

PREVENTING CHRONIC DISEASE

PUBLIC HEALTH RESEARCH, PRACTICE, AND POLICY



High Obesity Program Collection



U.S. Department of
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PUBLIC HEALTH PRACTICE BRIEF

The High Obesity Program: Overview of the Centers for Disease Control and Prevention and Cooperative Extension Services Efforts to Address Obesity

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Summary

What is already known on this topic?

Evidence is growing that strategies to improve physical activity and nutrition should focus on community-based approaches to improve health, especially in rural communities.

What is added by this report?

The High Obesity Program helped to increase access to healthier foods for more than 1.5 million people and increase access to physical activity for nearly 1.6 million people. More than 100 communities implemented policy, systems, and environmental changes that enhanced places for physical activity, and 88 priority communities increased access to healthier foods.

What are the implications for public health practice?

Public health strategies aiming to improve healthy food and physical activity access should consider working with nontraditional partners and using community-based participatory approaches to engage communities.

Abstract

The burden of obesity and other chronic diseases negatively affects the nation's health, businesses, economy, and military readiness. The prevalence is higher in certain geographic locations. Beginning in 2014, the Centers for Disease Control and Prevention's Division of Nutrition, Physical Activity, and Obesity awarded funding to 11 land-grant universities through the High Obesity Program. This program implemented evidence- and practice-based

strategies with a goal to increase access to nutritious foods and places to be physically active in counties in which the prevalence of obesity among adults was more than 40%. In these counties, funded land-grant universities developed partnerships and collaborations to work with community organizations, public health agencies, and other stakeholders to promote policy and environmental changes that address obesity. Data were collected by the Cooperative Extension Service in each selected county with technical assistance from land-grant universities and the Centers for Disease Control and Prevention. More than 2 million people were reached by the nutrition and physical activity policy, systems, and environmental interventions implemented.

Background

Obesity is a major public health problem in the United States and is associated with numerous poor health outcomes such as heart disease, stroke, and type 2 diabetes (1). To prevent and reduce the prevalence of obesity, the Division of Nutrition, Physical Activity, and Obesity (DNPAO) at the Centers for Disease Control and Prevention (CDC) provides support to state and local health departments and their partners to monitor levels of obesity and its risk factors among populations, and to implement and evaluate evidence-based strategies to improve nutrition and physical activity environments. In 2014, under an initial congressional funding authorization of \$4.7 million (increased to \$9 million in 2016), DNPAO developed the cooperative agreement *Programs to Reduce Obesity in High Obesity Areas*, known as the High Obesity Program (HOP).

HOP is a pilot program that funded 11 land-grant universities (LGUs) from September 30, 2014, through September 29, 2018, in states with a least 1 county in which the prevalence of obesity among adults was more than 40% according to data from the 2013 Behavioral Risk Factor Surveillance System. The purpose of HOP was to implement evidence- and practice-based strategies to im-



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prove physical activity and nutrition, reduce obesity, and prevent or control diabetes, heart disease, and stroke. In 2014, HOP began by funding a cohort of 6 LGUs (Auburn University, South Dakota State University, Texas A & M University, University of Kentucky, University of Tennessee, and West Virginia University). In 2015, two more LGUs (Louisiana State University and University of Arkansas) were added, and in 2016, three additional LGUs (North Carolina State University, Purdue University, and University of Georgia) received HOP funding (Figure).

ic, and environmental factors influence an individual's health behaviors and outcomes (11,12). Consistent with the CES framework, through HOP, LGUs and CES were asked to expand their approach beyond direct education efforts to also focus on implementing evidence-based obesity prevention strategies with a focus on PSE approaches that facilitate healthy choices related to nutrition and physical activity in these high-risk, primarily rural communities. This article provides an overarching description of the intervention approach of HOP and highlights initial outcome data from the program.

The High Obesity Program Approach

Given the growing evidence that community-based participatory approaches are effective in addressing health concerns in communities characterized by health disparities, particularly rural communities (11–13), HOP required CES to work with key stakeholders by engaging existing or developing new community coalitions to identify and support implementation of PSE approaches. The first year of the cooperative agreement was dedicated to stakeholder engagement and community planning. During this time, county extension agents helped to mobilize community coalitions. Coalition members included traditional public health partners as well as people representing a broad range of other organizations. Building and engaging community coalitions was a new approach to addressing obesity prevention, nutrition, and physical activity for CES. However, extension agents were thought to be well-suited for this role because, historically, they are often members of the communities they serve and have a deep understanding of local communities' needs, context, and culture.

HOP recipients were required to implement interventions in 3 strategy areas in their selected communities (recipients could select multiple communities within a county). The strategy areas were 1) education and promotion; 2) nutrition; and 3) physical activity. Education and promotion strategies leveraged the strength and existing expertise of CES. Nutrition and physical activity strategies required that recipients extend their expertise and introduce PSE approaches to the communities in which they worked. Recipients could choose from community or early care and education settings to apply these strategies. Of the 11 recipients, only West Virginia University selected the early care and education setting. For the nutrition and physical activity strategy areas, recipients were required to select at least one intervention to address in their selected setting.

To better understand the communities that recipients selected for their HOP funding, the first year of the funding period focused on a community needs assessment and program planning activities. Extension agents engaged community coalitions at every stage of



Figure. Counties selected for the Centers for Disease Control and Prevention's High Obesity Program, 2014–2018. Sources: Esri (2), HERE (3), Garmin (4), Food and Agriculture Organization of the United Nations (5), National Oceanic and Atmospheric Administration (6), US Geological Survey (7), OpenStreetMap (8), and US Census Bureau (9).

HOP was a new partnership approach to funding for DNPAO. The program provided an opportunity for DNPAO to collaborate with nontraditional public health partners — LGUs and their Cooperative Extension Service (CES) offices. DNPAO's collaboration with LGUs and CES offices aligned with the US Department of Agriculture's 2014 report, *Cooperative Extension's National Framework for Health and Wellness*, which encouraged cooperative extensions to move beyond direct education efforts to increase knowledge and awareness and to focus on policy, systems, and environmental (PSE) strategies to prevent obesity (10). This redirection by CES resulted from growing evidence that social, econom-

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the intervention process, including during the needs assessment phase. Through this process, extension agents and coalition members gained a detailed understanding of community needs and assets, which helped in selecting, designing, and implementing interventions. The needs assessments often served as baseline information for LGUs and usually combined qualitative and quantitative data. After conducting needs assessments, the results were shared with community stakeholders. LGUs worked with coalitions to select priority areas and their corresponding interventions. LGUs encouraged coalitions to select topic areas where policy and environmental change would be feasible within the funding period.

LGUs also provided assistance to extension agents to build their capacity to implement HOP strategies in the selected counties. LGUs provided routine training and technical assistance calls with county extension agents. They established systems to support agents in data collection, reporting, and performance monitoring. Extension agents provided direct support to the counties they served.

To support recipients' efforts, a 2-pronged approach was used, whereby CDC provided collaborative technical assistance to LGUs, and LGUs provided direct support to extension agents at the county level. As a part of its program infrastructure, CDC assigned project officers and evaluators to support each LGU during the HOP funding period. These CDC staff members have expertise in HOP program areas and provided technical assistance to LGUs on evidence-based nutrition and physical activity interventions, community-based participatory approaches, community needs assessments, and coalition development.

To monitor LGU progress, CDC, in collaboration with recipients, developed methods and metrics that recipients were required to report annually across 3 overarching data sources. The primary focus of data reporting was annual recipient updates on CDC-established performance measures (short-term outcomes) associated with each strategy. In addition, during the first year of the program, recipients were asked to report on community gaps and assets as determined by the needs assessments. LGUs also provided data on the intervention implemented in priority communities, including the counties in which interventions were implemented and the potential reach as determined by US Census data estimates. Lastly, LGUs provided detailed information to CDC on the resources (eg, financial, in-kind donations, volunteer hours, additional grant funding) they leveraged to support HOP-funded strategies.

The primary method for programmatic support and guidance occurred during monthly calls with each LGU staff member and their assigned CDC project officer and evaluator. Additionally, CDC evaluators facilitated monthly group calls with all LGU eval-

uators, which served as a forum for peer-to-peer learning on evaluation-focused topics. These calls, known as community-of-practice calls, also created an opportunity for recipients to provide CDC evaluators with feedback on reporting guidance for evaluation deliverables, including annual evaluation reports and performance measures. By engaging LGUs and soliciting their feedback, CDC was able to continuously improve technical assistance, guidance, and resources provided to HOP recipients.

Program Outcomes From CDC Annual Reporting

The LGUs achieved outcomes across the PSE strategies they implemented. LGUs worked with 54 primarily rural counties, with a total population of 2,003,147. In total, 124 coalitions were engaged during the program period (2014–2018). Coalitions worked closely with key partners such as state and local health departments, local businesses, faith-based organizations, departments of agriculture and local agriculture offices, departments of transportation, school systems, law enforcement, and farmers markets.

The 11 LGUs were required to select at least one intervention under the nutrition and physical activity strategy areas (Table). Recipients were asked to track and report the number and type of PSE changes made and identify the priority communities in which interventions took place. CDC then used 2018 US Census estimates of the resident population data to accurately aggregate populations (14). Through HOP, LGU recipients increased access to healthier foods for more than 1.5 million people and increased access to physical activity for nearly 1.6 million people. Across the 11 funded LGUs, more than 100 communities implemented PSE changes that enhanced places for physical activity, and 88 priority communities increased access to healthier foods.

LGUs also identified and reported HOP-leveraged resources to CDC. Categories (eg, partner contributions, supplemental funding) and estimates for leveraged resources were developed by CDC by combining existing guidance with recipient feedback. During the final 2 years of funding, 2017 and 2018, LGUs leveraged more than \$7.5 million across all reported sources.

Implications for Public Health Practice

The design and implementation of this program has several implications for public health practice. First, CDC supported LGUs to work with local CES offices to implement evidence-based strategies to promote obesity prevention in community or early care and education settings. Through this new CDC collaboration, CDC identified opportunities to address obesity prevention via partnerships, stakeholder engagement, and nutrition and physical

activity strategies within HOP's community and rural context. For example, LGUs and CES were identified as fitting partners for HOP programmatic efforts because of their direct engagement with communities. CDC worked with LGUs and extension agents to leverage these existing relationships and engage with communities on community-driven needs assessments and strategy implementation. Additionally, the HOP technical assistance structure and collaborative approach between CDC and LGUs and between LGUs and CES at the community level provided a cohesive environment for clear communication, problem solving, and idea sharing to advance HOP strategies in communities. Other CDC programs or public health organizations may find HOP's programmatic model optimal when working in a local community or rural context.

Second, HOP's use of a community-based participatory approach supported community engagement and buy-in for strategy implementation and HOP program efforts. For example, the community needs assessment, which engaged community coalitions and members, helped to focus interventions locally by incorporating community knowledge and context into assessments and ultimately into interventions. As a result, HOP increased access to healthier foods and physical activity via PSE interventions in 54 primarily rural counties across 11 states. Local knowledge is essential for PSE change, and a community-based participatory approach may help strengthen the commitment from communities and increase opportunities for community support and sustainability. CDC programs and other public health organizations may consider this approach for potential programs.

Third, recipients leveraged resources totaling more than \$7.5 million during the final 2 years of HOP. That HOP recipients were able to leverage resources from diverse sources (eg, partner contributions, volunteer hours, supplemental funding) is important. It may suggest that the HOP model is sustainable through its ability to acquire additional resources and engage additional partners and volunteers (15).

This brief evaluation of the HOP intervention has several limitations. First, the 2018 US Census estimates of the resident population reflected the population of priority communities in which interventions occurred, but anecdotal evidence suggests that, in some areas, residents from neighboring communities may have also accessed places to be physically active or to purchase healthier foods. Thus, the reach of the interventions may be underestimated. Second, because of the small population size of HOP priority communities, application of the interventions may be limited in their generalizability to the larger US population, particularly in urban areas. Third, funding periods differed by recipient. These differences may have limited the intervention scope and impact in some communities and produced different results among the 3

HOP cohorts. Lastly, CDC did not provide detailed guidance on funds leveraged until the final 2 years of the cooperative agreement. Thus, the total funds leveraged by recipients may be underreported.

The approaches described in this article provide an opportunity for public health organizations and CES to change community nutrition and physical activity environments to support obesity prevention.

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Table

Table. Number of Land-Grant Universities (LGUs) Selecting Interventions and Population Catchment Area, the High Obesity Program, 2014–2018^a

Intervention	Population Catchment Area by Intervention ^b	Number of LGUs Selecting the Intervention
Education and promotion: provide education and promotional support for environmental approaches (implement both):		
Outreach to children, adolescents, and families to increase healthy behaviors	2,003,147	11
Partner with community coalitions that support nutrition and physical activity		11
Nutrition: Implement evidence- or practice-based strategies to increase consumption of healthy food and beverages (select one)		
Implement food-service guidelines and nutrition standards (including sodium) where foods and beverages are available	1,564,631	6
Increase access to and promote healthy food at retail outlets		10
Physical activity: implement evidence- or practice-based strategies to increase opportunities for physical activity (select one)		
Create or enhance and promote access to safe places for physical activity	1,593,110	10
Promote joint-use agreements		6
Implement and promote Safe Routes to School or other walk/bike-to-school programs		4
Promote Complete Streets or other safe streets/community design initiatives		3

^a Beginning in 2014, the Centers for Disease Control and Prevention’s Division of Nutrition, Physical Activity, and Obesity awarded funding to 11 LGUs through the High Obesity Program. The program implemented evidence- and practice-based strategies with a goal to increase access to nutritious foods and places to be physically active in counties in which the prevalence of obesity among adults is greater than 40%.

