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Impact on Healthy Behaviors of Group Obesity Management Visits in Middle School Health Centers.

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Abstract

This mixed methods community-based participatory pilot study examined the feasibility and preliminary efficacy of group obesity management visits offered through school-based health centers. The study was implemented through an academic-community partnership in three school health centers serving primarily Latinx and African American youth. Participants (n=71) completed pre- and post- surveys about intention to change diet and exercise habits, knowledge and self-efficacy related to healthy eating, and social support. Focus groups were conducted after the intervention and 18 months later. Group visits were feasible and highly valued by study participants. Quantitative results showed a significant decrease in soda consumption, increased support from classmates, and an increased number of exercise days. In focus groups, youth endorsed cooking, tasting and shopping activities, noted the importance of family involvement in behavior change, and stated that stress reduction mindfulness exercises helped to change eating habits. Implications for school-based health care and school nursing are discussed.

KEYWORDS**:**

School health
Health/wellness
Child obesity prevention
Qualitative research
Behavioral change
School-based intervention
Community-based participatory research

Adolescent attitudes
School Nursing

Introduction

Although the overall prevalence of overweight and obesity in children and adolescents has remained stable since 2009 at 17%, the incidence of obesity among children and adolescents living in low-income communities is greater than twice the national average (Ogden, Carroll, Kit, & Flegal, 2012). A cross-sectional review of BMI scores from 2003-2012, comprising all California youth involved in fitness testing in 5th, 7th and 9th grades, revealed increasing disparities in obesity rates between white youth and youth of color (Falbe, Cotterman, Linchey, & Madsen, 2016). Studies have also shown low levels of adequate physical activity and fruit and vegetable intake among Latinx and African-American adolescents (Iannotti & Wang, 2013). In Oakland, California, the setting for the interventions described below, there is a 15-year disparity in lifespan between the poorest parts of the city, where the majority of African American and Latinx children live, and wealthier neighborhoods (Alameda County Public Health Department, 2016). Thus, the development of interventions tailored to Latinx and African American adolescents is critical to reduce health inequities, including premature death from diabetes and heart disease (Falbe et al., 2016).

The purpose of this paper is to describe a community-academic partnership that supported and analyzed the feasibility and impact of using shared medical appointments (SMA), combining group health education and brief individual provider visits at a school based clinic. The group visit interventions, aimed at treating obesity, were implemented in three middle schools in highly underserved neighborhoods of Oakland, California during the 2013-2014 academic year. We report findings on short-term and 18-month outcomes of these group visits, related to self-efficacy and self-reported change in eating and exercise habits, knowledge increase, and social support. We also note parent involvement at each site, and the extent to which adolescents reported sharing information they were exposed to in the interventions with their parents.

Background

Healthy eating and adequate levels of physical activity are key in preventing childhood obesity and type 2 diabetes. According to the American Academy of Pediatrics, children and adolescents should consume 5 servings of fruit and vegetables per day, perform moderate and vigorous physical activity greater than 60 minutes per day, and limit screen time (Daniels, Hassink, & Committee On Nutrition, 2015). However, one study found that only 9% of adolescents (12-19 years old) consumed more than 5 servings of fruits/vegetables per day, only 32% had more than 1 hour of physical activity per day, and over 70% reported more than 2 hours of screen time per day (Foltz et al., 2011). Obesity prevention is a priority given the health

consequences that overweight and obese children and adolescents face, including early heart disease, diabetes, and metabolic syndrome, along with psychological ramifications, such as teasing, discrimination, and victimization (Griffiths, Parsons, & Hill, 2010; Lloyd, Langley-Evans, & McMullen, 2012).

Shared medical appointments (SMAs), have been used to address pregnancy (Klima, 2003) and chronic conditions, such as diabetes, asthma, and obesity (Kong et al., 2013). SMAs provide patients with additional opportunities to develop self-management skills and to incorporate health education messages within the context of their daily lives (Lavoie et al, 2013). The group education component of the SMA varies by program and may be facilitated by the medical provider, dietitian, health educator or other trained clinic staff (Falbe, Cadiz, Tantoco, Thompson, & Madsen, 2015).

SMAs within community-based clinics have been shown to increase participant knowledge, social support, and clinic financial sustainability (Falbe et al., 2015), although some clinic-based pediatric programs have had problems with client retention (Srivastava et al., 2018). Effects of SMAs involving Latinx children from 5 to 12 on physical indicators, such as BMI, weight, and triglycerides, have been mixed (Falbe et al., 2015). Even with similar treatment models, differences in intervention length, content and frequency can affect the consistency of results (Whitlock, O'Connor, Williams, Bell & Lutz, 2010).

School-based health centers (SBHC) are feasible and ideal places to develop and test multicomponent, group-based obesity prevention

programs, including SMAs. They are most often set in communities with a high proportion of low income and minority youth (School Based Health Alliance, n.d.), and are seen as a trusted site by youth who rarely access care in traditional medical settings (Keeton, Soleimanpour, & Brindis, 2012). SBHCs have been shown to successfully recruit and retain older adolescents (ages 14-17) in group interventions (Love-Osborne, Fortune, Sheeder, Federico, & Haemer, 2014). Over 85% of SBHCs already offer individual nutrition, fitness or weight management programs and over 45% offer some form of group education about these issues (School Based Health Alliance, n.d.). To our knowledge there have not been published reports of SMAs treating obesity in SBHCs serving 11-14 year-olds.

