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An Adaptive Community-Based Participatory Approach to Formative Assessment With High Schools for Obesity Intervention*

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Abstract

BACKGROUND—In the emerging debate around obesity intervention in schools, recent calls have been made for researchers to include local community opinions in the design of interventions. Community-based participatory research (CBPR) is an effective approach for forming community partnerships and integrating local opinions. We used CBPR principles to conduct formative research in identifying acceptable and potentially sustainable obesity intervention strategies in 8 New Mexico school communities.

METHODS—We collected formative data from 8 high schools on areas of community interest for school health improvement through collaboration with local School Health Advisory Councils (SHACs) and interviews with students and parents. A survey based on formative results was created to assess acceptability of specific intervention strategies and was provided to SHACs. Quantitative data were analyzed using descriptive statistics while qualitative data were evaluated using an iterative analytic process for thematic identification.

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RESULTS—Key themes identified through the formative process included lack of healthy food options, infrequent curricular/extracurricular physical activity opportunities, and inadequate exposure to health/nutritional information. Key strategies identified as most acceptable by SHAC members included healthier food options and preparation, a healthy foods marketing campaign, yearly taste tests, an after-school noncompetitive physical activity program, and community linkages to physical activity opportunities.

CONCLUSION—An adaptive CBPR approach for formative assessment can be used to identify obesity intervention strategies that address community school health concerns. Eight high school SHACs identified 6 school-based strategies to address parental and student concerns related to obesity.

Keywords

child and adolescent health; community health; health policy; nutrition and diet; physical fitness and sport; school-based clinic

Recent years have seen an epidemic of obesity arise among the pediatric population of the United States. Obesity prevalence has tripled among school-aged children since 1980 and the current estimate of obese children and adolescents, aged 6–19 years, in the United States is 18.7%.¹ The development of type 2 diabetes mellitus is probably the most worrisome manifestation of the current obesity epidemic. Type 2 diabetes is preceded by a state characterized by relative insulin resistance and hyperinsulinemia leading to a constellation of metabolic derangements that include hypertension, dyslipidemia, and impaired glucose metabolism called the metabolic syndrome.^{2,3} Population prevalence studies have found that 12% to 44% of obese adolescents in the United States already meet criteria of having the metabolic syndrome.⁴ Unfortunately, the development of metabolic syndrome in childhood has long-term implications as affected children are more likely than their peers to develop type 2 diabetes 25 to 30 years later as adults.⁵ This relationship illustrates the need for early intervention and establishment of healthy living habits prior to adulthood.

Previous research has shown efficacy of interventions aimed at improving diet and physical activity in adolescents.⁶ This is encouraging because adolescence is a period not only of significant cognitive development, but also a period of establishing living habits that often persist into adulthood.⁷ A promising venue for adolescent obesity intervention is in schools where students spend much of their time and consume up to 2 meals per day. However, school-based interventions aimed at decreasing body mass index (BMI) have met with mixed results.⁸ A possible explanation for the disappointing trend may be the context in which these studies are developed. Nearly, all reported school health interventions have been carried out by university-based research teams but very few studies have examined the efficacy of interventions arising from within the community.⁹ In a recent systematic review, Summerbell et al⁶ argued that stakeholder opinions (parents, schools, etc) should be considered in the design of school-based obesity interventions and that doing so is likely to increase the efficacy of such studies. Encouragingly, interventions where researchers utilize the opinions and desires of community stakeholders have been successful among elementary students.¹⁰ Unfortunately, relatively few studies have been carried out in high schools. Recent reviews of adolescent and childhood obesity interventions have included 3/19,⁸ 1/18,¹¹ and 2/25¹² studies that include any high school-aged students. Of those 6 studies, only 4 were targeted specifically at high school students.

Consistent with calls⁶ for researchers to include community stakeholders in the design of school-based obesity interventions and in an effort to expand obesity intervention research into high schools, we formed alliances with 8 high schools and their communities to identify strategies to promote healthy eating and physical activity. This article describes our efforts

in designing a school-based intervention for high schools that is consistent with scientific evidence and which emerged from an iterative and collaborative process with numerous key stakeholders throughout the various school communities.