^b Data source: US Census Bureau (14).

PROGRAM EVALUATION BRIEF

Multilevel Faith-Based Public Health Initiative in Rural Alabama, 2017

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PEER REVIEWED

Summary

What is already known on this topic?

Recent shifts in public health approaches to reduce and prevent obesity focus on multilevel interventions encompassing organizational, interpersonal, and individual changes as emphasized in the social ecological model.

What is added by this report?

This report operationalizes a multilevel, faith-based health promotion initiative and provides evidence of such an initiative on multiple levels of the social ecological model.

What are the implications for public health practice?

Public health practitioners should prioritize partnerships with community organizations who can influence multiple levels of the social ecological model to provide support for healthy behaviors in at-risk populations.

Abstract

Recent shifts in public health approaches to reduce and prevent chronic disease encourage interventions to include multiple levels of the social ecological model. The objective of this 1-group pretest–posttest study was to determine differences in faith community policies and environments; interpersonal support; and individual behavior before and after Live Well Faith Communities, a 9-week, faith-based health promotion initiative. The study included a convenience sample of faith communities and participants. Validated instruments assessed faith communities' policies and environments and participants' interpersonal and individual practices and behaviors. Seventy-two small-group sessions with 737 adults were implemented in 14 faith communities. Faith

communities adopted policies requiring healthy options for meals and snacks and implemented environmental changes to promote healthy eating and physical activity. Participants reported significant improvements in healthy eating encouragement, shopping practices, and vegetable consumption. Multilevel interventions prompt community organizations to become healthier places and individuals to adopt healthy lifestyles.

Introduction

Overweight and obesity are national epidemics affecting more than two-thirds of adults in the United States (1); the Southeast has higher obesity rates than most other regions (2). Alabama ranks fifth nationally in obesity prevalence; 36.3% of adults in Alabama are obese (3).

Racial/ethnic minority populations tend to have higher rates of obesity than the non-Hispanic white population. Almost half (48.1%) of non-Hispanic black adults and 42.5% of Hispanic adults are obese, compared with 34.5% of non-Hispanic white adults (4). Many studies also indicate a correlation between obesity and socioeconomic status and education level. Not only is obesity a public health issue itself but obesity leads to other health problems, such as cardiovascular disease, cancer, diabetes, respiratory disorders, and more.

Recent shifts in public health approaches to reduce and prevent obesity and chronic diseases expand the focus from individual-level behavior change interventions to multilevel interventions encompassing policy changes, cultural shifts, environmental changes, interpersonal influence, and individual-level behavior changes as emphasized in the social ecological model. Because of this shift to multilevel interventions, community organizations, such as schools, workplaces, and faith communities, are increasingly common settings for health promotion initiatives. Growing evidence supports the effectiveness of faith-based health promotion initiatives (5–8).



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Purpose and Objective

In 2017, the Alabama Cooperative Extension System at Auburn University (Extension) launched Live Well Faith Communities (LWFC), a 9-week, multilevel, faith-based health promotion initiative. The objective of this 1-group pretest–posttest study was to determine differences in faith community (institutional) policies, environments, and programs; interpersonal support; and faith community member (individual) behavior before and after participating in LWFC. We sought to determine differences in participating faith communities' health infrastructure, partnerships, and programs; healthy eating policies, environments and programs; and physical activity policies, environments, and programs. Additionally, we sought to determine differences in perceived social support and behaviors related to healthy eating and physical activity of faith community members participating in LWFC.

Intervention Approach

The social ecological model recognizes and emphasizes the interaction among multiple factors influencing a person's behavior. This model consists of 5 levels of influence for health-related behaviors: individual, interpersonal, institutional, community, and public policy (9). Given the setting of LWFC, researchers used institutional, interpersonal, and individual levels for development, implementation, and evaluation of LWFC.

LWFC integrated the institutional level of the social ecological model through Extension personnel who 1) supported faith community leaders in conducting a needs assessment, 2) provided technical assistance, and 3) consulted with members of the faith community to inform, initiate, expand and/or sustain policy, systems, and environmental (PSE) strategies. PSE strategies suggested in the LWFC protocol included planning healthy meals to serve at faith community events; partnering with local farmers to sell low-cost produce at faith community facilities; developing a policy requiring fruits, vegetables, and/or water be served at any faith community gathering where food and/or beverages are served; and starting a walking or exercise group.

For the interpersonal level of the social ecological model, LWFC components were the small group environment of direct education lessons and a faith community champion. Extension personnel partnered with each participating faith community to identify a faith community member to serve as the champion. This person was the liaison between Extension personnel and the faith community. In addition to supporting the planning, publicizing, and facilitating logistics of LWFC, this person also supported parti-

cipants as they practiced principles learned in the direct education lessons and faith community leaders as they implemented evidence-based PSE strategies.

Extension personnel conducted 9 weekly small-group direct education lessons focused on positively influencing individual healthy eating and physical activity behaviors. These 9-week programs were conducted on a rolling basis throughout 2017. Lessons topics included eating smart at home; planning, shopping, preparing, and choosing healthy foods; making smart drink choices; and moving more throughout the day. A protocol and curriculum were provided to all Extension personnel. These materials included the following: a lesson overview, a detailed lesson plan, a handout for participants, a recipe for demonstration and tasting, PowerPoint slides with script, discussion questions, sample physical activities, social media posts, and a PSE strategy for discussion. Materials for the direct education portion of LWFC were adapted from *Faithful Families Eating Smart and Moving More* (10).

Evaluation Methods

A 1-group pretest–posttest study design assessed institutional healthy eating and physical activity policies, environments, and programs; interpersonal social support for healthy eating and physical activity; and individual healthy eating and physical activity behavior before and after participation in LWFC. The evaluations, like the 9-week sessions, were conducted on a rolling basis throughout 2017. The study protocol was approved by the Auburn University Institutional Review Board.

Sample

Trained Extension personnel recruited faith communities to participate in LWFC. Although these Extension personnel serve all counties in Alabama, we prioritized 14 counties with adult obesity rates greater than 40%. Supplemental Nutrition Assistance Program–Education (SNAP-Ed) personnel focused recruitment on faith communities in the same zip code area as a SNAP-Ed qualifying school, defined as school in which 50% or more of students receive a free or reduced-price school meal. Expanded Food and Nutrition Education Program educators focused recruitment on faith communities in which at least 75% of participants were low-income adults with children living at home, low-income pregnant teenagers or adults, or low-income grandparents who provide primary care for grandchildren.

Researchers trained and provided information and support to Extension personnel on faith community recruitment and partnership procedures. Extension personnel consulted an information sheet and an agreement of roles and responsibilities during an in-person, email, or telephone conversation to recruit potential faith com-

munities. When faith communities agreed to partner with Extension to implement LWFC, Extension personnel and faith community leadership completed and submitted to researchers the written agreement on roles and responsibilities.

To recruit participants in LWFC, researchers developed and provided a poster and bulletin/newsletter insert for Extension personnel to provide to the faith community for publicizing LWFC and its start date. LWFC was offered to faith community members as well as members of the surrounding community.

We used a convenience sample of faith communities and adults participating in LWFC for this study. All participants aged 18 or younger were excluded from analysis.

Surveys

We developed a faith community assessment as a pretest and posttest to assess the institutional level of the social ecological model. We adapted this survey from the Faithful Families Faith Communities Assessment (10), Live Well Greenville House of Worship Assessment (Meghan M. Slining, PhD, MPH, Furman University, LiveWell Greenville; verbal, electronic, and written communication, 2016), and the Texas A&M Capacity and Readiness Church Health Assessment (11). We conducted this assessment among each faith community's leadership, which included the faith community leader, the faith community champion, the health ministry team leader, and/or the health ministry team members. Twelve questions focused on general information about the faith community and its membership. Five questions determined the faith community's infrastructure related to health programming, such as a health ministry team, leader, and budget. Twenty questions focused on physical activity policies, environments, and programs. These questions emphasized physical activity opportunities made available by the faith community, such as an indoor gym, walking trail, playground, group exercise classes, walking clubs, or sports teams as well as promotion of physical activity in printed materials and policies. Thirty-two questions focused on healthy eating policies, environments, and programs. These questions emphasized guidelines requiring certain foods at faith community meals or snacks, food preparation, food service equipment, group classes on healthy eating, and promotion of healthy eating in faith community printed materials and policies.

We developed a participant assessment as a pretest and posttest to assess interpersonal and individual levels of the social ecological model. The assessment was developed from previously validated instruments (12–15).

To measure interpersonal support related to healthy eating and physical activity, the participant assessment included 10 questions from the Social Support and Eating Habits Survey (15) and 10

questions from the Social Support and Exercise Survey (15). These instruments measured 3 areas of social support: healthy eating encouragement, healthy eating discouragement, and physical activity participation encouragement. We used validated scoring procedures for the social support scales for analyses (15).

For the individual level of the social ecological model, the participant assessment measured practices and behaviors in food resource management, food safety, food purchasing, healthy eating, and physical activity (12–14).

Procedures

After recruitment and commitment of faith communities in early 2017, Extension personnel engaged faith community leadership to implement LWFC. The initial step included identifying and training a faith community member to serve as the LWFC faith community champion, which was integral to influencing the interpersonal level of the social ecological model in LWFC.

Next, Extension personnel helped the faith community leader, the faith community champion, and the health ministry team (if appropriate) complete the faith community assessment pretest. Extension personnel provided technical assistance to faith community leadership to promote use of assessment findings in developing a 9-week action plan. The action plan detailed activities necessary to initiate, expand, and/or sustain PSE strategies in the faith community. During the 9 weeks, Extension personnel provided technical assistance and consultation for implementation of the action plan.

Simultaneously, Extension personnel, in partnership with the faith community champion, helped participants complete the paper-and-pencil pretest during the first weekly small-group direct education lesson. Extension personnel and faith community champions also jointly implemented each of the small-group direct education lessons using the LWFC protocol and curriculum. The integration of the faith community champion into the program and the use of small groups in weekly sessions demonstrated the interpersonal level of the social ecological model in LWFC. The intent to positively influence individual healthy eating and physical activity behaviors further demonstrated the inclusion of the individual level of the social ecological model.

At the last weekly small-group direct education lesson, Extension personnel and faith community champions helped participants complete the posttest. At the conclusion of the final lesson, Extension personnel supported faith community leadership in completing the faith community assessment posttest.

We analyzed survey data by using SPSS version 24 (IBM Corporation) for Windows. Researchers used descriptive statistics to de-

termine means and percentages for demographic information. We used the Mann–Whitney *U* test and the independent-samples *t* test to assess differences in respondents who completed the pretest and respondents who completed the posttest. We considered a *P* value of <.05 significant.

Results

Sixteen Extension personnel implemented LWFC in 14 faith communities in 8 rural counties with adult obesity rates greater than 40%. Faith communities implemented 11 PSE strategies. Of 8 faith communities adopting guidelines requiring healthy options at meals or snacks, 2 required fruits, 3 required vegetables, 2 required nonfried foods, and 1 required low-sugar or no-sugar-added foods. One faith community created an onsite garden, one began providing physical activity opportunities at meetings or functions, and one began offering group exercise classes.

Extension personnel provided 72 direct education classes for 737 adults; 119 adult participants completed the participant assessment pretest (*n* = 79) and/or posttest (*n* = 48).

The average survey respondent was a middle-aged (mean age, 57.5 y), non-Hispanic black woman. Most (84%) respondents had at least a high school diploma or equivalent (Table 1).

At the interpersonal level, the mean (SD) score for healthy eating encouragement improved significantly ($t_{109} = -4.87$; $P < .001$) among respondents from 5.6 (4.2) on the pretest to 9.6 (4.2) on the posttest (Table 2). Healthy eating discouragement and physical activity encouragement did not differ significantly from pretest to posttest.

At the individual level in food resource management, responses differed significantly from pretest to posttest in 3 areas. At pretest, 38.5% of respondents indicated they often or always think about healthy food choices when planning foods for their family, whereas at posttest, 69.8% of respondents indicated this ($U = 2,259.5$; $P = .001$). At pretest, 53.8% of respondents indicated they often or always compare prices before buying foods, whereas at posttest, 71.4% indicated this ($U = 1,988.0$ $P = .045$), and at pretest, 25.3% indicated they often or always use nutrition facts to make food choices, whereas at posttest, 41.9% indicated this ($U = 2,144.0$; $P = .01$).

Also at the individual level, in food purchasing choices, 31.6% of pretest respondents indicated they often or always purchase foods with lower added sugar, whereas 48.8% indicated this at posttest ($U = 2,112.0$; $P = .02$). Finally, the average daily vegetable con-

sumption among respondents differed significantly from pretest (1.5 [SD, 0.8] cups) to posttest (1.8 [SD, 0.6] cups) ($t_{119} = -2.50$; $P = .01$).

Implications for Public Health

LWFC supported 14 faith communities in rural Alabama in becoming healthier places and 737 adults in adopting healthier lifestyles. The initiative positively influenced 3 levels of the social ecological model: institutional, interpersonal, and individual. At the institutional level, faith communities shifted policies and created environments to foster healthy eating and physical activity in the faith community setting. As hypothesized, the traditional role of the faith community in supporting positive development of its members, the intentional inclusion of small-group direct education classes, and the partnership with the faith community champion bolstered social support for participants in LWFC, which resulted in participants recognizing greater support for healthy eating. Furthermore, we noted key behavioral changes, including improved practices in making healthy choices and improved healthy eating behaviors.