In addition, SBHCs have the potential for participating in healthy lifestyle and other school climate improvement initiatives, led by school nurses and staff, that have been shown to contribute to positive behavior changes, such as managing chronic illnesses, including asthma, obesity and mental health conditions; providing reproductive health services for adolescents; and delivering preventative care such as immunizations (Keeton, Soleimanpour, & Brindis, 2012). Recent examples include programs to increase access to breakfast and exercise opportunities for 6^{th} to 9^{th} graders (Hoelscher, Moag-Stahlberg, Ellis, Vandewater, & Malkani, 2016) and promotion of locally grown ethnic produce through classroom tastings and home cooking activities for 5 to 8 year olds (Q. Chen et al., 2014). Targeting the eating behaviors of youth is important as youth have the

power to change the purchasing behavior and eating habits for themselves and their families (Calderon et al., 2016).

A recent study also suggests that increased self-efficacy is associated with decreased BMI in overweight and obese children ages 7 to 12 (J.-L. Chen & Kwan, 2016). According to Bandura (1977), an individual's perceived self-efficacy, or ability to make effective changes, will influence their behavior choices and coping mechanisms. Although changes in BMI and weight are frequently utilized to demonstrate efficacy of group interventions, changes in behaviors, such as diet and exercise in adolescence, are also critical components of obesity prevention, given that adolescence is a time of establishing health behaviors that will continue into and through adulthood (van Hoek, Feskens, Bouwman, & Janse, 2014). In a meta-analysis of adolescent obesity prevention studies using social cognitive theories, intention to change has been found to be a strong predictor of actual changes in physical activity (Plotnikoff, Costigan, Karunamuni, & Lubans, 2013). Therefore, measurement of increased knowledge and self-report of changes in behavior can also be used to measure program effectiveness.

Study Aims

The specific aims of this study were to:

1. Explore the feasibility of group intervention in three diverse SBHCs, including school site acceptability, recruitment and retention of participants, and acceptability of the intervention

2. Examine the impact of the group intervention in three diverse SBHCs on changes in diet and exercise habits, self-efficacy and knowledge related to healthy eating, and social support
3. Elucidate how early adolescents interpret the impact of an obesity treatment group on their own and their family's knowledge, attitudes and behavior

Method

Design

A learning collaborative, consisting of three school based health center (SBHC) staff and providers, the University of California, San Francisco (UCSF) School of Nursing faculty and students, Alameda County Health Department nutritionists, and Center for Healthy Schools and Communities staff met to plan, support, coordinate and evaluate these efforts. Members of this team met almost weekly over a 6-month period to share culturally appropriate, evidence-based curricula, develop criteria and methods for evaluation, and share strategies for parent engagement. School nurses were co-located in and partnered with each of the SBHCs in some of the health settings, but were assigned to multiple schools and were unavailable to participate in the interventions. As a community-based partnership, research methodology was developed jointly by the academic and community partners named above. This process was crucial to the development of trust and agreement on outcomes and the tools necessary to measure them (Belone et al., 2014). This study was approved by the UCSF IRB and by appropriate committees of

the participating clinics. UCSF's partnership with the SBHC was supported by the Atlantic Philanthropies' Elev8 initiative (see Schapiro, Green, Gutierrez, 2016).

Through this process, group visit interventions were implemented in three different school health centers. This study utilized a mixed-method research design, including qualitative measures, which is particularly helpful for evaluating community-based projects, specifically, understanding the process of intervention development and implementation, participant reactions, and context (Creswell, Klassen, Plano Clark, & Smith, 2011; Greene, 2007). The research questions and methodology emerged out of the community collaborative meetings (Creswell et al., 2011). A pre-post design was utilized with pre- and post-intervention surveys, and focus group evaluation immediately and 18 months post intervention. The intervention period lasted between 6-10 weeks at each site (See Table 1).

Setting

Three school sites were included in this study (labeled 1, 2 and 3 to protect confidentiality). The three middle schools chosen for the intervention were located in medically underserved areas of Oakland, California with over 71% of students eligible for free and reduced lunch (Oakland Unified School District, 2014). All three sites offered regular physical education classes. Sites 1 and 2 had similar population demographics. Although Site 3 had a larger proportion of Asian immigrant students, participants in the intervention at all 3 sites were African American or Latinx. Each site varied in

degrees of access to healthy foods, neighborhood cohesion, and histories of parent involvement in school activities. Although initiatives were underway in the District to improve the nutritional quality of lunches and snacks, sweetened beverages and calorie-dense snacks were available at school sites at the time of the intervention.

Recruitment and Participants

Each site made individual decisions about recruitment, depending on whether the program was held before, during or after school, and whether there was a whole-school component to the intervention, as in Site 3. (See Table 1). Two of the sites (Sites 1 and 3) made formal classroom presentations to youth about the proposed project, and accepted students whether or not they met inclusion criteria of BMI criteria (>85%). Site 2 combined recruitment with a school-wide BMI screening, conducted with the help of UCSF Nurse Practitioner (NP) students.