METHODS

Study Design Overview

Our study was guided by principles of community-based participatory research (CBPR). As such, there was strong emphasis on (1) building on and creating long-lasting alliances with local communities; (2) sharing of study findings with participants; (3) using strengths and resources existing within communities; and (4) creating a cyclical and iterative research process.¹³ We utilized a formative assessment research design, integrating both qualitative and quantitative data collection^{14,15} to promote bidirectional communication between researchers and study participants. Data collection efforts were divided into 2 phases (Figure 1). The first phase included both qualitative (phase 1a) and quantitative (phase 1b) data collection, carried out concurrently and independently of each other, with the goal of identifying aspects of student health that the school community showed interest in improving. Phase 1a featured semistructured interviews with high school students and their parents as well as the collection and integration of data from previously completed or current school health self-assessments. In phase 2, results from the first phase were used to create a survey, which was provided to School Health Advisory Council (SHAC) members from each participating school, to evaluate the acceptability of specific obesity prevention strategies.

Phase 1a — Student and Parent Interviews

Participants—We conducted semistructured interviews with a total of 7 overweight/obese students and 8 parents. Present and past weight status was obtained by self-report of participating students. Students were referred to the research team by SHACs and School-Based Health Centers (SBHCs). Parents primarily responsible for food preparation were interviewed. Project and recruitment information was presented to students and parents in a neutral manner emphasizing the importance of minimizing risks for cardiovascular disease and type 2 diabetes and taking care to avoid stigmatizing language regarding overweight or obesity. The final multiethnic student interview sample consisted of 2 African Americans, 4 Hispanics, and 1 “other.” The parent sample included 2 African Americans, 1 American Indian, 3 Hispanics, 1 non-Hispanic White, and 1 “other.”

Data Collection—Students and parents were interviewed by the principal investigator (ASK) and a medical anthropologist (ALS). Parents and students were interviewed separately. Adolescent and parent interview guides were designed to assess concordance of perspectives in the following areas regarding the problem of obesity: media use and information-seeking strategies, definitions of health, health concerns, strategies/approaches to weight loss, and barriers/facilitators to health in the school environment. In prior work (unpublished), the research team identified the importance of these issues as a basis for guiding subsequent interventional efforts. Interviews were conducted at times and locations convenient for the family (mostly in their homes and some at the university) and were audio recorded. Most interviews lasted approximately 1 hour and respondents were reimbursed \$20 for their time.

Data Analysis—Following an iterative analytic process, the multidisciplinary research team—representing diverse professional backgrounds and areas of expertise including medical anthropology, adolescent medicine, primary care nurse practitioner, health communications and CBPR—reviewed sets of 3 to 4 transcripts independently, identifying

key themes. Ongoing and concurrent data collection and analysis continued until 7 students and 8 parents had been interviewed, at which point the research team noted repetitions in the data being collected and reached consensus that the full range of organizing themes had been identified (data saturation). The qualitative data analysis software program NVivo8 (QRS International, Melbourne, Australia) was used to facilitate coding and text retrieval after the themes had been identified by the research team.

Phase 1b — School Health Assessments

Participants—Eight New Mexico high schools with SBHCs were recruited to participate. Our sample included schools from both rural and urban neighborhoods. Due to limited resources of this study, schools geographically closer to the university were given recruiting preference. In addition, the New Mexico Department of Health, Office of School and Adolescent Health, guided selection of schools with active and functioning SBHCs. Participating schools shared the following characteristics: (1) have an operating SBHC, (2) have a regularly meeting SHAC, (3) have > 500 students in total enrollment, and (4) serve a “majority-minority” population with greater than 50% of the student population designated as ethnic/racial minorities (Table 1). Schools meeting these criteria were purposefully recruited in anticipation of a future intervention.

Data Collection—Data regarding the health of the schools and areas for school change were obtained from the Healthy School Report Card (HSRC) and/or the Alliance for a Healthier Generation Healthy Schools Program Framework (HSPF). Completion of the HSRC had been previously mandated by New Mexico Public Education Department in 2008. The research team received formal training to assist schools in the implementation of the HSRC. This allowed for qualitative data collection through observation of discussion among SHAC members regarding the health needs of their schools. Two schools were also concurrently carrying out the HSPF.