Our study has several limitations. First, the research design, a 1-group pretest–posttest, lacked a comparison group, which is necessary for determining whether changes among participants resulted from participation in LWFC. Second, data were self-reported, and self-reported data are subject to such biases as recall bias and social desirability bias. Third, the convenience sampling method and homogenous sample limit generalizability of the study's findings.

Although these methodologic factors may have introduced limitations, they also were key strengths to our study. Convenience sampling was necessary because of the community-engaged approach of this initiative. Partnership with the faith community promoted adoption of PSE changes and recruitment of faith community members. Furthermore, the faith community assessment instrument was intentionally designed as a self-assessment, so that it would support discussion and contemplation of potential PSE strategies appropriate at the faith community (institutional) level. Although the study's generalizability is limited because of the homogeneity of the sample, the study provides evidence of the effectiveness of a multilevel, faith-based health promotion initiative in an African American population in the Southeast, which is at greater risk for obesity and chronic diseases than other populations. Our study suggests that faith communities are promising settings for public health initiatives aiming to influence multiple levels of the social ecological model.

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Tables

Table 1. Demographic Characteristics of Adults (N = 119) Completing the Participant Pretest (n = 79) and/or Posttest (n = 48) for Live Well Faith Communities, a 9-Week, Multilevel Faith-Based Health Promotion Initiative, Alabama, 2017^a

Demographic Characteristic	No. of Participants Who Answered Question	Value ^b
Age, mean (SD), y	58	57.5 (14.4)
Sex		
Male	60	16 (27)
Female		44 (73)
Hispanic/Latino	52	52 (100)
Race		
American Indian or Alaskan Native	59	1 (2)
Black or African American		58 (98)
Education		
Some high school	60	10 (17)
Graduated from high school or has GED		13 (22)
Some college		21 (35)
Graduated from college		16 (27)
Marital status		
Married	55	33 (60)
Single		22 (40)

^a The Alabama Cooperative Extension System at Auburn University launched Live Well Faith Communities, a 9-week, multilevel, faith-based health promotion initiative in 14 faith communities in 8 counties in which the prevalence of obesity was >40%.

^b All values are number (percentage) unless otherwise indicated. Not all participants answered all questions. Percentages may not add to 100 because of rounding.

Table 2. Interpersonal and Individual-Level Variables Among Participants Completing the Pretest and/or Posttest in Live Well Faith Communities, Alabama, 2017^a

Variable	Pretest (n = 79) ^b	Posttest (n = 48) ^b	Test Statistic (P Value) ^c
Interpersonal^d, mean (SD)			
Healthy eating encouragement	5.6 (4.2)	9.6 (4.2)	$t_{109} = -4.87 (<.001)$
Healthy eating discouragement	13.7 (4.5)	14.3 (4.0)	$t_{107} = -0.65 (.52)$
Physical activity encouragement	13.4 (10.2)	15.9 (11.3)	$t_{104} = -1.16 (.25)$
Individual			
Food resource management^e			
Plan meals ahead of time	28 of 79 (35.4%)	20 of 43 (46.5%)	$U = 1,875.0 (.31)$
Think about healthy foods when planning for their family	30 of 78 (38.5%)	30 of 43 (69.8%)	$U = 2,259.5 (.001)$
Shop with a grocery list	32 of 77 (41.6%)	19 of 43 (44.2%)	$U = 1,779.0 (.49)$
Compare prices before buying	42 of 78 (53.8%)	30 of 42 (71.4%)	$U = 1,988.0 (.045)$
Use nutrition facts to make food choices	20 of 79 (25.3%)	18 of 43 (41.9%)	$U = 2,144.0 (.01)$
Food safety^f			
Let meat or dairy food sit out	57 of 76 (75.0%)	29 of 42 (69.0%)	$U = 1,584.0 (.94)$
Thaw frozen foods at room temperature	25 of 75 (33.3%)	17 of 42 (40.5%)	$U = 1,665.5 (.59)$
Food purchasing choices^g			
Buy low-fat or fat-free milk or dairy foods	29 of 79 (36.7%)	23 of 43 (53.5%)	$U = 2,048.5 (.054)$
Buy food with lower added sugar	25 of 79 (31.6%)	21 of 43 (48.8%)	$U = 2,112.0 (.02)$
Buy food with low salt	23 of 77 (29.9%)	18 of 43 (41.9%)	$U = 1,952.5 (.09)$
Healthy eating and physical activity practices^h			
Average daily vegetable consumption, no. (mean), cups	1.5 (0.8)	1.8 (0.6)	$t_{119} = -2.50 (.01)$
Average daily fruit consumption, no. (mean), cups	1.4 (0.9)	1.6 (0.9)	$t_{118} = -0.73 (.46)$
Average exercise per week, no. (mean), days	2.3 (1.6)	2.5 (1.6)	$t_{116} = -0.45 (.66)$

^a The Alabama Cooperative Extension System at Auburn University launched Live Well Faith Communities, a 9-week, multilevel, faith-based health promotion initiative in 14 faith communities in 8 counties in which the prevalence of obesity was >40%.

^b The largest number of participants completing any question on the pretest was 79, and the largest number of participants completing any question on the posttest was 48. Some participants completed only the pretest, some completed only the posttest, and some completed both pretest and posttest.

^c Independent samples *t* test determined significance for differences in mean (SD) between pretest and posttest, and independent samples Mann-Whitney *U* test determined significance for differences in percentage between pretest and posttest.

^d Based on Social Support and Eating Habits Survey (15) and the Social Support and Exercise Survey (15). Scale for healthy eating encouragement ranges from 5 to 25, with higher scores indicating greater encouragement. Scale for healthy eating discouragement ranges from 5 to 25, with higher scores indicating greater discouragement. Scale for physical activity encouragement ranges from 11 to 55, with higher scores indicating greater encouragement.

^e Based on University of California Cooperative Extension's Plan, Shop, Save and Cook Survey (12) and Cooking Matters for Adults Survey (13). Percentage of respondents who answered "often" or "always."

^f Based on The Expanded Food and Nutrition Education Program's Behavior Checklist (14). Percentage of respondents who answered "often" or "always."

^g Based on Cooking Matters for Adults Survey (13) and SNAP-Ed Evaluation Framework and Interpretive Guide (16). Percentage of respondents who answered "often" or "always."

^h Based on SNAP-Ed Evaluation Framework and Interpretive Guide (16).

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PROGRAM EVALUATION BRIEF

Improving Physical Activity and Outdoor Recreation in Rural Alabama Through Community Coalitions

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PEER REVIEWED

Summary

What is already known about this topic?

Obesity is an epidemic in the United States, and certain regions are affected disproportionately in part as a result of built environments. Community-based participatory research ensures that a community's health needs are assessed appropriately and interventions to address those needs are developed through active partnerships with community leaders and residents.

What is added by this report?

Community coalitions in 14 counties in Alabama with rates of adult obesity at 40% or more implemented 101 interventions to address the lack of access to places for safe, affordable physical activity in 16 communities.

What are the implications for public health practice?

Physical activity interventions can be evaluated by calculating potential reach on the basis of census data or by directly measuring changes in the numbers and types of physical activity amenities.

Abstract

Obesity rates in the United States are trending upward, and disadvantaged populations continue to have disproportionate rates of obesity. In Alabama, the ALProHealth initiative used community-based participatory research to work with community coalitions to implement research-based interventions that addressed issues related to the lack of opportunities for physical activity in 14 counties whose populations are at high risk of obesity. Coalitions developed work plans and timelines for implementing interventions on the basis of issues discussed during focus groups at the

beginning of the ALProHealth initiative. These 14 coalitions implemented 101 interventions related to physical activity in 16 communities. In this evaluation, we measured potential reach and improvements in amenities. The largest reach for an intervention was achieved through marketing and communication efforts, while the most popular intervention, undertaken by the largest number of communities, centered on installing or repairing playground equipment at community parks. Community-based participatory research is an effective method for addressing health issues at the local level, as interventions are developed and readily adopted through active partnerships with community leaders and residents.

Introduction

The prevalence of obesity in the United States has reached epidemic levels and continues to grow. Thirty years ago, statewide obesity rates in the United States were below 15% (1). In 2013–2014, more than one-third of the adult population in the United States was obese (2). Previous research identified socioeconomic factors, such as race, income, age, and locale as indicators of the overall health of a population (3). For example, among races, African American people have the highest obesity rates (4). Rates of obesity are higher among people with a low income than among people with a high income (5), among older adults than among young adults (4), and among rural residents than among their urban counterparts (5). Compared with the nation, Alabama has a high percentage of African American residents, people and families living in poverty, older adults, and rural residents. Alabama has the fifth highest rate of adult obesity in the nation (36.3%) and the ninth highest rate of obesity among children and teenagers aged 10 to 17 years (18.2%) (6). In 2014, the adult obesity rates were 40% or greater in 14 Alabama counties.

A positive correlation exists between regular physical activity and good health. Physical activity contributes to reductions in obesity, cardiovascular diseases, diabetes, some cancers, anxiety, stress, and depression (7). Many factors influence participation in physical activity, one of which is the availability of physical activity as-



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sets in the built environment. The built environment refers to the physical aspects of an environmental site, which can affect physical activity levels of citizens through the existence of activity-friendly routes, such as sidewalks and bicycle paths, or facilities, such as parks and playgrounds. Just as disparities exist in rates of obesity among racial/ethnic minority populations and low-socioeconomic-status groups, disparities also exist in the quality of built environments that support physical activity and access to resources for physical activity (8). Rural environments are at a particular disadvantage because physical activity and active transportation resources such as sidewalks and bicycle paths are severely limited, and these inadequacies contribute to a higher prevalence of poor health outcomes among rural residents than among their urban counterparts (9).

Purpose and Objectives

To address obesity in Alabama, the Alabama Cooperative Extension System implemented ALProHealth, a community-based obesity reduction and prevention initiative. The program began in October 2014 and was implemented in 14 Alabama counties that have an adult obesity prevalence of 40% or more: Barbour, Bibb, Bullock, Chambers, Coosa, Crenshaw, Cullman, Escambia, Greene, Lowndes, Macon, Pickens, Sumter, and Wilcox. The population in these 14 counties, when compared with national and state populations, has a higher percentage of African American residents, has a lower income, is older, and has a higher percentage of rural residents (Table 1).

The overarching goal of the ALProHealth initiative is to prevent and reduce obesity in these 14 high-risk counties. This goal is being pursued through interventions related to 3 strategic areas: 1) education and technical assistance for built environment approaches, 2) a healthy retail food environment, and 3) opportunities for physical activity. Research-based interventions are being implemented to address each strategy. The objective of this study was to evaluate interventions related to increasing access to places for physical activity in these 14 counties.

Intervention Approach

The ALProHealth initiative used a community-based participatory research approach to maximize the effectiveness of community health assessments and to increase the likelihood that interventions were developed and adopted through active partnerships with community leaders. ALProHealth was conducted as a partnership between local communities and the Alabama Cooperative Extension System. County extension coordinators and regional extension agents in the 14 counties led the community coalitions. Each

county developed a coalition consisting of key members of the community, including city officials, school representatives, faith-based leaders, parks and recreation representatives, grocers, and other local residents interested in improving community health.

After coalitions were formed, the study team held focus groups in February and March 2015 with the 14 community coalitions to elicit information from local residents, particularly information on the challenges to maintaining a healthy lifestyle. We chose a focus group format because it encourages dialogue, provides rich text, efficiently elicits a range of ideas, and builds support and buy-in for community-based projects (10).

We organized focus groups to have 10 to 15 participants and last from 1 to 3 hours. A trained facilitator (R.W.B.), using a semistructured questionnaire, led each focus group discussion. The open-ended questions addressed nutrition education (“Where do you receive information about nutrition?”), access to healthy food (“Where do you go to purchase or receive healthy food?”), and opportunities for physical activity (“Where do you go to participate in physical activity?”). We recorded discussions and produced full transcripts for internal use. We placed a large aerial image (36” × 48”) of the community on a wall of the meeting room to help facilitate discussions about locations in the community. As participants identified locations related to the health of their community (eg, parks, schools, other recreation sites, food stores), the facilitator marked these locations on the map. The facilitator was often assisted by a coalition member who was familiar with the community and able to quickly identify locations being discussed.

A trained researcher (W.M.C.) coded each transcript by using NVivo version 10 (QSR International) to develop themes. The primary themes for coding were the 3 intervention strategies. The coder developed other nodes, on the basis of these 3 strategies, to group similarly themed statements. We converted community maps to a digital format by using ArcGIS version 10.4 (Esri). This conversion allowed us to share maps with focus groups and fellow grantees and to disseminate our research.

After the focus groups, we held meetings with each of the 14 coalitions to recommend research-based interventions. These recommendations were tailored according to the issues and information discussed in focus groups. This second meeting provided an opportunity for coalitions to hear ideas for potential interventions before any work plans were developed. The study protocol was approved by the institutional review board of Auburn University.

Evaluation Methods

For most ALProHealth interventions, our evaluation consisted of estimating the potential reach of an intervention through the use of

census data. For example, if a community coalition decided to add outdoor exercise equipment to an existing walking trail or park, we estimated the number of adults in the community who had access to a safe, affordable place for physical activity as a result of the additional equipment. If a playground was added to a park or school for community use, we estimated the number of children who had access to a new location for physical activity.

