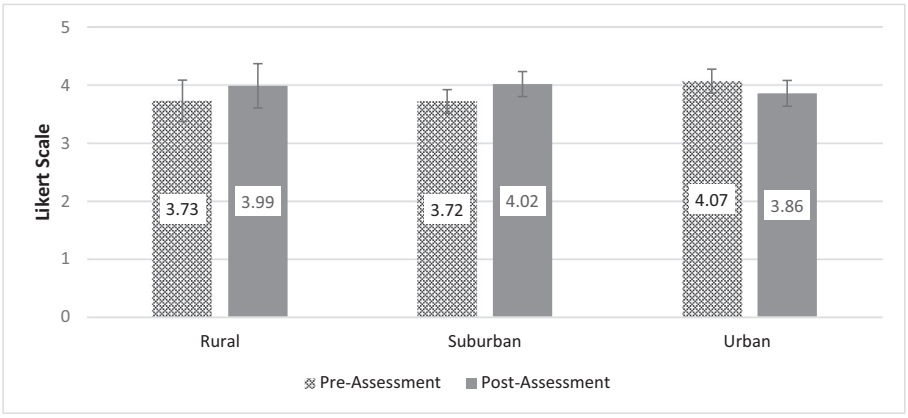

Fig. 6. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Knowledge & Skills | Participatory Competence and Decision-Making Across Time by Place.

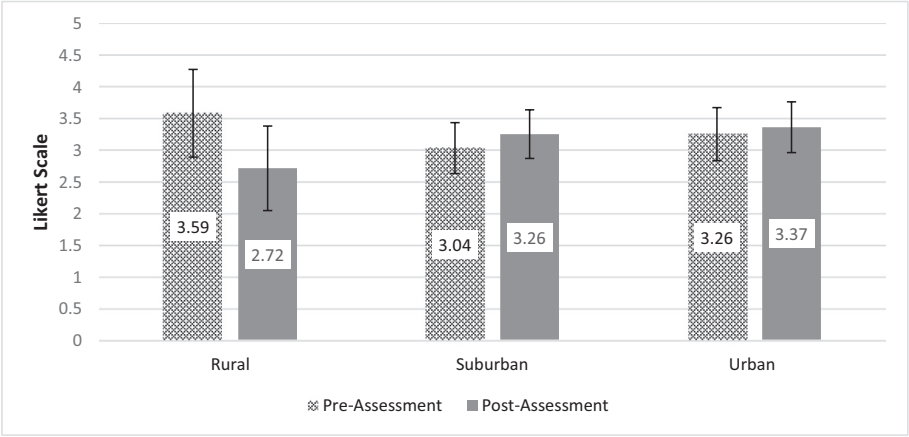

Fig. 7. Proximal Outcomes: Individual Youth Changes, Nutrition and Physical Activity | Sports/Enjoyment of Physical Activity Across Time by Place.

suburban communities reported an increase in 'advocacy outcome efficacy'. Demonstrating greater confidence that YEAH! can help make their school and/or community a better place for being physically active or eating healthy.

The three subscales that were not significant for any subgroup: 'self-efficacy for health and advocacy behaviors', 'active participation', and 'group resiliency' are directly linked to youth belief that they will realize change from their efforts. Unlike the previous evaluation (World Health Organization, 1992), the three subscales trend positively yet do not have significance ($p < .05$). One potential explanation is the level of support for PSE changes provided to participants at the community level. These subscales are dependent on the context or community environment in which the YEAH! club is operates. For example, the external support available for the youth as they advocate for improvements in physical activity and food options in their communities. The current study was spread across seven states and Washington, DC, of which only one had an active community health coalition that was invested in the YEAH! club's success. While that club experienced an increase in advocacy readiness, the others saw declines. The former study took place in one county as a youth advocacy training program of the San Diego County Childhood Obesity Initiative This suggests the critical value of engaging local community health coalitions and other relevant organizations to support the youth participating in YEAH!, their adult leaders, and the youth advocacy process in general.