The HSRC, developed by the Association for Supervision and Curriculum Development (ASCD), aims to allow schools to assess their environment based on evidence-based practices and engagement of school and community stakeholders.¹⁶ The evidence background for the HSRC came both from peer-reviewed literature as well as data collected from ASCD’s Health in Education Initiative, a school-community partnership.

The HSPF, developed by the Alliance for a Healthier Generation (a collaboration between the American Heart Association (AHA), William J. Clinton Foundation, and the Robert Wood Johnson Foundation), is an instrument for evaluating the current health environment of schools and also provides specific steps for improvement.¹⁷ The HSPF was developed by a panel of experts based on the 2005 Dietary Guidelines for Americans, AHA Pediatric Nutrition Guidelines, National Physical Activity Guidelines, National Physical Education Standards, and the National Health Education Standards.

Data Analysis—Both the HSRC and HSPF have centralized data analysis centers to which data is electronically submitted by the participating schools, independent of our study team. ASCD analyzes the results of the HSRC and returns to the school a list of areas for school improvements ranked according to how the school rated its importance and ease of affecting a change. Top suggested priorities were those that were rated very important and requiring very little effort to improve. The HSPF data analysis returns to the school a list of recommended strategies organized as “short-term goals” and “long-term goals.” SHACs shared these analyses and recommendations with the research team which allowed us to compare across schools for congruence of strategies and areas for improvements.

Phase 2—Survey of School-Level Obesity Intervention Strategies

Participants—In phase 2, we worked with existing school-community groups in charge of school health known as SHACs to determine specific acceptable strategies from areas identified in phase 1. SHACs represent an ideal forum for engagement regarding proposed school health initiatives because of their inherent ties and investment to the community and school as well as their permanence as standing local organizations dedicated to improving the health of students. SHAC members included students, parents/guardians, school-based health providers/nurses, health and physical education teachers, administrators, nutrition/food staff, and others interested in school health. In our sample, SHAC size varied from 5 to 19 members.

Data Collection—SHACs provided researchers with results from the 2 school health assessments (HSRC and HSPF). The assessments had been analyzed by their respective organizations using methods independent from the research team which identified areas of school health that the organizations recommended the schools improve. Using these identified areas for change as a guide, the research team developed a 14-question survey that encompassed 14 obesity intervention strategies. Results from parent/student interviews in the earlier phase were integrated into the survey strategies. The created survey encompassed strategies addressing all levels within the social-ecological model^{18–20} (SEM) which emphasizes the interaction of factors across and between the individual, social, organizational, and public policy levels that shape one's behavior.

The survey was piloted at one of the high schools and then made available to the remaining SHACs. SHAC members rated each strategy according to its acceptability, feasibility, and sustainability at their school. Completed surveys were anonymous to researchers as to the participant's name but not to the source school. The survey was provided by paper copy and via SurveyMonkey, a Web-based survey engine. Paper copy survey results were entered electronically by team members to SurveyMonkey for consolidation and to facilitate data analysis. Respondents were given \$5 for their time.

Data Analysis—Upon completion of the survey by all SHACs, results were analyzed for uniformity of strategy acceptability. Strategies were deemed acceptable if they were approved by more than 50% of SHAC members in at least 5 (majority) of the 8 schools. Among these acceptable strategies, if all 8 SHACs found the strategy acceptable, discussion was centered on confirmation of the strategies. For strategies that had 1 to 3 schools ranking them lower in acceptability, researchers met with the schools' SHAC members to discuss and clarify understanding of the strategies to reach a mutual agreeable outcome. Once consensus was reached, researchers returned to all 8 school SHACs to present the set of final strategies and to obtain signed support from school principals or superintendents. Signed support was obtained to facilitate gaining administrative approval for future intervention in these schools in the event of school staff/administrative turnover.