We calculated potential reach primarily by using estimated population counts of counties in the American Community Survey (11). If an intervention affected the entire county population, then we considered the entire county population to be reached. For age-specific interventions, such as the installation of playground equipment, we considered the population of children aged 14 or younger in the county. If a project was geared toward teenagers and adults, we considered the population for children aged 10 or older. We counted the number and types of physical activity interventions implemented by community coalitions. Determining actual use of amenities was not feasible because of the logistics of having a research team member monitor locations of physical activity (eg, parks, trails) and then extrapolate these data and a lack of resources to execute those tasks.

Results

The focus groups yielded similar statements about physical activity opportunities from one community to another. Focus group participants discussed primarily the lack of physical activity opportunities and facilities. Participants noted the following: “there’s not that many opportunities here,” “we don’t have the facilities to have a ball club,” “the children don’t have anything to do,” and “the city doesn’t have a place for recreation.” The development of a work plan led to coalitions discussing the possibility of creating new areas or enhancing community spaces for physical activity. Locations of interest included parks, playgrounds, trails, green spaces, and recreation fields.

Other participants noted a lack of awareness of facilities or programs. One stated, “We have a community life center, a walking track, indoor equipment, 2 weight rooms, and we maybe get 5 or 6 [people] most days to utilize the facility.” Coalitions included communication efforts in their work plans to address promoting existing facilities and resources through events such as annual outdoor celebrations or ribbon-cutting ceremonies for new or updated facilities.

Another theme was weather, an especially important topic in the southeastern United States, where high temperatures and humidity persist throughout much of the year. Participants noted the need for “some type of indoor activities center, where you’ve got cli-

mate control” and “more access to indoor activities.” This topic led to coalitions discussing the possibility of creating indoor exercise facilities that could be used by the public for free or an affordable fee.

On an individual level, many participants were frank about their lack of motivation or interest in exercise, stating, “motivation is the key” and “the bottom line is exercise has to be fun.” During work plan development, coalitions discussed the implementation of exercise groups and enjoyable programming to increase the attraction of participating in physical activity.

During the first 4 years of the ALProHealth initiative, the 14 community coalitions implemented 101 physical activity interventions in 16 communities (Table 2) to address the topics discussed in focus groups. Many interventions addressed the lack of facilities and resources for physical activity; the most popular projects were the addition of outdoor exercise or fitness equipment and the addition of playground equipment to enhance existing parks and trails. Some coalitions chose to address the challenge of weather and created indoor spaces for physical activity. Other enhancements made to existing parks and trails included adding rest benches, planting shade trees, installing water fountains, and enhancing the safety of spaces with the addition of lighting. Another popular intervention focused on communication efforts to promote existing resources for physical activity. This intervention was implemented through promotional events, such as annual block party celebrations and ribbon-cutting ceremonies, or through the creation of signage and other print resources to identify local places for physical activity.

Implications for Public Health

Results of focus groups comprising members of community coalitions in 14 counties with a prevalence of adult obesity at 40% or more in Alabama indicated environmental challenges to overcoming obesity. ALProHealth used a community-based participatory research model that recognized the coalition members as decision makers and developers of work plans to address these challenges. Community coalitions implemented 101 research-based interventions, based directly on issues discussed in focus groups, to address the lack of opportunities for physical activity. Interventions with the greatest potential reach were those that enhanced the safety, aesthetics, or usefulness of a community space; established a new walking or biking trail or enhanced an existing one; or installed outdoor exercise or fitness equipment.

Our evaluation of these interventions consisted primarily of calculating potential reach on the basis of estimated population counts. Potential reach is not the strongest measure for determining success; that we used it as a primary measure is a limitation of this study. However, we did not have the resources to collect and ex-

trapolate data on actual use. One future method for counting the number of people using a walking trail is the use of an infrared trail counter. These trail counters could be installed at intervention and control locations to log pre-intervention and post-intervention data.

When planning for physical activity or outdoor recreation interventions at a community level, researchers should consider using a community-based participatory model to increase effectiveness and buy-in for potential interventions. Local knowledge is critical to implementing and sustaining policy, system, or environmental changes, which can be achieved through active partnerships with community leaders.

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Tables

Table 1. Comparison of Selected Demographic Characteristics in the United States and in 14 High-Obesity^a Counties in Alabama^b

Location	Percentage African American	Median Family Income, \$	Median Age, y	Percentage of Population Living in Rural Areas
14 High-obesity counties in Alabama	36.1	44,669	40.0	74.3
Alabama	26.4	56,828	39.0	40.9
United States	12.2	67,871	37.7	19.3

^a “High obesity” defined as having a prevalence of obesity $\geq 40\%$ among adults: Barbour, Bibb, Bullock, Chambers, Coosa, Crenshaw, Cullman, Escambia, Greene, Lowndes, Macon, Pickens, Sumter, and Wilcox counties.

^b Data source: US Census Bureau (11).

Table 2. Type and Number of Physical Activity Interventions Implemented by Community Coalitions and Potential Reach of Intervention in 14 High-Obesity^a Counties in Alabama, 2014–2018

Intervention	No. of Communities Implementing Intervention	Potential Reach for Community Intervention, No. of People
Promote existing resources for physical activity through signage	14	58,667 ^b
Enhance safety, aesthetics, and usefulness of community spaces	12	57,111 ^b
Install outdoor exercise/fitness equipment	15	53,979 ^c
Establish a new or enhance an existing walking/biking trail	9	48,809 ^b
Host a promotional kick-off event to highlight resources for physical activity	12	38,555 ^b
Establish or support an indoor community fitness center	7	23,524 ^c
Establish and support a walking or exercise group	8	14,284 ^b
Install or repair playground equipment at community parks	16	8,363 ^d
Hire a professional consultant to improve local parks	3	7,711 ^b
Create or promote safe routes to walk/bike to school	2	937 ^e
Establish or support community or youth sports and activities	3	815 ^d

^a “High obesity” defined as having a prevalence of obesity $\geq 40\%$ among adults: Barbour, Bibb, Bullock, Chambers, Coosa, Crenshaw, Cullman, Escambia, Greene, Lowndes, Macon, Pickens, Sumter, and Wilcox counties.

^b Estimated total population of communities implementing intervention.

^c Estimated population aged ≥ 10 in communities implementing intervention.

^d Estimated population aged ≤ 14 in communities implementing intervention.

^e Total enrollment of schools implementing intervention.

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PROGRAM EVALUATION BRIEF

Community-Wide Efforts to Improve the Consumer Food Environment and Physical Activity Resources in Rural Kentucky

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PEER REVIEWED

Summary**What is already known about this topic?**

Several states participated in the Centers for Disease Control and Prevention High Obesity grant project. Obesity affects adults and children across a broad spectrum of geographic, socioeconomic, and racial/ethnic populations. To date communities have struggled to address how best to decrease the rates of obesity among the most marginalized populations.

What is added by this report?

From 2014 through 2018 a variety of nutrition and physical activity strategies were implemented across 6 counties in rural Kentucky with the goal of improving food access and resources for being physically active. We highlight the success of these programs in aiming to improve dietary intake and physical activity.

What are the implications for public health practice?

By understanding what community-driven nutrition and physical activity strategies are successful, other communities can develop and implement similar programs.

Abstract

Community interventions to improve access to food and physical activity resources can reduce obesity rates and improve obesity-related health outcomes. We describe a Kentucky community project that consisted of collaborating with grocery store managers to improve the consumer food environment and partnering with community members to improve walking trails, bicycle

racks, and other physical activity resources. We surveyed 2 random samples of community residents in 6 participating rural counties, 741 in 2016 (year 1) and 1,807 in 2017 (year 2). Fruit and vegetable intake significantly increased from year 1 (mean servings fruits, 2.71; vegetables, 2.54) to year 2 (mean servings fruit, 2.94; vegetables, 2.72). Although moderate physical activity did not change from year 1 to year 2, concern among residents about places to be physically active improved ($P = .04$). Involving community members in promoting obesity prevention programs may improve dietary intake and alleviate community concern about physical activity.

Introduction

Compared with urban communities, rural communities face greater barriers to healthy eating and active living, such as limited access to food, transportation barriers, fewer sidewalks, and fewer resources for physical activity. These barriers contribute to higher rates of obesity in rural communities than in their urban counterparts (1,2). A host of factors related to geographic isolation, socioeconomic status, and lack of access to affordable healthy foods all contribute to the prevalence of obesity and poor dietary outcomes (1,3). One approach to targeting obesity is through community programs.

Recent community efforts among African American adult women in the rural South have shown significant success with improved intake of fruits and vegetables and increased physical activity (4). Another school-based intervention involving community outreach also showed improved intake of fruits and vegetables (5). Although these community efforts used individual-level approaches, such as nutrition education through face-to-face sessions and in-class sessions, they did not address the built environment as a way to improve access to healthy foods and places to be physically active. Results from previous multilevel interventions targeting both urban and rural populations (6,7) suggest that tailored community-based interventions can improve health outcomes (7). However,



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research is needed to understand how changing the consumer food and physical activity environments in rural communities can improve health outcomes (8).

Research focusing on interventions directed at the consumer food environment (eg, items available in grocery stores) to improve nutrition has reported using recipe samples and placing products strategically as a way to increase purchases of healthy food items (9,10). In addition, a parallel focus is needed on improving community resources for physical activity. Research shows that when people have access to safe places for physical activity, the likelihood of their engaging in physical activity increases (4). Community involvement can help determine the type and location of physical activity enhancements.

We describe a community intervention conducted among 6 rural Kentucky counties from March 2016 through May 2017 to make environmental changes to promote access to healthy food and physical activity. The primary evaluation outcomes were self-reported results of surveys of adults about their intake of fruits and vegetables and minutes of moderate physical activity engaged in between baseline in March through May of 2016 and completion from March through May 2017, one year after implementation. Our objectives were to determine the effectiveness of a community-based program by using a quasi-experimental study design to assess mean differences in dietary intake; minutes of moderate and vigorous physical activity; and community concern about obesity, healthy eating, and physical activity.

Purpose and Objectives

Our project was funded by a cooperative agreement with the Centers for Disease Control and Prevention (CDC). Because the goal of our CDC cooperative agreement was program evaluation of development and delivery interventions at the community level, we used a quasi-experimental study design. Baseline data were collected in year 1 of the study before the intervention began, and data from follow-up surveys were collected in 2017 after completion of the intervention. To understand the key drivers of obesity and identify opportunities for obesity prevention in rural communities we selected 6 counties on the basis of US Department of Agriculture Rural Codes of 7 or higher (<https://www.ers.usda.gov/data-products/rural-urban-continuum-codes/>) and on the basis of an obesity prevalence of 40% or more (Clinton, Elliott, Letcher, Lewis, Logan, and Martin counties). These counties were identified as high-priority areas for intervention by the 1416 High Obesity Areas Grant Program of the Centers for Disease Control and Prevention (CDC) Division of Nutrition, Physical Activity,

and Obesity (2). These counties had poverty rates ranging from 25.7% to 35.7%, food insecurity rates of 15.2% to 20.1%, and an unemployment rate ranging from 9.6% to 17.3%.

Residents' engagement in assessing community food environment and physical activity needs and assets was facilitated by Family Consumer Science (FCS) Extension Agents in each county (11). Each agent recruited and convened a group of county stakeholders — health care providers and personnel from grocery stores, public health departments, and public libraries — in planning meetings to evaluate community needs and assets. University faculty and staff guided stakeholders in generating a list of community assets, discussing the risk factors contributing to obesity in their counties and mapping these obesity risk factors onto the identified assets. High produce costs resulting from geographic remoteness were identified as an unaddressed barrier to accessing fresh food and a contributing factor to obesity. In addition, the lack of safe and affordable resources for being physical active was another factor identified. These insights prioritized the targeting of grocery stores and farmers markets and improving resources that facilitate physical activity.

Intervention

Consumer food environment

The Plate it Up Kentucky Proud (PIU) social marketing campaign is a collaboration among University of Kentucky students, faculty, and staff; FCS extension agents; and the Kentucky State Department of Agriculture. As part of the PIU campaign, healthy recipes incorporating locally grown, in-season fruits and vegetables are developed by undergraduate dietetics and human nutrition students. Following taste-testing and evaluation, select recipes are prepared by FCS extension agents for further testing in the community setting.

Supermarkets with 5 to 7 cash registers were asked to participate in the PIU social marketing campaign in years 1 and 2 of the project. In each county, at least 1 store participated, and 17 stores participated in years 1 and 2 (Lewis County, 3 stores; Martin County, 2; Clinton County, 3; Logan County, 4; Letcher County, 3; Elliot County, 2). Stores with 5 to 7 cash registers were designated as supermarkets ($n = 16$), and stores with 8 cash registers or more ($n = 1$) were designated as supercenters. Evidence-based marketing strategies in the stores were implemented to heighten awareness of the PIU brand, including recipe samples offered at grocery store entrances and produce offered at check-out end caps. Additionally, children's shopping carts, placards for grocery carts with PIU recipes and the PIU logo, and a banner of the PIU logo outside each grocery store were provided.

All farmers markets in the counties participated in PIU events during their season (May–September of years 1 and 2). Tote bags and gel packs were distributed as incentives for PIU sampling, and \$5 gas cards were distributed to encourage shopping at farmers markets.