Procedures

The interventions used an SMA model with a group education component. Participants were pulled out of the group for brief individual NP visits at Sites 1 and 2, and the NP visits were conducted separately at Site 3. The programs were facilitated by health educators, dietitians, NPs, and behavioral health providers. Curriculum themes were similar across all three sites and focused on nutrition, physical activity, body image and social emotional health specifically tailored to youth. Pullout visits provided an opportunity to assess individual behaviors, health risks and questions related

to the topic for each week. All three interventions included a family component where families were integrated into the program and involved in active learning at least once during the intervention.

The SMA model was adapted by each clinic from a self-sustaining model developed in a neighboring county for Latinx school-aged children in a clinic setting, consisting of 10 weekly parent-child interactive groups, brief individual pullout provider visits, and bilingual-bicultural clinic staff who reached out to parents between sessions (Falbe et al., 2015). Basic Federal guidelines for curriculum were adapted to each site (See Table 1). In order to maximize uptake of the intervention and acceptability to the school, each site customized group visits to the particularities of its own site, with varying degrees of focus on elements, such as stress reduction or food justice. For example, each site negotiated the best time of day for the intervention with their school administration, which impacted their fidelity to the SMA model. Each clinic also made individual decisions about how they were going to bill for the group visits, and all of the sites had additional external funding to that being offered by the University's grant-supported contributions. This diversification of funding promoted shared power dynamics. However, individual mandates from each site's funders led to additional site specific modifications, such as a weekly exercise session in Site 2, and both movement and mindfulness at Site 3. In addition to the differences in SMA implementation discussed above, Site 3 integrated participants into school wide health and food justice interventions, including teacher wellness, health

fairs and additional parent events. For additional comparisons of common components across sites and differences, see Table 1.

Measures

For quantitative measures, a quasi-experimental design employed pre- and post-test evaluation surveys, administered right before and after the group intervention. All data received by UCSF researchers was de-identified and stored on encrypted computers with secure back-up.

Feasibility and retention were assessed by the number of participants invited to the study, the number of students enrolled in the intervention, the number of students who completed the baseline assessment, the number of students who completed the follow-up surveys, and number of eligible students who participated in focus group interviews (See Figure 1).

Short term impact was measured by a 16-item questionnaire asking participants about behavioral outcomes, including food intake, activity, knowledge, self-efficacy on choosing healthy food, being active, and perceived support from their peers. The questionnaire incorporated questions from an adapted version of the California Healthy Kids Survey (CHKS) for fifth grade (WestEd, 2016), a statewide survey administered in grades 5, 7, 9 and 11; and a Power Play!School and Idea Resource Kit (SIRK) survey (Baranowski et al., 2000). Both CHKS and SIRK have demonstrated adequate reliability and validity (Baranowski et al., 2000; WestEd, 2016).

For qualitative measures, focus groups were conducted by UCSF faculty and staff in English, using semi-structured interviews and interactive

activities for the youth participants. Incentives for program participation are described in Table 1, each participant received an additional $10 gift card as an incentive to attend the post intervention focus group. Focus groups were audiotaped with co-facilitators also taking notes. Guiding questions covered the following domains: what intervention activities were challenging, liked or disliked, how participation changed the way the youth thought about their eating and physical activity, the role of family in the program and in their learning, how the program impacted their home environment, skills learned and their application in the future, and how the program could be improved.

Data Analysis

For quantitative data, descriptive statistics, means, and standard deviations for the quantitative variables, as well as frequencies and percentages for categorical variables, were calculated for all of the survey variables. Linear mixed models were used for the analysis of the differences in repeated measurements (such as differences in before and after intervention) and the differences between groups are modeled as a random effect. Because of their advantage in dealing with missing values, mixed effects models are often preferred over more traditional approaches such as repeated measures ANOVA. All statistical analyses were performed with SPSS 22 for Windows. Data are expressed as mean ± SD. Level of significance was set at $p < 0.05$.

For qualitative data, with a small number of focus groups and participants, we used thematic analysis to highlight emerging themes (Braun

& Clarke, 2006). Thematic analysis is performed by familiarization with data, generating initial codes, searching for patterns or themes across the data set among codes, reviewing themes, defining/naming/combining/collapsing themes, and producing the final report (Braun & Clarke, 2006). Themes were identified from the most relevant patterns across interviews in relation to the research aims. Excel and Atlas.ti, a qualitative software program, were used to manage analysis. Steps to ensure trustworthiness of qualitative data included the use of transcript quotations to capture portrayals of authentic and multiple voices (credibility), thorough documentation of each step of data collection and analysis (transferability), and demonstration that the conclusions of the researchers were clearly derived from the data (confirmability) (Quinn & Fantasia, 2018). The sites each kept records of their own implementation of the intervention on encrypted computers, all of which lends itself to the dependability and replicable nature of the intervention and analytic process.

Results

Feasibility

A total of 71 children were enrolled in the study (sample size from 8 to 45 per site). Across all sites, students were in grades 6-8 and had equal gender distribution. About 40% to 79% of participants completed a post intervention assessment, depending on the site (See Figure 1). Each site used a different recruitment method (See Table 1). All sites accepted

students whether or not they met BMI cut-off for overweight (>85%), in order to avoid potential stigma associated with participation (See figure 1).