RESULTS

Parent/Student Interviews

We identified 3 overarching themes from interview transcripts. Not surprisingly, parents and students cited a lack of healthy food options available in the school setting as an essential barrier to improving nutrition. Furthermore, interviewees were also concerned about the lack of physical exercise opportunities outside of participation in organized sports. Last, both groups consistently expressed insufficient exposure to health/nutritional information through classroom experiences. The following quotes from selected parents and students illustrate these themes:

We're in classes for an hour and a half or so...you're pretty much sitting down for the hour and a half and then you're walking 7 minutes to another class and then you're in class for another hour and a half so you're sitting down for a long period of the day. (Student)

There's of course extracurricular activities like base-ball and football and all that and then the PE [physical education] but if the kid doesn't want to join them then it's not going to do any good for that kid...a gym class throughout their entire years in school, maybe that would be an idea. (Parent)

Definitely put healthier snacks in the snack machine, it's like corn nuts and stuff... they can also serve healthier meals, like they don't serve salad and I'm not even sure if they have health [class]. (Student)

SHAC Survey

Strategies were considered “acceptable” if a majority of school SHACs had a majority of SHAC members rate the strategy as “acceptable.” Of the 14 strategies, 7 were identified as most acceptable to the SHACs (Table 2). These included (1) supply healthier food; (2) prepare food in a healthier manner; (3) conduct yearly taste tests of new healthy foods representing the ethnic/cultural/religious cultures within the school; (4) institute a healthy foods marketing campaign; (5) create an after-school physical activity program; (6) identify and publicize community activities that encourage physical activity; and (7) develop a Web-based classroom health curriculum. In addition to the 14 strategies examined, the research team included a question to confirm that schools were maintaining a regularly meeting SHAC.

The “After-School Physical Activity Program” strategy was rated as “acceptable” by all 8 participating schools. The other strategies deemed acceptable by study protocol each had 1–3 schools that initially ranked them lower in acceptability. The research team attended subsequent SHAC meetings to resolve these differences. The goal of these sessions was not to “convince” the SHAC of the necessity of a particular strategy; rather, the discussions focused on identifying the reasons for the lower ranking and on clarifying the intent of the strategy. Through this iterative process, we were able to reach verbal consensus with all participating SHACs for 6 of the 7 acceptable survey strategies.

DISCUSSION

An adaptation of CBPR approach to formative assessment was useful in identifying acceptable strategies with 8 rural and urban high schools. Over a 2-year period, our alliance with SHAC members in participating schools led to the development of a school-wide obesity intervention that is acceptable to the school communities and scientifically sound. School administrators and SHACs responded positively to the alliance and expressed enthusiasm for the proposed intervention study, which they came to view with a sense of ownership. SHACs shared similar responses about the acceptability of many of the surveyed intervention strategies and were able to reach consensus on 6 obesity intervention strategies that target the individual, social, organizational, and policy levels of behavioral determinants within the SEM.

The 6 chosen strategies were developed collaboratively with the SHACs but are consistent with scientific literature. Of the 6 strategies, 4 focus on improving nutrition (supplying healthier food, improving food preparation, healthy eating marketing campaign, and yearly taste tests) and 2 strategies focus on increasing physical activity (after-school noncompetitive activities and linkage to community physical activity opportunities). Schools are ideal forums for improvement of both nutrition and physical activity as students spend

approximately 20% of waking hours and consume roughly 40% of daily food intake in school.^{8,21} Combination interventions (including improvements in both diet and physical activity) have been shown to be more likely to be efficacious than single target interventions.²² Furthermore, strategies identified in our study have been used in previous successful interventions. Providing healthier food options in the cafeteria, improving food preparation, instituting taste tests, and conducting a broad marketing campaign were elements of a school-based obesity intervention among a cohort of 1858 5- to 14-year-olds that demonstrated an overall statistically significant decrease in BMI ($-.04$, $p < .001$) and an 11% reduction in the prevalence of obesity.¹⁰ Similarly, improving healthy food options and conducting a marketing campaign were again used in a nutrition policy study among 1349 elementary students in 10 schools that demonstrated a 50% reduction in the incidence of overweight in intervention schools compared to control schools over a 2-year period.⁹ Literature also holds promise for taste testing of healthy foods. For children and even some adults, unfamiliarity with a food is often a prime reason to shun a novel food.²³ Calls have been made for more research into food exposure intervention in adolescents.²⁴