Physical activity resources

County coalitions determined which physical activity enhancements would be best suited for their communities. Selections were wide-ranging, from Fit-Trail installations to park benches, from park bathroom renovations to water bottle–filling stations, from road striping for bicycles and pedestrians to sunshades in parks and athletic fields. These diverse actions were selected to remove barriers to physical activity. FCS Extension Agents in each county offered programs that involved the use of the enhancements, such as conducting a “bike rodeo” in a park with new benches, trash cans, water bottle–filling stations, and bike racks.

Evaluation

Random-digit–dial surveys were conducted in years 1 and 2 for the 6-county region. A detailed description of each county and methods for sampling residents are available (11). Briefly, adult residents in all counties were called who had either land lines or cellular telephones. The random-digit–dial procedure ensured that every residential telephone line (both landline and cellular) in these Kentucky counties had an equal probability of being called. Households were screened to identify the adult primary food shopper. Primary food shopper was determined by asking the following: “Do you conduct at least 25% of the food shopping per week for your household?”. If the person responded yes, the survey continued. If the person responded no, the caller asked to speak with the primary food shopper in the household. Demographic questions assessed income level, sex, age, years of residence, and marital status.

Up to 15 call attempts were made with up to 10 scheduled callbacks to those reached at an inconvenient time. The final sample for year 1 was 741 respondents, and for year 2, 1,807. These were 2 separate samples and were thus treated as distinct random samples. The University of Kentucky institutional review board approved this study.

Outcome measures

The primary outcome was change in fruit and vegetable intake, measured in the survey as, “On a typical day, how many servings of fruits or vegetables do you consume?” The response options consisted of less than one serving, 1 serving, 2 servings, 3

servings, 4 servings, 5 servings, or 6 servings. These questions were previously validated among the National Cancer Institute Eating at America’s Table (12).

To capture physical activity minutes, the survey asked how often the person engaged in moderate physical activity (defined as 30 minutes of moderate activity such as walking, light jogging, gardening; 3.0 to 6.0 metabolic equivalents (METs) of energy expenditure) in minutes and then days per week. The same question was asked for vigorous physical activity (defined as 30 to 45 minutes of vigorous activity such as running, cycling, rowing; >6.0 METs of energy expenditure). These questions were taken from the National Health and Nutrition Examination Survey Physical Activity and Physical Fitness Questionnaire (https://www.cdc.gov/Nchs/Nhanes/2015-2016/PAQ_I.htm).

Secondary outcomes were changes in shopping behaviors, assessed by asking where and how often respondents shopped at the following types of food venues: supercenters, supermarkets, and farmers markets or community-supported agriculture gardens. Response options were 2 or more times per week, once per week, 2 to 3 times per month, once per month, a few times per year, never, and don’t know. These response options were collapsed to create categorical variables of 2 to 3 times per month, including once per month, a few times per year, and at least once per week. These questions have been used among rural residents in Kentucky and North Carolina (11).

Our study assessed whether there was an increase in levels of concern about obesity, healthy eating, and physical activity among surveyed participants after being exposed to the intervention for more than a year. From a 2016 survey among those participating in Department of Agriculture Cooperative Extension Service programs in the same Kentucky counties we studied, we determined that 1,000 to 9,000 families were reached via Extension Service efforts related to information about accessing healthy food, and 0 to 7 physical activity environmental changes were implemented in the counties. Therefore, to determine whether there was an increase in overall community concern about healthy eating, obesity, and physical activity, we asked several questions. To assess levels of concern, respondents were asked whether obesity, healthy eating, and physical activity in their community were a concern. Response options were not at all a concern, minor concern, moderate concern, serious concern, and don’t know. To assess these changes from year 1 to year 2, we used Fisher’s exact tests for categorical variables and *t* tests to assess changes in mean servings of fruits and vegetable consumed and mean minutes and days per week of moderate and vigorous physical activity, adjusted for age, income, race/ethnicity, and sex. Stata 14.0 (StataCorp LP) was used in all analyses, weighted for the sample size in each county (13).

Results

From year 1 to year 2, the mean number of servings per day of fruit increased significantly from 2.71 to 2.94 ($P = .03$), and the mean number of servings per day of vegetables increased from 2.54 to 2.72 ($P = .04$) (Table 1). No significant change occurred from year 1 to year 2 in shopping frequency at primary type of food store. However, there was an increase in mean frequency of shopping at farmers markets, from 7% shopping at farmers markets once a week in year 1 to 12% in year 2.

Our analysis of the variables measuring community concern about obesity, healthy eating, and awareness of PIU indicated that levels of concern about obesity, healthy eating, and physical activity, changed significantly from year 1 to year 2 (Table 2).

Implications for Public Health

Our program targeting small and mid-sized rural supermarkets and farmers markets improved dietary intake of fruits and vegetables and shopping frequency at farmers markets. Previous research indicated that community interventions were modestly successful in addressing key health outcomes, including via social marketing campaigns (14) and taste-testing, which our results support. In addition to these established marketing strategies, PIU addressed the communities' food retail infrastructure. Recipe samples and placement of healthy items at check-out counters led to purchase of healthier food (15), as did signage on grocery carts. These findings suggest that the enhancements to the consumer food environment (recipe samples, product placement, signage) combined with social marketing approaches were effective in improving fruit and vegetable intake in rural communities.

Our findings should be interpreted cautiously. Because we used a quasi-experimental study design, no causation can be established. Data on costs were not collected to determine cost-effectiveness of our strategies (8). Much of the physical activity infrastructure was new at the time of the second survey, and programming around the infrastructure was still limited. Another limitation was the difference in sample size between years 1 and 2 generated by the random-digit-dial method. The difference may be related to the possibility that residents became familiar with the program by year 2 and were more willing to respond to the survey team. Nevertheless, these results suggest a role that community residents and store owners can play in improving the rural consumer food environment.

Our findings suggest that involving community members and grocery store owners was key in improving the community food environment in rural counties. Social marketing programs such as PIU appear to be useful in raising awareness and concern about

healthy eating and obesity in small, rural communities with limited consumer food options. Campaigns like PIU can "blanket" the consumer food environment of rural counties and aid in improving access to healthy foods.

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Tables

Table 1. Demographic Characteristics and Changes in Shopping, and Dietary Habits Among Community Residents (N = 2,548) in Rural Counties With High Prevalence of Obesity, Kentucky 2016–2017^a

Characteristic	Year 1 (n = 741)	Year 2 (n = 1,807)
Female sex	75 (555)	73 (1,319)
Participant in Supplemental Nutrition Assistance Program	13 (96)	19 (343)
Education		
High school graduate or GED	27 (200)	30 (542)
Some college	22 (163)	23 (415)
Married	64(474) ^b	57(1,029) ^b
Dietary habits		
Servings of fruit/d, mean (SD)	2.71 (2.26) ^b	2.94 (2.72) ^b
Servings of vegetables, mean (SD)	2.54 (2.35) ^c	2.72 (2.25) ^c
Physical activity, min/d, mean (SD)		
Moderate activity	131 (0.41)	128 (0.43)
Vigorous activity	99.92 (0.64)	113 (0.72)
Physical activity, days/wk, mean (SD)^d		
Moderate activity	4.6 (2.05)	4.7 (2.52)
Vigorous activity	4.38 (1.92)	4.3 (1.09)
Type of store for primary shopping^e		
Supercenter	85(630)	85 (1,535)
Supermarket	65(481)	63(1,138)
Frequency of shopping at supercenter^e		
2–3 times per month	24(178)	28 (506)
1 time per week	32 (237)	30 (542)
Frequency of shopping at supermarket^e		
2–3 times per month	23 (176)	24 (434)
1 time per week	26 (182)	26 (470)
Fruit and vegetable community shopping (farmers market, CSA garden)		
2–3 times per month	10 (74)	10 (19)
1 time per week	7 (52) ^c	12 (217) ^c
Distance from farmers market, miles, mean (SE)	9 (.34)	9 (.21)

Abbreviations: CSA, community supported agriculture; GED, general equivalency degree; SD, standard deviation; SE, standard error.

^a Values are number (percentage) unless otherwise indicated. Percentages may not total 100 because of rounding. Totals in some categories may not correspond to overall totals because of nonresponders in some categories of questions.

^b Significance of change from year 1 to year 2, $P = .03$.

^c Significance of change from year 1 to year 2, $P = .04$.

^d Moderate physical activity = 3.0 to 6.0 metabolic equivalents (METs) of energy expenditure; vigorous physical activity = >6.0 METs.

^e A midsize supermarket has 5 to 7 cash registers; a supercenter has at least 8 cash registers.

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Table 2. Concern Among Community Members (N = 2,548) About Social Marketing Changes on Obesity, Healthy Eating, and Physical Activity from Year 1 to Year 2 in Rural Counties With High Prevalence of Obesity, Kentucky 2016–2017^a

Area of Concern	Year 1 (n = 741) ^b	Year 2 (n = 1,807)	P Value ^c
Obesity			
Not at all a concern	15 (2)	110 (6)	.02
Somewhat a concern	600 (81)	947 (52)	
Serious concern	111 (15)	750 (41)	
Healthy eating			
Not at all a concern	22 (3)	116 (6)	.03
Somewhat a concern	615 (83)	1,061 (58)	
Serious concern	110 (14)	630 (34)	
Physical activity			
Not at all a concern	22 (3)	156 (8)	.04
Somewhat a concern	630 (85)	1,122 (62)	
Serious concern	77 (11)	529 (29)	

^a Values are number (percentage). Percentages may not total 100 because of rounding.

^b Values for obesity and physical activity do not total 741 because of 5% nonresponders.

^c Change from year 1 to year 2.

PUBLIC HEALTH PRACTICE BRIEF

Opportunities and Challenges Addressing Access to Healthy Food in Five Rural Louisiana Food Stores

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Summary

What is already known about this topic?

Environmental food store interventions are recommended to develop healthy food environments and to reduce obesity.

What is added by this report?

A multicomponent environmental food store intervention was implemented in 5 rural food stores across 3 Louisiana parishes with high obesity prevalence to address healthy food access.

What are the implications for public health practice?

We highlight the successes and challenges of working in the rural food store climate as well as results of our program evaluation on health behavior change. By understanding the rural food store climate, public health practitioners can tailor best practices to reduce obesity for rural populations.

Abstract

The prevalence of high obesity in rural communities may result from low access to healthy foods. To improve the local food environment, a multicomponent environmental food store intervention was implemented in 3 Louisiana parishes where obesity prevalence was greater than 40%. The intervention consisted of healthy-food demonstrations, in-store marketing, and encouraging store owners to stock healthy items. We documented aspects of the rural food store climate, such as store size and the store owner's willingness to stock healthy items, that affect improving access to healthy food. We found that although the intervention was not effective in shifting purchasing or dietary habits of customers, positive changes in some food store environments did occur. To maximize the effect that rural food store interventions can have on re-

ducing obesity, it is essential to understand aspects of the rural food store climate.

Background

Louisiana consistently ranks in the top 10 states with the highest prevalence of obesity, and in 2017, 36.2% of Louisiana adults were obese (1). To combat rising obesity, Louisiana State University's (LSU's) AgCenter's Cooperative Extension Healthy Communities initiative created cross-sector partnerships with schools, elected officials, community members, faith-based communities, and community stakeholders to promote healthy eating and physical activity through policy, systems, and environmental approaches. The Healthy Communities initiative began in 2015 and initially targeted 3 rural Louisiana parishes (counties): Madison (population, 11,616; adult obesity prevalence, 43.4%); St. Helena (population, 10,509; adult obesity prevalence, 41.9%); and Tensas (population, 4,771; adult obesity prevalence, 41.8%) (2,3). A central component of this initiative was the development of local Healthy Communities coalitions that assess local needs and prioritize interventions targeting the local nutrition and physical activity environments.

In response to coalition feedback, the Healthy Communities initiative implemented multipronged interventions in 5 food stores in the 3 parishes in fall 2017. The interventions aimed to increase the community's awareness of healthy food offerings and to increase access to healthy foods and included the following components: healthy food demonstrations, in-store marketing, and encouraging store owners to stock healthy items.

Intervention Approach

Healthy Communities Coalition members and program staff members worked through a collaborative needs assessment process to identify local resources, including existing food stores. In some cases, coalition members introduced LSU AgCenter staff to local food store owners. If contact was more difficult to make, the program staff conducted outreach to food stores and invited store



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owners to attend Healthy Communities Coalition meetings. In one Healthy Communities Coalition, the store owner regularly attended coalition meetings. Owners from at least one major food store, grocery, or convenience store were recruited in each parish. To improve the intervention's reach, our approach was geared toward engaging owners of local stores recommended by community members as being locations where they frequently shopped. All store owners who were invited to participate agreed to do so. In total, 5 stores (3 grocery stores and 2 convenience stores) across the 3 parishes became Healthy Communities Partner Stores.

In June 2017, store owners received technical assistance through in-person site visits regarding strategies to promote healthy food items from a consultant with The Food Trust, a national healthy food access organization. Store owners were asked to provide input on available marketing materials that worked best for their store, were given shelving and cooler infrastructure, and asked about aesthetic preferences. Store owners selected the most applicable and feasible interventions to improve healthy food access and awareness in their store. All stores chose to participate in in-store marketing and nutrition education, and LSU AgCenter program staff members led implementation to minimize the burden on the food store staff. Although no monetary incentives were provided, store owners did receive marketing materials at no cost. The marketing materials were provided by the LSU AgCenter and valued at \$1,000 per store. Store owners were also encouraged to stock healthy items; however, this was voluntary. One store used a merchandising store "reset" (large scale rearrangement of a store's products) as an opportunity to integrate healthy food products into their store.