4.2. Youth psychosocial factors (YPF) knowledge and skills by place, race/ethnicity and sex

Of the drivers of change related to YPF knowledge and skills, 'participatory competence and decision-making', 'pride in group work', and 'group outcome efficacy' resulted in significant differences by place only. The 'participatory competence and decision making' subscale measures persistence and commitment to influencing decisions to realize a goal. Both rural and suburban club scores moved from neutral to positive, while urban clubs decreased slightly from positive to neutral. 'Pride in group work,' a reflection of the esteem assigned to the work and effort by the group, resulted in suburban clubs with the highest score compared to urban and rural groups. 'Group outcome efficacy' indicates how the student's club can influence adults' and other peers' attitude about physical activity and nutrition. Suburban students had the highest score, followed by rural and urban groups. Overall, we see that suburban youth were more confident in their individual and group influence over others and outcomes. Suburban students, more than rural and urban students, felt the greatest efficacy toward affecting other's health behaviors. This likely led them to feel more pride in the work and time their group invested in YEAH!

4.3. Proximal outcomes (PO) individual youth changes: nutrition and physical activity by place, race/ethnicity and sex

The nutrition and physical activity proximal outcomes assess youth co-benefits from the YEAH! advocacy training, and all showed positive impacts. All youth increased the number of days they were physically active for at least 60 min from an average of 3.81 to 4.29 of the recommended seven days (U.S Department of Health and Human Services, 2018). This change is consistent with the results from the initial evaluation (World Health Organization, 1992). We can conclude that YEAH! consistently improves physical activity participation among

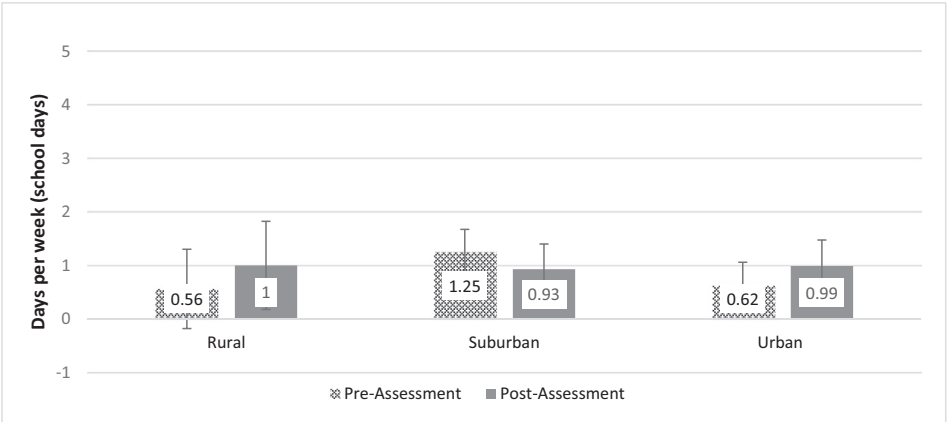

Fig. 8. Proximal Outcomes: Individual Youth Changes, Nutrition and Physical Activity | Active Transportation Across Time by Place.

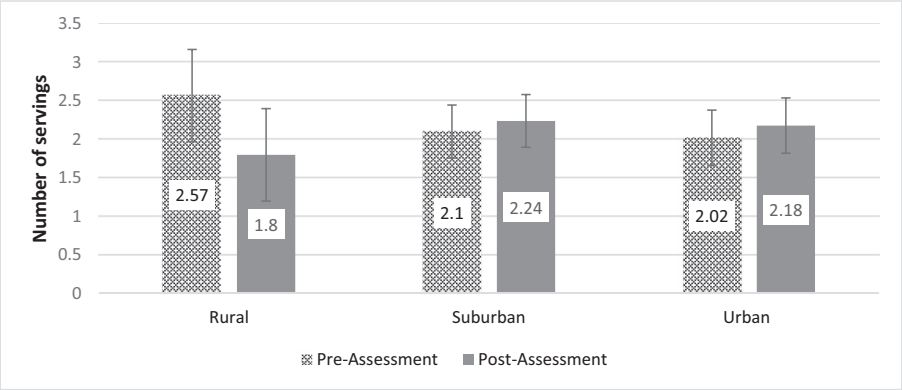

Fig. 9. Proximal Outcomes: Individual Youth Changes, Nutrition and Physical Activity | Servings of Fruits and Vegetables Across Time by Place.

the youth who participated in these programs.