All three sites reported that they were able to negotiate specific times for pulling youth out of classes or other activities, and that they were able to reserve classrooms or other space outside of the SBHC for specific activities. The early morning timing agreed on at Site 3 had two drawbacks: the SMA was harder to implement at that time of day, and this site had more difficulty with retention (see Figure 1).

As detailed below, participants reported satisfaction with the program, and stated they would want to repeat the experience. Sites 1 and 3 were each able to engage with parents three times during the course of the interventions, however, Site 2 reported difficulties with parent participation. Focus group recruitment and permissions were the most challenging part of the study, and none were conducted at Site 3. There is high student mobility within the District, and only those participants who were in 6th grade during the initial intervention were available for 18-month focus groups.

In terms of sample participation, all students at Site 1 who were in the 18 month focus group had also participated in the immediate post-intervention focus group. At site 2, some students participated in only the immediate post intervention focus group, others only in the 18 month focus group, while still others participated in both.

Impact: Short-Term Outcomes

On the last day of the intervention, children completed the post survey and reported trends toward increases in the following categories: intentions to eat raw or whole fruit, eat vegetables, have tried a new fruit or vegetable, and physical activity (See Table 3). Decreases were reported in the following categories: eat French fries or chips and soda consumption. Linear mixed model statistical analysis was used to examine the efficacy of the program on children's short term outcomes. Results of the analysis found statistically significant improvement in children's health outcomes after the intervention (See Table 2). We found a significant decrease in drinking soda ($F = 5.69$, $p = .02$), increased support from classmates and an increase in the number of days of physical activity ($F = 7.30$, $p = .008$), and children's physical activity knowledge ($F = 8.371$, $p = .01$) at 3 months follow up.

Youth Interpretation of Impact: Focus Group Findings

All participants completing the intervention completed post surveys and were offered participation in the focus groups. Immediately after the intervention, we conducted one focus group at Site 1 (n=8) and three focus groups at Site 2 (n=13). Follow-up focus groups were completed at sites 1 (n=4) and 2 (n=4) 18 months later. Attempts were made to recruit parents for focus groups in English or Spanish, however, only three parents at Site 1 were interviewed. Given the small number, this component was dropped as part of the evaluation.

In the immediate post intervention focus groups and the 18-month follow up groups, there was more overlap than divergence in the lessons and

themes discussed. Because of this overlap, the qualitative results and themes from both time points are reported together, unless otherwise indicated. Students in the focus groups reported an overall appreciation for the program and a willingness and desire to participate in something similar to it in the future, including before or during high school. The young people who participated described four dimensions of the experience reported below. Brand names of snack foods have been removed from quotes.

Memorable/most enjoyed aspects of the program: "Things you can experiment with…". Students in the focus groups particularly endorsed peer learning, and interactive activities as the most engaging and enjoyable. Eighteen months following the intervention, the students described the hands-on lessons in detail, such as visiting the corner store where they read nutrition labels and bought $5 worth of healthy snacks. One girl reflected on a new healthier snack she discovered as part of the field trip: "*The [store brand] banana chips…I love those now*". As a cohort of younger adolescents, their enjoyment and memory of tangible experiences in comparison to a lecture style presentation is developmentally appropriate. Other highlighted interactive activities included cooking lessons and a hip hop dance class. These were identified and remembered as 'better' and 'more enjoyable' than other lessons that reviewed the food pyramid or the concept of BMI on a red-yellow-green scale, indicating obese, overweight and healthy ranges.

Incorporating stress and mindfulness: “Calm down our stress so we don’t eat too much”. Of note is that students remembered lessons about stress management and its relation to obesity and healthy eating. They enjoyed an interactive lesson on stress designed to show the cumulative effects of stress, in which they observed how shaking a bottle of soda water led to increased pressure and finally, explosion. One student recalled: “The thing was because every time when you’re stressed, you feel like eating, and we’re like trying to calm down our stress so we don’t eat too much.” Learning both the relationship of stress and eating and how to alleviate stress with mindfulness activities were important take home messages.

Program impact and student accomplishments: “I used to be at yellow, now I’m at green”. Students reported various interpretations of the program’s impact and their accomplishments since completing the program. Participants described how they became more physically active after the intervention by walking and playing sports. They also described being more aware of how junk foods could affect them and that they made positive changes in their diet. One student said: “I don’t eat as much junk food, I used to go to the store every day and buy hot chips, but now I don’t.”

Some students reported using distraction techniques, such as drinking a bottle of water instead of eating, while others relayed their new commitment to various vegetables and other healthy ways of eating. In the first set of groups, students reported that trying new foods (for example,

papaya, broccoli, mushrooms, smoothies) discussed during the intervention helped open them up to eating more fruits and vegetables. At the 18 month follow up, one young girl described her and her mother's weight loss as a proud accomplishment since the program: "*My mom lost like 20 pounds, I lost like 10 to 15. I did*", while another described how he had changed his eating habits since the program: "*I didn't know about how the food affected you, so I would eat whatever I wanted. And yeah, now I don't."* Students described how they were now aware of nutrition labels and which foods the school provided that are unhealthy. One student stated: "The food in the school has too much like calories and sugar – my school sells soda and chips, but tell us to be healthy, it's not fair." Students felt the obesity treatment group had positively influenced their knowledge and behaviors as evidenced by their pride in accomplishments and their enthusiasm for participating in future obesity and health related programs.