In-store marketing included shelf banners and signage that used a traffic-light concept to help customers identify healthy and unhealthy options. Green signals "Go," indicating the healthiest foods; yellow signals "Caution," indicating somewhat healthy foods; and red signals "Stop and Think," indicating the least healthy foods (Table 1). Marketing was installed throughout partner stores in produce, dairy, and meat departments and on aisles of canned and frozen goods, bread, pasta, and cereal. Grab-and-go coolers with beverages and snack items were also targeted. In-store marketing was installed in all partner stores over a 4-month period (September–December 2017). The in-store marketing exposure period ranged from 8 to 12 months (August 2017–August 2018). LSU AgCenter staff members conducted in-store nutrition education lessons, including food demonstrations and healthy food taste tests, on at least a quarterly basis during the intervention period.

Implications for Public Health

Several aspects of the rural food store climate emerged as important considerations when implementing environmental food store interventions in rural areas. First, the size of the store and its ownership dictates the store's ability to stock healthy items. Four of 5 partner stores were independently owned and operated by people residing in the parish their store served. One store was owned by a local grocery retail chain. All 3 grocery stores ordered and received products through large, full-service warehouse distribution centers. Stores are required to sign contracts for numerous years and must attain certain sales levels to meet contract requirements. Therefore, larger stores had better access to new, healthy products and an easier time sourcing them. These stores also received additional assistance in many areas such as payroll, transaction processing equipment, bookkeeping, and store merchandising resets.

Smaller stores, such as the convenience stores we worked with, did not have these amenities and therefore had a limited capacity and ability to stock healthy items. One store owner commented that his store had been on decline since the 1970s as families continued to move out of the parish, resulting in reduced sales and a store with smaller capacity. As stores get smaller, they no longer meet wholesaler contracting requirements. Without these contracts, small store owners must source independent vendors to stock their stores. However, given the rural location of stores, they encounter difficulties in procuring vendors that are willing to make long-distance deliveries, particularly fresh-produce vendors. One store owner mentioned that during spring and summer months, when local community members have gardens, he buys produce from gardeners to supplement his produce department. Therefore, less traditional routes of procuring healthy foods, such as working with seasonal local gardeners, may be an opportunity to explore in rural areas as this work continues. These store owners also mentioned that they were less willing to order new products for their stores because they felt there was a high chance the products would not sell. In these cases, we focused on promoting the healthy items that already existed, thereby increasing awareness of existing healthy foods as opposed to increasing access to additional healthy foods.

A second aspect of the food store climate relates to the importance of food and beverage companies. Across all stores, many point-of-purchase areas (strategically placed displays or coolers that aim to attract customers) could not be altered or changed because of contracts in place with large food and beverage companies, such as Coca Cola, Little Debbie, Pepsi, and Frito-Lay. These companies supply infrastructure (shelving or coolers) for products and have local company representatives stock products weekly, reducing burden on the store's staff. Items with high sugar and sodi-

um content were available at point-of-purchase areas, including the checkout aisle. Our experiences are echoed in a recent study of agreements between food stores and food and beverage distributors (4). These distributors influence what foods are stocked in stores, and in turn, what foods are available for customers to purchase.

Despite difficulties in accessing and sourcing new, healthy products, we saw increases in healthy food offerings in partner stores overall (Table 2). Two store owners voluntarily increased available healthy items. These increases were due in part to larger (grocery) stores being able to stock new items through merchandising store resets and using such resets as an opportunity to stock healthy products. One of these stores also implemented a healthy checkout aisle stocked with healthy grab-and-go snacks strategically placed at the point of checkout. Pre-intervention and post-intervention store inventories showed that in-store healthy food availability increased the most for canned fruits and vegetables and whole-grain cereal. These positive findings are supported by a previous study of rural food store owners indicating that owners are willing to stock healthy items (5).

Future interventions should carefully consider whether the intervention strength (eg, dose, reach) is adequate to promote behavior change. In our study, 63% of customers said that they noticed signage for healthy foods and drinks in the partner store before signage was installed; these results may indicate that customers may not have noticed the implementation of in-store marketing or that survey responses were subject to social desirability bias. A similar study assessing customer reactions to healthy in-store marketing interventions found that few customers noticed program interventions, which included in-store marketing, and noted that more marketing promotion was needed (6). Stronger cross-promotion or reinforcement of marketing with nutrition education lessons (eg, food demonstrations) or additional strategies, such as in-store advertisements or loud speaker announcements, may be necessary to increase customer exposure to marketing through direct customer contact. Furthermore, pre-post assessments (52 customer surveys pre-intervention and 78 surveys 8 to 11 months post-intervention) revealed no changes in customer perceptions about the local food environment or self-reported purchase and consumption of healthy (eg, fruits, vegetables) and unhealthy (eg, soda) foods. At both time points, 40% of customers at baseline and 38% post-intervention reported purchasing fruits or vegetables from the partner store at least once in the past week. It is possible that the level of in-store marketing and nutrition education as implemented was not a sufficient dose to produce the desired behavior changes. Previous food store interventions that were successful at producing purchas-

ing or dietary changes had at least medium to high dose (exposure), reach (number of participants reached), and fidelity (program implemented as planned), and achieved dose and reach through multipronged strategies (7) that combined behavioral and environmental approaches.

Interestingly, customers surveyed at the partner food stores reported positive perceptions of their local food environment, despite living in rural food deserts (rural areas more than 10 miles from a grocery store or supermarket) (8). A recent study in a rural agricultural community found that community members felt that they had adequate access to healthy foods and perceived a positive food environment whereas the objective measurement of their local food environment indicated lack of access to healthy foods, a poor food environment (9). Therefore, individual perceptions of the local food environment may not be helpful in indicating the success of interventions aimed at increasing healthy food access and awareness.

Currently, interventions, including enhanced in-store marketing, that engage local food retailers are promoted as best practices to encourage the development of healthy food environments and to reduce obesity (10). Our assessment further identifies rural food store owners as important stakeholders in addressing rural healthy food access. Although we documented successes in large food stores, aspects of the rural food store climate require consideration for feasible approaches in these small stores, given the limitations of smaller stores' ability to source a wide variety of healthy foods. Our assessment highlights important aspects to inform ongoing efforts addressing rural healthy food access.

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Tables

Table 1. In-store Marketing Using Traffic Light Concept to Indicate Healthy Foods, Louisiana 2017–2018

	Green – Go: Healthiest	Yellow – Caution: Somewhat Healthy	Red – Stop: Least Healthy
Fruits and vegetables	Fresh fruits and vegetables	Canned or frozen fruits and vegetables with less than 290 mg sodium and no added sugar	Canned or frozen fruits and vegetables with more than 290 mg sodium or with added sugar
Grains	Whole grains listed as the first ingredient: pasta, rice, bread, flour	Refined and whole grain: whole grain is not listed as first ingredient	White refined: whole grain not listed as an ingredient
Proteins	Lean and low-fat fish, poultry, eggs, beef, pork	Non-lean meat: steak, ground beef, poultry with skin	Processed meats: high sodium or high fat meats – bacon, deli meat, sausage
Beverages	No sugar added, water, fat-free, or 1% low-fat milk	100% juice, diet drinks, low-fat chocolate milk	Soda, fruit drinks, sport drinks, iced tea, lemonade

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Table 2. Baseline and Post-Intervention Availability of Healthy Food Offerings^a Across 5 Healthy Community Partner Stores, Louisiana 2017–2018

Food	Baseline	Post-Intervention
Fresh fruit	27	25
Fresh vegetables	40	45
Canned fruit	16	22
Canned vegetables	39	64
Frozen fruit or vegetables	70	68
Skim or low-fat milk	8	3
Whole grain bread	3	5
Whole grain cereal	9	24
Lean cuts of meat	1	1
Dried beans or peas	14	18

^a Average number of varieties.

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PROGRAM EVALUATION BRIEF

Gardening for Health: Using Garden Coordinators and Volunteers to Implement Rural School and Community Gardens

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PEER REVIEWED

Summary

What is already known about this topic?

Several states participated in the Centers for Disease Control and Prevention High Obesity grant project. Community gardens increase access to and availability of healthy food, increase physical activity of gardeners, and provide numerous social and emotional benefits.

What is added by this report?

From 2014 through 2018 community gardens were established across 6 counties in rural South Dakota with the goal of engaging community members to improve food access and resources and be more physically active. We describe this process.

What are the implications for public health practice?

Gardens are a part of the local foods landscape in rural communities; thus, understanding how community gardens can influence broad community policies, systems, and environments can help other communities to develop and implement similar programs.

Abstract

Gardens provide access to healthy food, increase access to nutrition and physical activity opportunities, and are a focal point for community interventions. We used a gardening intervention to improve local access to and consumption of fruits and vegetables and as an integral part of overall efforts of local wellness coalitions. Seasonal garden coordinators were hired, and action plans included goals for nutrition and physical activity education pro-

grams and youth and adult engagement. The characteristics of each garden (size, items planted, number of volunteers) and pre- and post-intervention surveys were used to understand how the gardens affected communities. Thirteen gardens were planted, and volunteers provided 18,136 hours; adults from the community reported an increased awareness of garden benefits. The community garden intervention provided opportunities for collaboration with a variety of schools, community organizations, and city and tribal organizations, thereby increasing the sustainability of the intervention.

Background

Community gardens increase access to and availability of healthy food (1), and fruit and vegetable consumption is higher among adults who participate in community garden projects than those who do not, in both rural (2) and urban areas (3). Physical activity levels are also higher among community gardeners, because the work done in gardens constitutes moderate-to-high physical activity (4). Furthermore, people who garden have lower body mass indexes than those who do not (5), probably because of the diet- and physical activity-related benefits of gardens and gardening.

Connecting and interacting with nature itself has many health benefits (6), and the benefits of community gardens go beyond improving diet, physical activity, and weight outcomes. Numerous social and emotional benefits of community gardening have been documented, including social interaction (7), strengthened family relationships (8), community building and engagement (3,7,9), and greater life satisfaction (9). Moreover, food insecurity has been reduced in certain populations by community gardening (8), which also has been shown to increase food self-sufficiency (10,11). Although community gardening efforts have many benefits of their own, gardens themselves can also serve as a focal point for other interventions in the community, including family gatherings, com-



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munity meetings, and improving physical and mental well-being (12).

Communities and academic entities can successfully partner to develop community gardens (13), which are a vital part of a healthy community approach and are built-in aspects of the community engagement process. South Dakota State University (SDSU) Extension worked with local communities to implement garden-based interventions that were tailored to meet the needs of rural South Dakotans, including tribal communities. The purpose of the gardens was to improve local access to and consumption of fruits and vegetables in counties with prevalence of adult obesity higher than 40% and with a high percentage of Supplemental Nutrition Assistance Program (SNAP) participants. We describe how community garden coordinators and volunteers were used to implement school and community gardens and the public health implications of the project.

Partnerships and Collaborations

SDSU Extension staff members and collaborators first engaged and supported communities in establishing a local wellness coalition as part of the Centers for Disease Control and Prevention's (CDC's) High Obesity Program and the Supplemental Nutrition Assistance Program Education's (SNAP-Ed's) cooperative agreements to empower communities to implement environmental interventions, such as gardens. The newly formed coalitions recruited and engaged community members and raised awareness about coalition efforts. Each coalition had an Extension staff member who acted as lead facilitator and helped to ensure that activities kept moving forward. Local community wellness coalitions met monthly, and some more frequently, depending on the project they were working on. All wellness coalitions were asked to create a food and demonstration garden. The overall intent of these gardens was to demonstrate a holistic approach that consisted of nutrition education, access to healthy foods, gardening instruction, and physical activity to make gardening and related activities an integral part of the overall efforts of the local wellness coalitions.

Implementing Rural and Community Gardens

Each community wellness coalition decided where the gardens would be located on the basis of access to resources, management, and other factors. Existing gardens were acceptable as long as they were welcoming and open to all members of the community and had appropriate site management strategies in place. Once the wellness coalition chose its garden sites, a garden action plan was created for each site to determine the intended scope of the project (eg, type of crops, planting strategies, growing structures such as

raised beds, access to water). All garden sites were to include youth and adult engagement in planting and growing food, and harvesting, processing, and preserving produce. The wellness coalitions set progressive goals for nutrition and physical activity education programs and the size and scope of the garden each year. Many of the garden sites incorporated policy and system changes as a result of the development and maintenance of the gardens. For example, policy aspects included shared use agreements and zoning, and systems changes included composting efforts and access to water.

Seasonal garden coordinators were hired from within the communities and were trained to assist each community with their gardening efforts, such as developing new gardens, assisting with current gardening efforts, and helping to build high tunnel systems (unheated greenhouses that can help farmers extend their growing season). The garden coordinators staffing model was different for each community. Most communities hired 2 garden coordinators to distribute the work. The garden coordinators worked from April through September, and each community was allowed up to 520 hours of work by the garden coordinators. The overall responsibilities of the garden coordinators were to assist community members with gardening, encourage kids and adults to garden while growing food for their local community, recruit community members to participate in gardening and nutrition education activities, train volunteer groups to assist with gardens and provide nutrition and physical activity lessons at the garden, and maintain garden records. Garden coordinators were trained by SDSU Extension before the start of their employment, and many were current SDSU Extension Master Gardeners with over 8 weeks of previous garden training experience (14).