Although recent reviews have shown a lack of evidence for physical activity interventions decreasing BMI among adolescent participants, physical activity interventions have been shown to be effective in improving other health parameters including mean blood cholesterol, VO_2 max, duration of physical activity, and decreased time spent watching television.^{6,11,25–28} Dobbins argues in his review of physical activity interventions, “In order to produce sustainable effects, it may be necessary to widen the scope of the strategy to include the community so as to promote multiple environments that support active living as children move from childhood to adolescence to adulthood.”²⁵ Our identified study strategies expand beyond the parameter of school curriculum to after-school activities that involve students, teachers, families, and community. Community activities have the advantage of being permanent and may persist beyond the scope of any formal intervention. This expands the opportunity for physical activity intervention beyond the limiting duration of a funded study. The long-term effects of physical activity interventions in schools are unknown at this time due to the vast majority of published studies not persisting beyond 6 months. The strategies identified by our study may create long-lasting connections and community alliances that have the potential to provide greater effect than the short-term interventions reported in recent reviews.

Lessons and Limitations

Lessons learned include (1) working from the “bottom up” to gain administrative approval for school research is an effective approach and (2) when attempting to use adaptive CBPR within schools, researchers should anticipate the need for sufficient time in their research plan to build trust, adapt to changing schedules, and to negotiate the diverse needs of community members.

In the course of our study, we experienced multiple instances of administrative turnover ranging from superintendents and principals to SHAC leaders and study advocates. Such turnover of key individuals can often be the cause of study delays and even possibly study termination in those studies that sought only to gain support from key administrators. Our study began at the level of the SHAC at each school. Researchers met with SHACs and established an alliance with SHAC members at each school. For example, when a supportive principal in one of our schools was replaced, obtaining support of the new principal was expedited by the established relationship built with SHAC members who remained at the school and were vocally supportive of the study. This bottom-up approach insulates researchers from the risk involved in gaining support from only a small number of key administrators who can be replaced without warning.

An unanticipated challenge we faced was the time commitment required to work with and form alliances with multiple communities on a participatory basis. Our research with the participating schools spanned a 2-year period which was longer than we originally anticipated. We found that CBPR requires flexibility in the timeline as well as researcher willingness to devote a lengthy period of time to cultivate relationships and trust.

Limitations of this study include limited resources and generalizability. Because of constraints in financial resources, data collection methods had to be low burden and cost effective (eg, Web-based survey) to work with schools that were located locally and in surrounding rural communities. Second, because of the formative nature and CBPR approach of this study, results may not be generalizable to other populations. However, formative qualitative data collection and CBPR have both been extensively used in previous studies and their advantages are well known in developing culturally appropriate interventions.^{13,15} Although our results have limited generalizability, the process by which we identified acceptable obesity intervention strategies may be used in any population.

IMPLICATIONS FOR SCHOOL HEALTH

We describe a process and report the benefits and challenges of forging alliances with school communities within an adaptive CBPR approach to identify acceptable obesity intervention strategies. SHACs are ideal community collaborators for participatory school-based research because of their sustainability, commitment to school health, and expertise in the capabilities of their schools. Principles of CBPR can be applied to formative research in tailoring an intervention for a target population as demonstrated by this study. Even with limited resources, others interested in working with schools can use this process for formative research while maintaining CBPR principles to design school-based obesity interventions.

Human Subjects Approval Statement

This study was approved by University of New Mexico Human Research and Review Committee for the purpose of the student and parent interviews. Utilization of the HSRC and HSPF results as well as administration of the SHAC surveys was exempt from required institutional review board approval. All study participants had the opportunity not to participate.