Importantly, the proximal outcomes for nutrition and physical activity measures differ by subgroup. Youth from suburban clubs reported the greatest increase in 'sports/enjoyment of physical activity,' highlighting a greater preference for recreational physical activity options. However, rural clubs reported the largest decrease in their recreational physical activity measures but doubled their average reported active transportation, walking or biking to and/or from school, from 0.56 to 1 day per week. While this is a small increase for rural youth, it aligns with the reported level of active transportation for urban and suburban clubs. Nationwide, the number of students using active transportation to school has consistently declined. In 2014, 10% or fewer students walked or biked to school (Jones and Sliwa, 2016) and 13% in 2011, compared to 48% in 1969 (McDonald et al., 2011). The built environment has changed, but not as dramatically as this mode shift would suggest. The major impact on active transportation to/from school is from concerns over pedestrian injuries and death (Botchwey et al., 2014; Aranda-Balboa et al., 2020; World Health Organization, 2012). This trend is reinforced from our study as 32.8% of students indicating parental concerns and 56.2% noting traffic and other related reasons why they do not walk or bike to school. While the effect of YEAH! on student active transportation was not large, research has demonstrated that many built environment changes and programs (crossing guards, bicycle racks, and promotional materials) must be implemented to increase active transportation among youth (McDonald et al., 2011).

Healthy People 2020 provides a target of 0.93 fruits and 1.16 of vegetables per day per 1000 cal for the population age two years and older (U.S. Department of Health and Human Services: Office of Disease Prevention and Health Promotion, n.d.-a; U.S. Department of Health and Human Services: Office of Disease Prevention and Health Promotion, n.d.-b). Rural, suburban, and urban students reported at least two servings of fruits and vegetables per day (measured by one medium-sized fruit or vegetable) in the pre-assessment. Based on the post-assessment, suburban and urban students slightly increased their servings by 0.23 and 0.16, respectively. Although we did not measure caloric intake, this increase is encouraging, as students, regardless of demographic group, increased their fruit and vegetable consumption. Additionally, African American/Black and Latino youth decreased their 'fast food servings/week' significantly from 4.53 to 1.68, and 5.26 to 1.31, respectively. Girls also decreased their 'fast food servings/week' from 4.22 to 2.12 days compared to an increase for boys from 1.57 to 2.59 days per week.

Overall, YEAH! shows notable impact in key subcategories, 'peer support for healthy behaviors' and 'meeting physical activity recommendations' for all youth. In total, there were 13 significant subscales, 9 with place differences, 3 with race/ethnicity differences and 1 with sex differences. This shows the impact of place on youth psychosocial factors for perceptions, knowledge and skills, and proximal

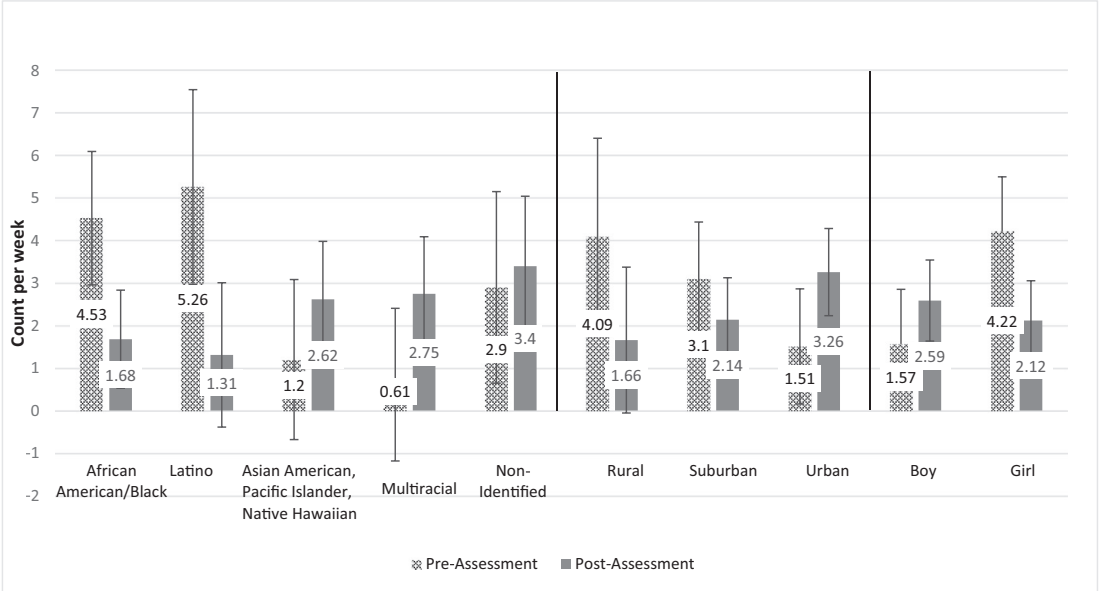

Fig. 10. Proximal Outcomes: Individual Youth Changes, Nutrition and Physical Activity | Fast-food Intake Across Time by Race/Ethnicity, Place, and Sex.