The goal of the project was to provide garden coordinators with resources and simple, easy-to-use tracking tools for successful implementation of the project. The garden-characteristic tool provided information on garden size, number of plots, location of water, results of soil testing, and types of food produced. The produce-tracking tool provided information on types of produce, number of items harvested, whether produce was donated (eg, to a food pantry), sold, or used by volunteers and their families. Produce lost to spoilage and theft were estimated. The garden visitor log tracked volunteers (youth and adult), distance traveled, activities completed, and estimated time spent at the garden. Garden coordinators also tracked their time spent working at the garden by using a detailed time sheet submitted monthly as part of the payroll process. Additionally, nutrition education was conducted at the garden sites for both youth and adults as a part of SNAP-Ed outreach efforts.

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Benefits of Community Gardens in Schools and Communities

All communities created community action plans and budgets for community garden implementation. The average garden size across all sites was 1,495 square feet (range, 32 square feet to 4,362 square feet). Gardens used plots, raised beds, and tire beds. Each individual garden harvested an average of 138 pounds and 232 items. One garden harvested 770 pounds of produce. Most produce was donated to food pantries and volunteers. One site donated 75% of its produce to the YMCA feeding program in its community. From May 2017 through September 2017, garden volunteers provided 18,136 hours in garden management. This represents a value of \$386,297 in service to South Dakota communities (15). Volunteers traveled various distances. In one community, volunteers traveled an average of one-half mile to work at the garden. In a more rural community, volunteers traveled an average of 8 miles. Some outlier volunteers traveled over 200 miles round trip.

In one tribal community, the wellness coalition collaborated with a local summer school to plant a raised box garden of yellow crook-neck squash. The students then participated in the “Grow it, Try it, Like it” SNAP-Ed nutrition education program. Another tribal community planted and harvested sweetgrass and sage. A portion of the sage was donated to the local school for morning smudging. The Standing Rock Boys and Girls Club started with a simple grow station and then transitioned their garden outdoors to create the Wakanyeja “Beginning of Life” Garden (Figure 1). The Marty Boys and Girls Club initiated Wakaniza Ta'owozupi “Children’s Garden,” described in their video *Growing Healthy Food, Families and Communities Across South Dakota* (Figure 2), which has expanded to include a high tunnel, to use produce for healthy snacks. All used innovative gardening techniques to extend the growing season while providing a neighborhood gathering place.



Figure 1. The Standing Rock Boys and Girls Club started with a simple grow station and then transitioned their garden outdoors to create the Wakanyeja “Beginning of Life” garden where all are welcome.



Figure 2. The Marty Boys and Girls Club developed a video, *Wakaniza Ta'owozupi, Children’s Garden* video, entitled *Growing Healthy Food, Families, and Communities Across South Dakota*.
<https://www.youtube.com/watch?v=QgbSPRH2WB8>.

Implications for Public Health

Working with communities to develop community gardens is a large undertaking, and external funding helped to kick-start these efforts. Dedicated, trained seasonal garden coordinators made the maintenance and sustainability of the gardens possible, and selecting coordinators from within the community helped to quickly establish trust and buy-in from other community members. Although garden coordinators received training before their start and had access to trained SDSU Extension staff members throughout

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their employment, we strongly recommend that the position of garden coordinator require completion of Master Gardening training (14). Furthermore, to engage the community, we recommend that previous experience and passion for the job be considered.

Few garden tracking evaluation tools were applicable to measuring project outcomes; therefore, in the communities, we modified and piloted examples found through a review of the literature. Evaluation tools used at the gardens had to be easily completed by community members, because extension staff members were not always present for data collection. Scales to weigh the produce also had to be easy to use and had to withstand changes in weather throughout the garden season because they remained outside in the elements. Furthermore, a lockbox system was also needed that could withstand the weather and protect data collection. Using garden coordinators to distribute and collect surveys may increase efficiency.

The community garden intervention provided opportunities for collaboration with a variety of schools, community organizations, and city and tribal organizations. In one tribal community, the city provided water as an in-kind donation, and the local YMCA provided garden space. Another tribal community developed an agreement with the Indian Health Service for water use. This collaboration and leveraging of funds will support sustainability of the community gardens.

Gardens are a part of the local food landscape in rural communities, which face limited food access and high rates of food insecurity. This project showed that community gardens can produce substantial amounts of produce, as evidenced by the 770 pounds of produce grown in one garden. In addition, community members were willing to contribute volunteer hours to the success and sustainability of the gardens. However, further exploration into what groups in these rural communities are using the produce, how they are using it, and its effect on diet quality and food security is still needed. Furthermore, the ability of gardens to influence broad community policies, systems, and environments, such as integration into farmers markets and farm-to-school, still need to be explored.

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PROGRAM EVALUATION BRIEF

Community Coalitions for Change and the Policy, Systems, and Environment Model: A Community-Based Participatory Approach to Addressing Obesity in Rural Tennessee

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PEER REVIEWED

Summary

What is already known on this topic?

Complex health issues such as obesity are best addressed through interventions that operate at various levels of behavior change (eg, individual, community, cultural). These interventions are most successful when implemented at the community level with diverse groups working together to achieve change.

What is added by this report?

Four rural counties in Tennessee adopted the policy, systems, and environment (PSE) approach to address the obesity epidemic in their communities. Community-based participatory practice was the guiding force in conducting activities. The community-based participatory initiative was embraced by 67,400 community members and 67 organizations.

What are the implications for public health practice?

These interventions have been effective in rural communities where health care resources are often limited. Key to this transformative approach is timing and alignment with ongoing initiatives working toward similar goals.

Abstract

Four rural counties in Tennessee adopted the policy, systems, and environment (PSE) approach to address the obesity epidemic in their communities. The community-based participatory initiative, Community Coalitions for Change (C3), was embraced by 67,400 community members and 67 organizations. During year 1, coalition members discussed a need to return to long-held traditions of

collective community engagement and action to address rural obesity rates. In response, C3 established 25 community gardens and supported 10 existing gardens, resulting in 8,300 community members who received garden produce. Sites began with an average number of 11 physical activity resources, which increased by year 3 to an average of 13 resources as a result of C3 activities. Overall, 61% (248 of 405) of survey respondents participating in direct education programs reported being more physically active as a result of participating in the programs, 59% (117 of 199) reported eating more fruit, and 66% (131 of 199) reported eating more vegetables. Implications for public health include timing and aligning obesity prevention activities with ongoing initiatives that are working toward similar goals.

Introduction

Complex health issues such as obesity are best addressed through interventions that address various levels of behavior change (eg, individual, community, cultural). These interventions are most successful when implemented at the community level with diverse groups working together to achieve change. Four rural counties in western Tennessee (Haywood, Humphreys, Lake, and Lauderdale) with adult obesity rates greater than 40% (on the basis of 2012 Behavioral Risk Factor Surveillance System data) participated in a community-based intervention to reduce obesity rates. The initiative, Community Coalitions for Change, or C3, began with the goal of reaching the 67,400 community members who were at disproportionate risk for chronic diseases associated with obesity, poor nutritional habits, and lack of physical activity. Community advisory councils, established before the C3 initiative, had identified obesity as a top priority at least a decade earlier. Thus, public health surveillance and community-based perspectives aligned on the need and rationale for the C3 intervention. State-level faculty and specialists affiliated with the Family and Consumer Sciences (FCS) department of the University of Tennessee Institute of Agriculture Extension (Extension) conceptual-



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ized the approach, guided implementation, and conducted evaluations of the C3 initiative. FCS agents and C3 program assistants collaborated with 19 groups, including local health department councils, the Tennessee Department of Education's Coordinated School Health councils, networks dedicated to preventing substance abuse, state and county commissions on aging, and several county and state park boards. During the 4 years of the intervention, 160 people representing 67 organizations served on C3 coalitions (Appendix).

Purpose and Objectives

The purpose of this initiative was to engage communities in the process of reducing the prevalence of obesity over the long term and in accordance with the policy, systems, environment (PSE) model. The public health community embraces the PSE approach (1–3). This model stresses the importance of direct education and recognizes the need to alter contexts that influence personal health behaviors.

PSE changes described herein build on the foundation laid by previously funded Community Transformation Grant programs led by community coalitions in partnership with local health departments and other community-based organizations (4). Our work expanded the scope and scale of those programs by focusing on instigating community-wide cultural, social, and behavioral changes rather than individual-level behavior.

All 4 counties participating in C3 activities are rural and have a long agricultural history and a county-based Cooperative Extension infrastructure. Across all 4 counties, the median annual income is \$34,563 (5), an average 27% of households live below the federal poverty level, and an average 20% of the population reports being food insecure (6). Three of the 4 counties are predominantly non-Hispanic white, and all have strong faith-based communities.

Intervention Approach

Community-based participatory practice (CBPP) was the guiding force in conducting C3 activities. This approach uses community engagement and empowerment to improve outcomes (7,8). It involves building relationships between programs and community members and focuses on developing mutual trust and equality; program participants and community members are viewed as important contributors to the entire process (9). These relationships are developed and maintained throughout the process, from identifying critical issues of concern cited by the community to disseminating results.

Evidence of the CBPP model, and a key driver to implementation success, was that C3 coalitions were born out of, or modeled on, existing health councils in all 4 counties. Those groups consisted of representatives from local community groups, businesses, organizations, and FCS agents. C3 coalitions provided direction on grant activities. These activities included identifying and engaging new coalition members, working on needs assessment activities, prioritizing grant activities, working together on intervention projects, and identifying opportunities for sustainability and potential to expand grant activities. Community members also provided ongoing feedback to the program about what was working and what was not working. This feedback permitted an intervention that was responsive to community needs.

With the support of FCS agents and C3 program assistants, communities implemented projects in years 2 through 4. Prioritized intervention activities were in the following areas: 1) increasing the number of direct educational programs delivered through Extension, 2) increasing interventions that promoted healthy nutrition options, and 3) increasing physical activity interventions that promoted exercise and being active. More than \$3 million was dedicated to these projects, and each county had equal access to funds at the start of the program. Haywood County used the most funding, followed by Lauderdale, Humphreys, and Lake counties, in that order. Because the process of allocating and spending funds was transparent — counties were equally allocated at outset, and decisions on how and why to spend the funds were made by each community — we had no problems in allocating funds.

Evaluation Methods

During the first year, FCS evaluation staff members (ie, the evaluation team) completed a comprehensive situational analysis for each county to identify community needs and strengths. After approval from the University of Tennessee's institutional review board, the evaluation team collected input from community members through surveys and focus groups and worked with county FCS agents and C3 program assistants to complete assessments of parks and retail food venues. The evaluation team used the Physical Activity Resource Assessment (10) to complete recreational site audits in the 4 counties. The evaluation team then examined existing data, including recent community needs assessments (conducted within the last 5 years), census data, health department reports, and data available through geographic resource mapping at CommunityCommons.org.

In years 2 through 4, the lead evaluation specialist reviewed data from surveys, interviews, focus groups, audits, and pedometer monitoring in both process and outcome evaluation activities. The evaluation team determined appropriate evaluation methods on the

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basis of how to access and collect information in a community-based manner without exhausting communities with repetitive efforts. In year 4, the final year of the grant, the evaluation team also engaged 40 coalition and community members in the process of ripple effect mapping (REM). REM is a facilitated group process based on the Community Capitals Framework to collect qualitative data about perceived outcomes and sustainability efforts related to projects like C3 (11).

Results

Direct education. Overall, 1,844 adults, children, and adolescents participated in direct education opportunities such as in-store food demonstrations, cooking classes, gardening workshops, nutrition programs, and exercise classes. Of these, 405 (22%) completed surveys about physical activity and 199 (11%) completed surveys about healthy eating. For physical activity, 61% (248 of 405) reported being more physically active as a result of participating in the programs. For healthy eating, 59% (117 of 199) reported eating more fruit and 66% (131 out of 199) reported eating more vegetables.

Nutrition interventions. All 4 counties had a strong focus on promoting healthy food choices. Related work aligned to the PSE model in various ways. Among these are 1) policy changes allowing children to carry water bottles at school; 2) systemic shifts toward collaboration between organizations, evidenced by providing community garden vegetables at the local food pantry; and 3) environmental alterations such as promotional and motivational signage in restaurants, grocery stores, and corner stores along with the installation of food storage and display equipment.

Intercept surveys designed to gauge familiarity with the intervention among C3-participating grocery store customers showed a range of responses among 162 respondents, from 38% (n = 61) who recalled seeing the bundled promotions to 54% (n = 87) who recalled seeing the “shelf-talkers” (branded, nutritional information attached to a store shelf to capture consumers’ attention and increase awareness and knowledge about an item). Almost one-third (n = 43) of respondents indicated that these promotions encouraged them to choose healthier foods. Additionally, interviews with 8 retail food managers revealed that 7 managers felt that the interventions had been successful and 4 managers felt that the interventions had improved their sales.

Physical activity interventions. The third priority was physical activity interventions that promoted exercise and being active. We found evidence of the PSE model in policy changes. For example, 9 churches opened their indoor and outdoor facilities (eg, gymnasiums, sports fields) to noncongregation members, and 11 schools permitted use of their walking paths or playground equipment.

However, the fear of liability and a type of cultural aversion to signing official documents precluded institutions from committing these neighborly practices to paper. C3 increased communities’ capacity for systems change by promoting walking clubs at senior living facilities. The environmental context was the area of greatest change related to physical activity. Promotional signage was created by state-level content experts in partnership with a contracted marketing firm and then installed in 53 venues in all 4 counties. Four new community parks were created, and physical activity equipment was installed in 38 venues.