Parental and family involvement and impact: "We don't eat stuff we used to". Family involvement in the interventions varied across the sites and included parent and child lessons and dinners, youth sharing what they learned, and an evaluation by the student of their family's food practices, values, and health goals. At three of the four initial focus groups, students said they did not talk to their parents regularly about the program and many did not do the homework assignments with their parents. However, students who attended the 18-month focus groups at two sites reported that they had shared information with their parents throughout the program, and that

parents had changed food purchasing, what they served the family, and various messages parents conveyed to the youth about healthy eating. Students talked about learning to make healthier versions of foods their families already ate, such as quesadillas. One student reflected: “I didn’t know about reading the nutrition facts and my mom didn’t know about them. Now she checks everything, I mean everything, even the water. And she always gets the fresh fruits.” Another student stated: “We used to have a bowl with [candy]; now we have a bowl with fruit.”

Although we were not able to conduct formal parent focus groups, we did interview three parents at Site 1. Two initial findings from the interviews were parent frustration with their children’s oppositional behavior in early adolescence, and a suggestion that perhaps the intervention should be conducted before sixth grade.

Discussion

This study describes the feasibility and impact of group obesity interventions in 3 SBHC-connected sites on youth attitudes and behaviors regarding healthy eating and exercise habits. The collaborative in our study and the three sites intentionally addressed health issues on multiple levels in accordance with socio-ecological theory, as have other obesity prevention interventions (Kong et al., 2013; Sussman et al., 2013).

Feasibility

Feasibility studies are designed to determine whether a study can be conducted or a project can be implemented (Eldridge et al., 2016). We were

primarily interested in ascertaining whether SMAs for obesity and physical activity could be approved and implemented in our school settings, if there were difficulties with recruitment and retention, whether the group interventions were acceptable to the participants, and whether parents would attend some sessions. There were challenges with attendance in early morning sessions, as compared to during and after school interventions . Each site had its own challenges with parent involvement, though Sites 1 and 3 each conducted 3 parent sessions with food demonstrations and parent-child activities. Family interventions in other studies have included telephone calls to caregivers by SBHC clinicians or staff, mailings reinforcing skills, or inclusion of the parent in the actual intervention sessions (Gillis, Brauner, & Granot, 2007; Kong et al., 2013), Other interventions focusing on children in high poverty neighborhoods cite long work hours and lack of transportation as barriers to parental involvement (Srivastava et al, 2018) and suggest that school programs search for creative ways and times to involve parents (Johnston & Moreno, 2014). Study authors have found focus group recruitment to be particularly challenging in middle school settings, even with incentives, and involving school nurses and staff and allowing more time for recruitment may be helpful. While the intent of this project was exploratory and formative in nature, evaluation measures (pre and post-testing, as well as focus groups) allowed for documentation of each pilot project, helping to ascertain the nature and variability of the intervention within each contextual setting.

Our study suggests that SMA obesity prevention can be implemented at SBHCs. Survey results showed a decrease in soda consumption and a self-reported increase in eating raw or whole fruits, eating vegetables, and trying a new fruit or vegetable. These positive eating behaviors were also mentioned during focus group interviews, and indicate changes not only at the individual child's level, but also at the family level. Students in focus groups at the time of the intervention stated that they did not bring health information home to parents, but the 18 month follow up groups reported that they had in fact shared this information and that their parents had made significant changes in family purchasing and eating habits. Hands-on intervention activities that were built into the SMA groups, such as corner store shopping trips and a carbonated water bottle stress experiment, were recalled favorably by participants at 18 months, and these experiences may have prompted behavior-changing discussions with their families. These assertions may have been influenced by reporting bias, and there was no way to verify the assertions with parents, observe the participants' health behaviors, or to compare behavior changes with youth who had not been part of the intervention. To date, studies have not evaluated specific mechanisms by which information learned at school helps change family behaviors. Students reported changes in family purchasing and eating habits even at a site with minimal direct family involvement, although it is important to note that focus group participants at month 18 represented only a small sub-sample of those who participated in the initial intervention.

These initial findings point to the importance of studying the dynamics of information exchange and family adoption of healthy behaviors in future studies, as well as the potential influence of concurrent community activities, such as publicity about efforts to pass a local soda tax.

Our participants endorsed the challenges noted in previous studies of maintaining healthy eating and exercise habits in schools that provide limited availability of healthy food, drink and exercise opportunities, including reduced physical education requirements (Caballero et al., 2003; Sussman et al., 2013). Despite these challenges, our survey results found increased support from classmates and an increase in the number of days of physical activity and children's knowledge regarding the recommended levels of physical activity. The increased support noted from classmates speaks to the added benefit of group interventions. The intervention was designed to intentionally create a safe and nurturing network of peers to support healthy living and mitigate some of the impacts of negative peer pressure and the school environmental context that was often counter to the messages that they were receiving through the intervention.