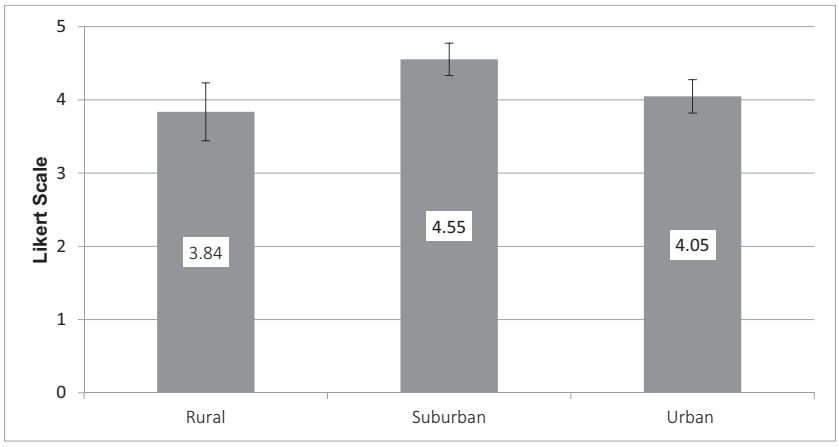

Fig. 11. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Knowledge & Skills | Pride in group work by Place.

outcomes for nutrition and physical activity. African American/Black and Latino youth showed significant benefits on self-reported nutrition and physical activity. This finding is positive since these subgroups experience the highest prevalence of youth obesity (Hales et al., 2017). Urban students were the only demographic group whose optimism for change, advocacy outcome efficacy, and participatory competence and decision making declined after participating in YEAH! These subscales measure student hope, self-efficacy, and belief in the future. These findings suggest that, in relation to urban students, suburban and rural students are more hopeful, optimistic, and have a greater belief in their own ability to influence change.

5. Limitations

This study experienced recruitment, retention, and programmatic challenges that were present in the initial YEAH! evaluation (World Health Organization, 1992). Two YEAH! clubs dropped out of the study when their adult leaders left their respective organizations. This was primarily a challenge with youth organizations that rely on seasonal staff to support afterschool programs. Training and ongoing support from adult leaders was critical to student enthusiasm for the curriculum and necessary to mitigate any discomfort with decision-makers. Adult leaders were provided support from the research team through ongoing curriculum delivery resources across multiple modes (email, online, and weekly phone calls). Additionally, the original compensation structure created financial challenges for organizations unfamiliar with the 4–8-week reimbursement wait period. This challenge remained even as YEAH! Clubs submitted invoices throughout the program period because intermittent payments failed to address institutional payment concerns. Eventually, YEAH! Clubs were made aware of this timeline and opted to submit one final invoice and receive one payment at the end of the program. A larger recruitment target and better engagement strategies were incorporated in this study to overcome previously reported limitations. The self-report nature of the measures is also an important study limitation, but one that could not be avoided. Self-reporting is the only way to get data on attitude and belief changes. However, direct measures of physical activity could be collected using pedometers and accelerometers. The recruitment of racial and ethnic diverse youth was challenged as well. The study recruited youth from Hawaii and Maine, hoping to have a robust representation of Pacific Islander and American Indian youth, respectively. Instead, a majority of the youth who selected Pacific Islander or American Indian also chose at least one other race/ethnicity. The study thus had a large sample of youth whom identified as multiracial. With relatively few youth who identified as Pacific Islander or American Indian only, researchers chose to aggregate the data collected from the Asian American, Pacific Islander, and Hawaiian identified youth. While we are aware that the Pacific Islanders and Native Hawaiians experience different socio-economic barriers (Srinivasan and Guillermo, 2000), the primary recruitment of both groups occurred in Hawaii where racial identification is notably more multi-ethnic (Kaneshiro et al., 2011).