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Figure 1.
Study Phases

Table 1

School Demographics

	HS 1	HS 2	HS 3	HS 4	HS 5	HS 6	HS 7	HS 8
Total enrollment	1803	1325	930	947	1796	1957	566	843
Free or reduced lunch (%)	44	58	>99	>99	55	61	36	>99
African American (%)	6	2	<1	1	8	<1	2	1
American Indian (%)	4	2	48	7	13	2	5	9
Asian (%)	2	<1	0	<1	4	<1	2	1
Hispanic (%)	72	68	45	90	57	90	69	70
Non-Hispanic White (%)	17	27	7	2	18	7	21	19

HS, high school.

Table 2

Results of SHAC Survey^{*}

	HS 1	HS 2	HS 3	HS 4	HS 5	HS 6	HS 7	HS 8
Are food service personnel interested in an already existing Web-based training program in healthy food preparation?	1/6 17%	7/19 37%	4/7 57%	2/5 40%	6/15 40%	3/9 33%	9/18 50%	5/8 63%
Can the school have healthier foods supplied? [†]	4/6 67%	11/19 58%	4/7 57%	2/5 40%	10/15 67%	4/9 44%	13/18 72%	5/8 63%
Would the school be able to prepare food in a healthier manner? [†]	4/6 67%	14/19 74%	5/7 71%	5/5 100%	2/15 13%	3/9 33%	12/18 67%	5/8 63%
Can the school conduct yearly taste tests of healthy foods that reflect the cultures and religions of the students? [†]	6/6 100%	10/19 53%	6/7 86%	3/5 60%	4/15 27%	7/9 78%	12/18 67%	7/8 88%
Change beverages offered to students outside of the school meals program to make them no- or low-calorie drinks?	6/6 100%	3/19 16%	3/7 43%	1/5 20%	1/15 7%	4/9 44%	8/18 44%	3/8 38%
Is the school interested in a marketing campaign to promote healthy snack and food choices in all areas where food is sold? [†]	5/6 83%	13/19 68%	6/7 86%	5/5 100%	5/15 33%	3/9 33%	17/18 94%	5/8 63%
Change all foods offered to students outside of the school meals program to healthier options.	6/6 100%	9/19 47%	6/7 86%	4/5 80%	3/15 20%	2/9 22%	9/18 50%	3/8 38%
Is it possible to fit an already-existing Web-instruction program on healthy eating and physical activity within a required PE or Health Education class for all 9th-grade students?	3/6 50%	8/19 42%	4/7 57%	4/5 80%	10/15 67%	6/9 67%	10/18 56%	4/8 50%
Would health education teachers be willing to use an already-existing Web-training program in physical activity and healthy eating?	2/6 33%	5/19 26%	4/7 57%	4/5 80%	12/15 80%	5/9 56%	8/18 44%	3/8 38%
Would physical education teachers be willing to use an already-existing Web-training program in physical activity and healthy eating?	1/6 16%	4/19 21%	2/7 29%	4/5 80%	2/15 13%	4/9 44%	9/18 50%	3/8 38%
Is the school interested in an after-school program that provides a range of noncompetitive physical activity opportunities? [†]	4/6 67%	14/19 74%	5/7 71%	5/5 100%	10/15 67%	6/9 67%	13/18 72%	6/8 75%
Would the school be willing to only sell and serve healthy food and beverages in staff lounges and school-sponsored staff functions?	2/6 33%	6/19 32%	4/7 57%	5/5 100%	2/15 13%	7/9 78%	11/18 61%	6/8 75%
If the research team were to identify community activities to encourage students to be more physically active, would students/parents be interested? [†]	5/6 83%	12/19 63%	5/7 71%	5/5 100%	6/15 40%	8/9 89%	15/18 83%	6/8 75%
Would staff be interested in a professional development Web-based course on strategies for including physical activity and healthy eating in before- and after-school programs?	3/6 50%	9/19 47%	5/7 71%	2/5 40%	2/15 13%	2/9 22%	8/18 44%	4/8 50%

SHAC, School Health Advisory Council.

^{*} Results are shown as number of SHAC members from each school that viewed the strategy as "acceptable" over the total number of SHAC members from the respective school. Percentages are also provided. Results greater than 50% are bolded.

[†] Strategy that gained eventual consensus of acceptability from all SHACs.