Focus group participants reported involvement in physical activities and/or interactive sessions, such as hip hop or cooking demonstrations, as one of their favorite parts of the program. Improvement in the amount of physical activity is critical in healthy weight management and prevention of childhood obesity (van Hoek et al., 2014; Whitlock et al., 2010). Although youth reported more physical activity, they were not specific about the type

of activity in which they engaged. This aspect of the program should be explored in more depth in future studies, assessing what factors might contribute to successful outcomes or factors that may serve as barriers, such as unsafe environments, cost, and individual preferences. Hands-on activities like those included in our programs can encourage participants and promote behavior change (Johnston & Moreno, 2014). Our results are also consistent with previous studies suggesting that culturally appropriate interventions can improve the health behaviors of children (Falbe et al., 2015; Johnson, Weed, & Touger-Decker, 2012). Food is one expression of culture, and participants were able to explore their own relationships to food, within the context of their specific culture. These well-received, tangible experiences enabled participants to look at food choices and adjust their traditional meals to be healthier.

Community-based participatory research (CBPR) can contribute to intervention research by bringing together local and culturally appropriate practices with academic approaches, and highlight challenges in the areas of external validity, implementation of evidence-based interventions, university control of resources, sustainability and historical lack of trust (Wallerstein & Duran, 2010). Interventions at Site 1 and Site 3 incorporated deliberate conversation and lessons about systemic food insecurity in impoverished urban areas with the intention of planting seeds of agency. We explored the broader context of social justice and the impact of food deserts, media, marketing, and environmental racism which helped deepen the connection

of the participants' food choices to their material reality. Though our interventions did not specifically incorporate youth activism, we intended to inspire students to develop agency for future community-based participatory action research and advocacy. Future CBPR projects in schools could explore this further.

The increasing disparities in obesity rates between white youth and youth of color (Falbe et al., 2016), and the impact of minority status and poverty on obesity (Iannotti & Wang, 2013), highlight the urgency of effective and sustainable obesity prevention and treatment. Most SBHCs in the US are located in low-income and minority communities (School Based Health Alliance, n.d.), and with their easy accessibility for youth and families and focus on prevention, they may offer an ideal place to conduct group and population level healthy eating and activity interventions (Keeton, Soleimanpour, & Brindis, 2012). This initial pilot study highlights the need for further research with larger numbers of students, and outcome measures that can track specific program components, such as the results of hands-on activities, but which also allow for measurement of local variations in the intervention being implemented, such as an emphasis on food justice.

Strengths and Limitations

This analysis presents results from interventions at three different sites with different recruitment strategies, funding avenues, program models, and follow up. Although all three sites used group interactive health education, only two sites used a formal SMA model and had follow-up focus groups,

while the third site followed some of the participants in medical visits during and after the intervention. One potential limitation of multi-site CBPR is accounting for and incorporating the individual competing requirements, program funding and implementation and data collection methods into the final analysis. For example, in this study, we were unable to analyze gender and ages across sites due to missing data. We were also unable to recruit Asian youth and families in the one clinic with a large Asian immigrant population, nor were we able to conduct a focus group in this clinic. Each clinic individualized recruitment and follow-up methods, so it was difficult to compare initial enrollment and retention figures. Building on the trust developed during this CBPR process, future studies could start by developing joint research questions and conducting trainings for all partners in research methods needed to answer those questions (Davis et al, 2017). Including more clinic, school nursing and school staff in the early stages of future study planning, could strengthen consistent data collection in future studies.

In addition, the small sample sizes (n=71) limited our analysis of the significance of various behavior changes, since only drinking less soda, perceiving additional support from classmates and exercising more days of the week rose to the level of statistical significance in the pre-and post-surveys. Additionally, due to the small sample size, we chose to pool the results for analysis, which does not allow for evaluating each site individually-and therefore, limits the ability to tease out the impacts of intervention dose, time of day, and SMA vs. alternative models. The great

variability within each of the three sites may also have impacted the overall results. Future research should include larger samples, and ensure partner participation in and agreement to a consistent bundle of intervention strategies with individual site enhancements, in order to strengthen evaluation within and across sites. It would also allow for comparisons to schoolwide survey results to better discern the impact of the interventions on different profiles of participants. The relatively long delay in follow-up data collection at 18 months may have also contributed to an under-representation of the program's results, given the difficulty of tracking this mobile population, the age of the participants and their potential recall capacity. Future studies could plan to capture data at more frequent and proximal intervals (e.g., six months, 12 months).

With limited parent input, researchers were not able to report their views on the impact of youth interventions on family attitudes and behaviors. Challenges in recruitment, setting up the activities, obtaining consistent follow up in community settings, and obtaining timely parent consent are areas for consideration for SBHCs or schools in general looking to implement similar interventions. Perhaps including more clinic, school nurses and school staff in the early stages of future study planning, could strengthen consistent data collection in future studies.

Despite these limitations, this study successfully utilized a CBPR approach and evaluated the effectiveness of adopting group obesity and physical activity interventions in middle schools located in low income,

minority neighborhoods. As noted above, CBPR methods supported the incorporation of social justice and critiques of the availability and cost of healthy foods in both neighborhood convenience stores and the schools in which the studies were located, and suggested further avenues for youth advocacy in the future. The trust developed among academic and community partners during this pilot study may allow for greater consistency in future interventions and in data collection. Two sites found that the SMA model could be integrated into a school day or an after school program. The experience of Site 3, with early morning groups separated in time from provider follow-up, suggests that SBHCs can experiment with the model to find the best fit for their site and the needs of the partnering school.