Lastly, we considered our study exploratory both because the YEAH! conceptual model was being applied in new geographic areas, with hard to reach racial and ethnic populations, and because of the

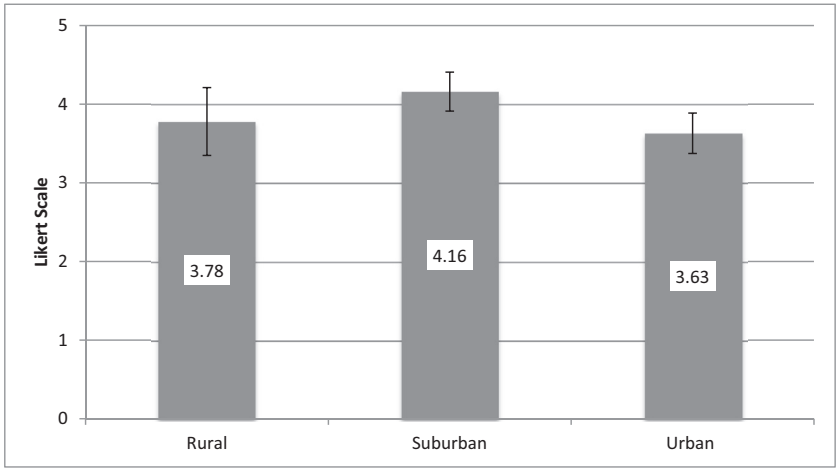

Fig. 12. Youth Psychosocial Factors, Participation, and Hypothesized Drivers of Change: Knowledge & Skills | Group outcome efficacy by Place.

relatively small subgroup sample sizes that we were able to collect data on at two time points. The small n's (leading to possible Type II errors) and multiple statistical analyses (leading to possible Type I errors) underscore the need for further research to replicate our findings. Additionally, there were small sample sizes within multiple place, race/ethnic, and sex demographics (e.g. urban Latino girls) which prevented researchers from doing further analysis into specific changes.

6. Next steps

This study demonstrated numerous improvements in advocacy and health behavior outcomes among youth. Given these positive findings, next steps include repeating this study with local health coalitions or community organizations that will be supportive of physical activity and food improvements the YEAH! clubs may recommend. Additional dissemination efforts are underway targeting schools, after school programs, community organizations, and youth-serving organizations. Future research seeks to repeat the study in key communities where YEAH! has recruitment champions, and community organizations that can provide support to the clubs as they work on their advocacy plans.

To minimize respondent burden, the pre- and post-intervention surveys will be shortened to reflect only those questions that relate to the established subscales, demographics, and are useful in analysis. Study personnel will rework the race/ethnicity question to address concerns with listing of multiple categories. Study personnel will also create web-based formats for the youth assessments, which will ease data collection and pairing of pre- and post-assessments for analysis. We will also explore objective measures of physical activity by participants for a week before training starts and a week after the YEAH! program's completion, which will help validate the self-report physical activity measure. For future research, we plan to include larger numbers of youth, particularly from the racial and ethnic groups that were underrepresented in this study, focus our recruitment in areas with concentrated poverty, and consider ceiling effects on the subgroup outcomes. Overall, these findings indicate a positive effect of the YEAH! program and youth advocacy for health behaviors, and the program should continue to collect confirmatory data.

Disclosures

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CRediT authorship contribution statement

Nisha Botchwey:Conceptualization, Methodology, Validation, Investigation, Resources, Writing - original draft, Writing - review & editing, Visualization, Supervision, Project administration, Funding acquisition.**Jasmine Jones-Bynes**:Formal analysis, Data curation, Writing - original draft, Writing - review & editing, Visualization.**Katie O'Connell**:Investigation, Data curation, Writing - review & editing.**Rachel A. Millstein**:Methodology, Writing - original draft, Writing - review & editing.**Anna Kim**:Conceptualization, Methodology, Validation, Investigation, Writing - review & editing, Funding acquisition.**Terry L. Conway**:Methodology, Formal analysis, Data curation, Writing - original draft, Writing - review & editing.

References

Anderson, S.E., Whitaker, R.C., 2009. Prevalence of obesity among US preschool children in different racial and ethnic groups. Archives of Pediatrics & Adolescent Medicine. 163 (4), 344–348. https://doi.org/10.1001/archpediatrics.2009.18.

Aranda-Balboa MJ, Huertas-Delgado FJ, Herrador-Colmenero M, Chillion P. Parental Barriers to Active Transport to School: A Systematic Review. *International Journal of Public Health.* 2020*; 65:* 87–98. https://link.springer.com/article/10.1007/s00038-019-01313-1. Published November 2019. Accessed December 2019.

Bandura, A., 1977. Self-efficacy: toward a unifying theory of behavioral change. Psychol. Rev. 84 (2), 191–215. https://doi.org/10.1037/0033-295x.84.2.191.

Botchwey, N.D., Trowbridge, M., Fisher, T., 2014. Green health: urban planning and the development of healthy and sustainable neighborhoods and schools. J. Plan. Educ. Res. 34 (2), 113–122. https://doi.org/10.1177/0739456x14531830.

Botchwey ND, Conway TL, Floyd M, et al. Challenges recruiting diverse youth for physical activity research. *Preventive Medicine*. 2020;131:1–6. doi:https://doi.org/10.1016/j.ypmed.2019.105888.

Cain KL, Millstein RA, Sallis JF, et al. Contribution of streetscape audits to explanation of physical activity in four age groups based on the Microscale Audit of Pedestrian Streetscapes (MAPS). *Social Science & Medicine*. 2014;116:82–92. doi:https://doi.org/10.1016/j.socscimed.2014.06.042.

Davis, A.M., Bennett, K.J., Befort, C., Nollen, N., 2011. Obesity and related health behaviors among urban and rural children in the United States: data from the National Health and Nutrition Examination Survey 2003-2004 and 2005-2006. J. Pediatr. Psychol. 36 (6), 669–676. https://doi.org/10.1093/jpepsy/jsq117.

Fialkowski, M.K., Debaryshe, B., Bersamin, A., et al., 2014. A community engagement process identifies environmental priorities to prevent early childhood obesity: the Children's healthy living (CHL) program for remote underserved populations in the US affiliated Pacific Islands, Hawaii and Alaska. Matern. Child Health J. 18 (10), 2261–2274. https://doi.org/10.1007/s10995-013-1353-3.

Fujimoto WY. Diabetes in Asian and Pacific Islander Americans. In: National Institute of Health. *Diabetes in America*. 2nd ed. Bethesda, MD: National Institutes of Health; 1995 https://www.orau.gov/cdcynergy/web/db/Content/activeinformation/resources/DB_Diabetes_in_Asian_and_Pacific_Islander_Americans.pdf. Accessed December 2019.

Glickman D, Parker L, Sim L, Cook H, Miller A. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation.* Washington, D.C: National Acadamies Press; 2012. https://www.ncbi.nlm.nih.gov/books/NBK201141/. Accessed December 2019.

Hales CM, Carroll MD, Frayar CD, et al. *Prevalence of Obesity Among Adults and Youth: United States,* 2015-2016. Hyattsville, MD: National Center for Health Statistics; 2017. 1–6, NCHS Data brief 288. https://www.cdc.gov/nchs/data/databriefs/db288.pdf. Published October 2017. Accessed April 2019.

Hansen, A.Y., Meyer, M.R.U., Lenardson, J.D., Hartley, D., 2015. Built environments and active living in rural and remote areas: a review of the literature. Curr. Obes. Rep. 4 (4), 484–493. https://doi.org/10.1007/s13679-015-0180-9.

Holden, D.J., Crankshaw, E., Nimsch, C., Hinnant, L.W., Hund, L., 2004. Quantifying the impact of participation in local tobacco control groups on the psychological empowerment of involved youth. Health Educ. Behav. 31 (5), 615–628. https://doi.org/10.1177/1090198104268678.

Ingram DD, Franco SJ. *2013 NCHS urban–rural classification scheme for counties. National Center for Health Statistics.*Hyattsville, MD: U.S Department of Health and Human Services; 2014. 1–25, Vital Health Statistics Series 2 (166). https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf. Accessed March 2019.

Jones, C.P., 2000. Levels of racism: a theoretic framework and a gardeners tale. Am. J. Public Health 90 (8), 1212–1215. https://doi.org/10.2105/ajph.90.8.1212.