Utilizing both pre and post intervention surveys and focus groups enabled the team to examine the intervention's impact on diet and physical activity habits, and knowledge and attitudes related to healthy lifestyles over a period of more than 18 months. Although our 18-month sample was small, we were encourage by the vivid and detailed recall of hands-on activities in the 18 month focus groups, suggesting that the group interventions facilitated the retention of knowledge, such as mindful eating or reading food labels, that could not be transmitted effectively in traditional provider visits. It is possible that less intensive refresher sessions, which build upon hands-on activities, might be effective in maintaining changes in attitudes and behaviors. It will be important to examine many specific indicators to measure change, such as minutes of physical activity or BMI, in order to

counter the potential reporting bias in focus groups and its influence on how we report overall program impact.

Implications for School Nursing and Next Steps

This study detailed ways in which group obesity interventions based in SBHCs have the potential to change knowledge, attitudes and behaviors. SBHCs, together with school nurses, are well positioned to recruit and advocate for these types of interventions. Given school nurses' interactions with young people and their focus on prevention, obesity interventions are an ideal area for collaboration between school nurses and SBHCs. In many settings, school nurses collect standardized BMI information, and could be the first point of contact for students and a referral source for SBHCs. With different opportunities for interacting with students, school nurses and SBHCs could independently follow up with promoting positive behavior change and referring for more intensive intervention if needed. Given the difficulty in recruiting parents and retention, school nurses may well contribute to the effort of reaching and enrolling parents.

The youth follow-up groups also helped suggest next steps in school-based obesity interventions and research: refinement of interactive and hands on lessons, continued incorporation of mindfulness and stress reduction techniques, creative ways to involve busy families, and the need to study the mechanisms by which health promotion knowledge passes between child and parent, rather than just parent to child. Youth also noted the discrepancy between the lessons on diet and the lack of access to

healthy foods in their schools and neighborhoods, areas of advocacy, which ongoing CBPR could help reinforce. Finally, youth expressed a desire to repeat the program in or before high school, and future interventions could connect high schools with their feeder middle schools for potential peer support and longer term support towards healthy communities.

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Figure 1: SBHC Group Obesity visit Prevention Study participants recruitment and retention