Jones, S.E., Sliwa, S., 2016. School factors associated with the percentage of students who walk or bike to school, school health policies and practices study, 2014. Prev. Chronic Dis. 13 (E63), 1–9. https://doi.org/10.5888/pcd13.150573.

Kaneshiro, B., Geling, O., Gellert, K., Millar, L., 2011. The challenges of collecting data on race and ethnicity in a diverse, multiethnic state. Hawaii Med. J. 70 (8), 168–171. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3158379/pdf/hmj7008_0168.pdf, Accessed date: January 2019.

Kenney, M.K., Wang, J., Iannotti, R., 2014. Residency and racial/ethnic differences in weight status and lifestyle behaviors among US youth. J. Rural. Health 30 (1), 89–100. https://doi.org/10.1111/jrh.12034.

Kohl HW. *Educating the Student Body Taking Physical Activity and Physical Education to School.* Washington: National Academies Press; 2013.

Koplan, J.P., Liverman, C.T., Kraak, V.I., 2005. Preventing Childhood Obesity: Health in the Balance. National Academies Press, Washington, D.C.

Kulbok, P.A., Rhee, H., Botchwey, N., Hinton, I., Bovbjerg, V., Anderson, N.L.R., 2008. Factors influencing adolescents decision not to smoke. Public Health Nurs. 25 (6), 505–515. https://doi.org/10.1111/j.1525-1446.2008.00737.x.

Linnenbrink, E.A., Pintrinch, P.R., 2002. Motivation as an enabler for academic success. Sch. Psychol. Rev. 31 (3), 313–327. https://psycnet.apa.org/record/2002-18945-003, Accessed date: June 2019.

Linton LS, Edwards CC, Woodruff SI, Millstein RA, Moder C. Youth Advocacy as a Tool for Environmental and Policy Changes That Support Physical Activity and Nutrition: An Evaluation Study in San Diego County. *Preventing Chronic Disease.* 2014;11:1–10. Doi:https://doi.org/10.5888/pcd11.130321.

Lutfiyya MN, Lipsky MS, Wisdom-Behounek J, Inpanbutr-Martinkus M. Is Rural Residency a Risk Factor for Overweight and Obesity for U.S. Children?*. Obesity. 2007;15(9):2348–2356. doi:https://doi.org/10.1038/oby.2007.278.

Marmot, M., 2005. Social determinants of health inequalities. Lancet 365 (9464), 1099–1104. https://doi.org/10.1016/s0140-6736(05)74234-3.

Martin J. The Role of Advocacy. In: Waters E, Swinburn B, Seidell J, Uauy R. *Preventing Childhood Obesity: Evience, Policy, Practice.* Chicester, West Sussex: Blackwell Publishing Ltd; 2010: 192–199. https://onlinelibrary.wiley.com/doi/book/10.1002/9781444318517. Accessed May 2018.

McDonald NC, Brown AL, Marchetti LM, Pedroso MS. U.S School Travel, 2009 an Assessment of Trends. *American Journal of Preventative Medicine.* 2011; 41(2): 146–151. doi: https://doi.org/10.1016/j.amepre.2011.04.006.

Millstein, R.A., Sallis, J.F., 2011. Youth advocacy for obesity prevention: the next wave of social change for health. Transl. Behav. Med. 1 (3), 497–505. https://doi.org/10.1007/s13142-011-0060-0.

Millstein, R.A., Woodruff, S.I., Linton, L.S., Edwards, C.C., Sallis, J.F., 2016a. A pilot study evaluating the effects of a youth advocacy program on youth readiness to advocate for environment and policy changes for obesity prevention. Transl. Behav. Med. 6 (4), 648–658. https://doi.org/10.1007/s13142-016-0408-6.

Millstein RA, Woodruff SI, Linton LS, Edwards CC, Sallis JF. Development of measures to evaluate youth advocacy for obesity prevention. *International Journal of Behavioral Nutrition and Physical Activity*. 2016b;13(1). doi:https://doi.org/10.1186/s12966-016-0410-x.

McNeely MJ, Boyko EJ. Type 2 Diabetes Prevalence in Asian Americans: Results of a national health survey. *Diabetes Care.* 2004; 27(1): 66–69. doi/https://doi.org/10.2337/diacare.27.1.66.