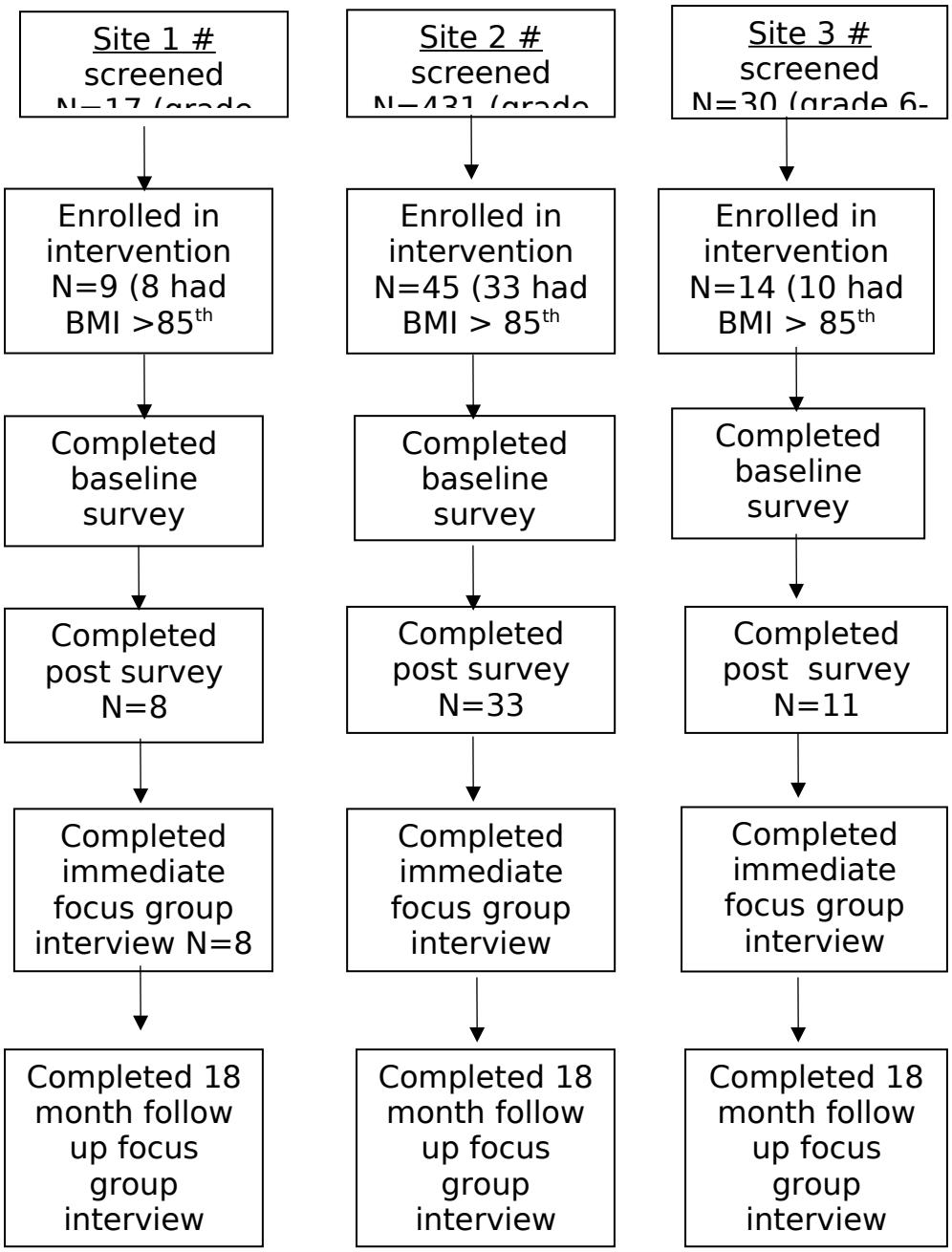

Table 1. Comparison of Program Components

	Site 1	Site 2	Site 3
Recruitment	Short presentations in after school program classes, presented as after school enrichment program elective option	Youth with elevated BMIs identified through schoolwide screening then offered participation in 2x/week pull out from PE program	Publicized classroom portion as before school morning elective, encouraged clinic patients with elevated BMI to attend, snowball recruitment
Parental consent	Required		
Prescreen in clinic	Pre-intervention appt with clinic NP	Pre-intervention appt with clinic NP	No
Incentives for attendance	$5 gift card for youth, water pitchers/mixing bowls for parents	Class credit for PE	$20-40 gift cards, depending on # of sessions attended
Number of sessions	10 SMA, 55 min	9 SMA, 55 min, plus weekly exercise session	6 wks, 4 sessions/wk, 30 min (2 Ed, 1 behavioral health, 1 movement)
Education Component Facilitator	Nutritionist, NP reinforcement, Health Educator	Health educator, NP reinforcement	Health Educator, Behavioral Health Clinician
Medical Visit	Pullout during group	Pullout during group	Seen at other times
Nutritional components	Curriculu, adapted from We Can! https://www.nhlbi.nih.gov/health/educational/wecan/		
Youth activities	Cooking, corner store challenge, reading food labels	Cooking, snack preparation	Cooking, food justice components, youth leadership in school-wide health events
Physical activity component	No	9 wks, provided by local nonprofit	6 wks, Mindful movement, provided by local nonprofit
Sedentary activity reduction	No		

component			
Emotional Stress Reduction Component	Present		
Parent engagement meetings with dinner	3	1	3
Post Intervention Follow Up	Individual clinic visits	Additional stress groups, individual clinic visits	Individual clinic visits
Funding	Alameda County Health Care Services Agency, UCSF Elev8 (Atlantic Philanthropies)	Safeway Foundation/Childre n's Oakland Research Center	Hallways to Health (National School Based Health Alliance)

Table 2. SBHC Student Baseline & Post Intervention Survey Outcome Data (mean and SD)

Item	Baseline	Follow up	F (p)
*During the past 24 hours, how many times did you eat fast food?	.5 (.9)	.67 (1.01)	.057 (.81)
*During the past 24 hours, how many times did you drink a glass of can of soda?	1.6 (1.4)	1.10 (.93)	5.69 (.02)
*During the past 24 hours, how many times did you eat French fries or chips?	1.2 (1.3)	1.10 (1.07)	.27 (.61)
*During the past 24 hours, how many times did you eat any raw or whole fruit?	2.2 (1.4)	2.69 (1.32)	3.28 (.07)
*During the past 24 hours, how many times did you eat vegetables?	2 (1.6)	2.25 (1.53)	.56 (.46)
*In the past 7 days, I have tried a new fruit or vegetable (% of YES)	43.7%	57.7%	2.37 (.09)
*Number of days of exercise (60 mins per	3.9 (2.21)	4.80	8.37

day)		(2.21)	(.01)
**Soda and chips give me energy for my day (low score better)	1.8 (1.0)	1.90 (1.02)	.26 (.62)
**What I eat makes a difference in how my body feels (low score better)	1.0 (1.2)	.85 (.80)	.49 (.49)
**Emotions can impact the choices I make for my body (low score better)	1.1 (1.1)	.96 (.98)	1.25 (.27)
***I can ask my family to buy fruit and vegetables that I like to eat (low score better)	.5 (.8)	.37 (.63)	3.24 (.08)
***I can choose fruit or vegetables over chips for a snack (low score better)	1.0 (1.0)	.76 (.86)	.87 (.35)
***When I want to eat healthy food, I can find it easily (low score better)	.5 (.8)	.58 (.75)	.18 (.68)
***I feel support from my classmates (low score better)	1.4 (.9)	.90 (.87)	7.30 (.008)
***I am proud of the choices that I make (low score better)	.8 (.8)	.66 (.61)	3.02 (.09)
***I can achieve goals I set for myself to eat healthy and exercise (low score better)	.8 (1.0)	.69 (.86)	1.93 (.17)

*=Behaviors, **=Knowledge, ***=Self-Efficacy All Self-reported