MRU, Meyer, Moore, J.B., Abildso, C., Edwards, M.B., Gamble, A., Baskin, M.L., 2016. Rural active living. Journal of Public Health Management and Practice. 22 (5), 1–16. https://doi.org/10.1097/phh.0000000000000333.

Nader, P.R., Bradley, R.H., Houts, R.M., McRitchie, S.L., O'Brien, M., 2008. Moderate-to-vigorous physical activity from ages 9 to 15 years. JAMA. 300 (3), 295–305. https://doi.org/10.1001/jama.300.3.295.

Ogden, C.L., Carroll, M.D., Kit, B.K., Flegal, K.M., 2014. Prevalence of childhood and adult obesity in the United States, 2011-2012. Jama. 311 (8), 806–814. https://doi.org/10.1001/jama.2014.732.

Patterson, P.D., Moore, C.G., Probst, J.C., Shinogle, J.A., 2004. Obesity and physical inactivity in rural America. J. Rural. Health 20 (2), 151–159. https://doi.org/10.1111/j.1748-0361.2004.tb00022.x.

Popkin, B.M., Duffey, K., Gordon-Larsen, P., 2005. Environmental influences on food choice, physical activity and energy balance. Physiol. Behav. 85 (5), 603–613. https://doi.org/10.1016/j.physbeh.2005.08.051.

Ribisl, K.M., Steckler, A., Linnan, L., et al., 2004. The North Carolina youth empowerment study (NCYES): A participatory research study examining the impact of youth empowerment for tobacco use prevention. Health Educ. Behav. 31 (5), 597–614. https://doi.org/10.1177/1090198104268550.

Schell, L.M., Gallo, M.V., 2012. Overweight and obesity among North American Indian infants, children, and youth. Am. J. Hum. Biol. 24 (3), 302–313. https://doi.org/10.1002/ajhb.22257.

Srinivasan, S., Guillermo, T., 2000. Toward improved health: disaggregating asian american and native hawaiian/Pacific islander data. Am. J. Public Health 90 (11), 1731–1734. https://doi.org/10.2105/ajph.90.11.1731.

Summerbell CD, Waters E, Edmunds L, Kelly SA, Brown T, Campbell KJ. Interventions for preventing obesity in children. *Cochrane Database of Systematic Reviews*. 2005. doi:https://doi.org/10.1002/14651858.cd001871.pub2.

U.S Department of Health and Human Services. *Step it up! The surgeon general's call to action to promote walking and walkable communities.* Washington, D.C: U.S Department of Health and Human Services; 2015. 1–47. https://www.hhs.gov/sites/default/files/call-to-action-walking-and-walkable-communites.pdf. Published March 2015. Accessed on April 2019.

U.S Department of Health and Human Services. *Physical Activity Guidelines for Americans 2nd Edition.* Washington, D.C: U.S Department of Health and Human Services; 2018. 1–113. https://health.gov/sites/default/files/201909/Physical_Activity_Guidelines_2nd_edition.pdf. Accessed April 2019.

U.S. Department of Health and Human Services: Office of Disease Prevention and Health Promotion n.d.-a. Nutrition and weight status increase the contribution of fruits to the diets of the population aged 2 years and older. https://www.healthypeople.gov/2020/data-search/Search-the-Data#objid=4937. Accessed December 30, 2019.

U.S. Department of Health and Human Services: Office of Disease Prevention and Health Promotion n.d.-b. Increase the contribution of total vegetables to the diets of the population aged 2 years and older. https://www.healthypeople.gov/2020/data-search/Search-the-Data#objid=4939. Accessed December 30, 2019.

Whitehead, G., 2009. Adolescent leadership development. Educational Management Administration & Leadership. 37 (6), 847–872. https://doi.org/10.1177/1741143209345441.

\World Health Organization. *Advocacy Strategies for Health and Development: Development Communication in Action.* Geneva, Switzerland: World Health Organization; 1992. 1–22. https://apps.who.int/iris/handle/10665/70051. Published November 1992. Accessed December 2018.

World Health Organization. *Population-based Approaches to Childhood Obesity Prevention.* Geneva, Switzerland; World Health Organization; 2012. 1–48. https://apps.who.int/iris/bitstream/handle/10665/80149/9789241504782_eng.pdf;jsessionid=1171C9E5166FD7C8192E137B199ED638?sequence=1. Published November 2012. Accessed December 2018.