In year 1, the evaluation team assessed 36 park and recreation sites by using the Physical Activity Resource Assessment. In years 2 through 4, only the 26 sites that were selected by coalitions for improvements were assessed by using the Physical Activity Resource Assessment. In year 1, sites had an average number of 11 physical activity resources, which increased by year 3 to an average of 13 resources as a result of C3 activities. Most of these changes related to bike racks, adult exercise stations, and sports equipment and courts.

Integrated PSE outcomes and collective impact. The inherent nature of PSE work is synergistic, meaning that one alteration intends to promote change in another arena, such as the way in which a policy change affects how systems function and/or permits change to the environmental context. For example, availability of healthy food preparation equipment catalyzed the adoption of nutrition-related policy changes in 6 churches, where they replaced some foods with healthier options (eg, fried chicken replaced by grilled chicken). Two school systems agreed to implement a policy that allowed students to bring water bottles into the academic setting after C3 provided water bottle refilling stations. In Lake County, the Coordinated School Health representative implemented a change in school policy that led to banning unhealthy food as rewards to students.

During the situational analysis in year 1, coalition members discussed a need to return to long-held traditions of collective community engagement and action related to increasing access to healthy foods. In response, C3 established 25 community gardens and supported 10 existing gardens. More than 8,300 community members, including students, seniors, subsidized housing residents, and food pantry clients, received produce from these gardens. Gardens were also successful in engaging volunteers: 632 volunteers donated 6,188 hours in years 3 and 4 for a value of \$152,341. In addition, 37 laborers donated 350 hours, and \$3,790 of donated supplies were received.

Farmers markets were another method through which community members built on their shared value of collective impact. Two counties (Humphreys and Lauderdale) worked with their existing

farmers markets to encourage community members to purchase locally grown fruits and vegetables. REM participants identified the mutual benefit the market has for farmers and participants. They reported that the market was well attended and sold out of produce occasionally. REM participants credited C3-affiliated efforts for increased farmers market participation and revenue.

Implications for Public Health

CBPP has been used extensively to address complex health issues such as obesity prevention (12), physical activity in rural communities (13), and chronic diseases (14). CBPP facilitates action and change at the individual, family, and community levels, which is necessary for obesity prevention. In addition, CBPP allows researchers to explore issues that affect health outcomes and to define novel and creative ways to reduce health disparities. CBPP has been effective in rural communities where health care resources are often limited (15,16), and it was effective in our initiative. Critical to CBPP are meaningful engagement, ownership of interventions, accountability, ability to build on strengths, and willingness to recognize and respect that a well-intentioned intervention is not succeeding. The CBPP approach embraced by the C3 initiative empowered community members to sustain interventions as they improved their own health outcomes and began to transform their communities.

Key to this transformative approach is timing and alignment with ongoing initiatives working toward similar goals. The confluence of the C3 grant with the Governor's Foundation for Health and Wellness initiative, Healthier Tennessee, and the Tennessee Department of Health's Primary Prevention Initiative, was mutually beneficial. Many of the activities that helped counties achieve Healthier Tennessee status also helped accomplish C3 goals — and vice versa. In exactly the same way, health department employees were able to participate in C3 projects, while meeting their own agency's Primary Prevention Initiative goals. This synergistic outcome was reiterated by REM participants who spoke about the many important obesity prevention outcomes that were facilitated by these overlapping and interlocking efforts.

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Appendix. Organizations Involved in Community-Based Participatory Approach to Addressing Obesity in Rural Tennessee

- African Methodist Episcopal minister
- Afterschool care
- Area health education center
- Arts council
- Baptist minister
- Board of education
- Boys and girls club
- Chamber of commerce
- Child care provider
- Children's hospital
- Church of Christ minister
- City government administration
- City mayors
- City parks and recreation
- City police department
- Community centers
- Community hospital
- Community park association
- Coordinated school health
- Corner store manager
- County government administration
- County health department
- County mayors
- County parks and recreation
- County school system
- Department of children's services
- Department of corrections

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- Department of human services
- Department of transportation
- Economic development council
- Extension 4-H agents
- Extension agriculture agents
- Extension family and community education volunteer clubs
- Family life center
- Farmers
- Farmers' market administrators
- Federally qualified health center
- Governor's Foundation for Health and Wellness
- Grocery store manager
- Head Start
- Hospital community outreach program
- Manufacturing business
- Master gardeners
- Medicaid coordinator
- Mental health services
- Methodist minister
- National alliance on mental illness
- Neighborhood association
- Outpatient drug treatment center
- Physical therapy center
- Pregnancy center
- Private counseling center
- Private gym
- Private insurance company
- Private weight-loss clinic
- Regional commission on children and youth

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- Senior center
- Sheriff's department
- State commission on children and youth
- State health department
- State health insurance assistance program
- State parks
- Technical college
- Teen job development program
- Tennessee General Assembly
- University
- YMCA

PUBLIC HEALTH PRACTICE BRIEF

Expanding Bicycle Infrastructure to Promote Physical Activity in Hidalgo County, Texas

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Summary

What is already known on this topic?

Although policy, systems, and environmental (PSE) strategies can expand access to healthy living infrastructure, public health programs have not traditionally incorporated PSE components in community health interventions.

What is added by this report?

Community coalitions collaborated to design and implement PSE-focused interventions resulting in expanded bicycle infrastructure and sustainable public health activities in Hidalgo County, Texas.

What are the implications for public health practice?

Involving community members and building their capacity to implement PSE interventions is necessary to address systemic barriers to public health. Health programming that is community driven and incorporates PSE strategies can maximize impact, reach, and sustainability of public health interventions.

Abstract

The role of the built environment as both an asset and a barrier in promoting physical activity is well documented. However, literature on the role of communities in catalyzing policy, systems, and environmental (PSE) change to address gaps in the built environment is scant. We describe a community-driven PSE intervention, resulting in expanded bicycle infrastructure and physical activity opportunities in a South Texas border community. Funded through the Centers for Disease Control and Prevention, the Working on Wellness project engaged community-based coalitions in efforts to increase opportunities for physical activity in Hidalgo County, Texas. Coalitions collaborated with the city of Weslaco to install bicycle lanes and with the Hidalgo County Metropolitan Planning Organization to establish a countywide Bicycle Friendly Business

program. Community-driven PSE interventions can be effective public health strategies in creating long-term sustainable solutions that address environmental determinants of obesity.

Background

Demographics

Located along the southern United States border with Mexico, Hidalgo County is part of a 4-county region known as the Rio Grande Valley. The county's 860,861 residents are predominantly Hispanic (92%), and nearly one-third (29.5%) live in poverty (1). Educational attainment lags behind both the state and nation. Only 63.7% of adults aged 25 years or older have a high school diploma or higher, compared with 82.8% at the state level and 87.3% at the national level (1). This difference is meaningful because low socioeconomic status is associated with poor health outcomes (2).

Obesity and health outcomes

Obesity is a persistent public health challenge in Hidalgo County. County statistics in 2019 show that 1 of every 3 people is obese (3). High rates of obesity contribute to health disparities in the region. Approximately 27% of adults have diabetes and another 32% have prediabetes (4). Diabetes can lead to serious health complications over time, including cardiovascular disease, vision loss, kidney failure, and limb amputation (5).

Regular physical activity can help prevent obesity and associated chronic diseases. However, lack of safe spaces in the built environment — physical structures built or designed by humans (ie, roads, buildings, sidewalks, and bike paths) (6) — can limit opportunities for people to be physically active. Over one-fifth (21%) of Hidalgo County residents report no physical activity (3). Sedentary lifestyles can increase the risk of developing chronic diseases such as obesity, diabetes, and heart disease (3).

Working on Wellness (WoW) program

Established in 2015, the WoW program aims to improve health outcomes by addressing environmental and policy determinants of obesity. The WoW program team used the Hexagon Tool (7), a



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readiness assessment instrument that examines 6 factors (need, fit, resources, evidence, readiness, and capacity) to determine intervention communities in Hidalgo County. On the basis of this initial assessment, Peñitas, San Carlos, South McAllen, and Weslaco were identified as the intervention communities. Program staff at Texas A & M University's AgriLife Extension Service and the School of Public Health partnered with community members to establish coalitions in each of the intervention communities. Policy, systems, and environmental (PSE) intervention strategies aim to enhance or create structures in which people live, work, and play with the goal of creating long-term, sustainable changes that support healthy living. WoW coalitions collaborated with private and public sector partners to design and implement PSE change interventions focused on improving healthy behaviors by enhancing physical activity and healthy food access.

Partnerships and collaborations

Complementing a community-driven approach to local decision making about PSE strategies, AgriLife Extension Service and the School of Public Health provided support at the outset to help establish community coalitions and funding to implement interventions. Additionally, WoW staff members provided technical assistance throughout the grant period.

In our example intervention community of Weslaco, Weslaco High School, the South Texas Juvenile Diabetes Association, and bicycling advocates were key members of the Weslaco coalition. These coalition members were instrumental in obtaining buy-in from city leaders, including the mayor, the city manager, and the parks and recreation director. Coalition members also helped secure additional grant and in-kind resources from city government and private sector partners.

The Hidalgo County Metropolitan Planning Organization (HCMPO) collaboration was key in advancing interventions with an active transportation focus. HCMPO staff created the Bike Friendly Business program, and in partnership with WoW, implemented the program countywide. The HCMPO's Bicycle Pedestrian and Advisory Committee also served as a platform to collaborate with transportation experts on active living planning for the region.

Expanding Bicycle Infrastructure

A community participatory approach was key in building trust and meaningful partnerships that facilitated community buy-in and leveraged partner resources. In collaboration with community members, WoW staff members conducted a baseline needs assessment in 2015 to assess the built environment. Findings indicated limited active living infrastructure to support physical activity for

community members. This process also identified people to help establish community coalitions in each intervention strategy. Additionally, the needs assessment helped tailor technical assistance programming to build the capacity of community coalitions and partners to develop, implement, and sustain PSE interventions.

On the basis of an asset mapping activity and findings from the needs assessment, each community coalition worked toward identifying and selecting high-priority projects for interventions. WoW staff members facilitated this process by applying the Strategic Doing (8) approach, developed by the Purdue Agile Strategy Laboratory. Strategic Doing facilitates action-oriented collaborations by systematically approaching an opportunity and creating a shared action plan for implementation that includes identifying key stakeholders, existing resources, and concrete next steps.

Intervention selection and implementation

In the intervention community of Weslaco, coalition members prioritized street connectivity and expansion of bicycle infrastructure. The coalition identified Panther Loop, an informal path surrounding Weslaco High School, as a potential intervention site. The Family, Career and Community Leaders of America club at Weslaco High School completed an assessment of Panther Loop. During this time, coalition members also identified and mapped potential locations for bicycle lanes.

The coalition presented the Panther Loop and bicycle lane recommendations to the mayor, the city manager, and the parks and recreation director. After discussing available resources, potential reach, and the feasibility of project implementation and sustainability, the coalition and the city agreed to move forward with the bicycle lane project. Installing bicycling lanes increases ridership even in communities with no cycling culture (9). This holds true even when controlling for other variables that might influence transportation modes including land use, climate, socioeconomic factors, gasoline prices, public transport supply, and cycling safety (9). With financial support from the WoW coalition, the city installed 5 miles of bicycle lanes in September 2016. Local partners also created the Weslaco Bikearoos program to educate community members on bike safety and hosted group rides along the bicycle lanes. Through the Weslaco Bikearoos, quarterly bike rodeos and group bike rides began in February 2017 (Figure 1). During bike rodeos, children learn about bike safety and practice their new skills on an obstacle course and on a 3-mile group ride afterwards. Teens and adults participate in bike rides twice a week along the bicycle lanes.

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Figure 1. Weslaco Bikearoos bike ride, Weslaco, Texas, October 2017. Photo produced by Evelia Castillo.



Figure 2. Bicycle Friendly Business, representing activities outside of the 4 intervention communities, McAllen, Texas, June 2019. Photo by Robert DeLeon.

In response to findings that indicated a lack of infrastructure for active living in the county, WoW staff and coalition members joined the HCMPO's Bicycle Pedestrian and Advisory Committee to engage transportation experts in WoW interventions. This engagement resulted in collaboration with the HCMPO to implement the Bicycle Friendly Business program. WoW provided bicycle racks to incentivize businesses to join the program, and coalition members helped with recruitment (Figure 2). Fifty-one businesses in the county have joined the Bicycle Friendly Business program, supporting active living by providing bicycle parking, free water refill stations, restrooms, bicycle repair kits, and special discounts for cyclists. Bicycle Friendly Business members installed 57 bicycle racks to accommodate 190 bicycles across multiple locations in 6 cities throughout Hidalgo County.

Coalition members collaborated with city leaders in Weslaco and the HCMPO to formulate policy-focused interventions. In Weslaco, the coalition actively participated in the development of a master trails plan for both bicycling and hiking (10). Coalition members attended 3 workshops hosted by Weslaco Parks and Recreation to provide input and recommendations in spring 2017. Weslaco commissioners officially adopted the Weslaco Master Trails Plan in June 2017. This systems-focused plan creates an "integrated seamless transportation and recreation framework to facilitate hiking and biking as a viable transportation alternative throughout Weslaco" (10). Coalition members continue to advocate for implementation of the Weslaco Master Trails Plan by engaging with city leaders and attending city commission meetings. In 2018, the city installed an additional one-half mile of bicycle lanes.

In collaboration with HCMPO staff, the Bicycle Pedestrian and Advisory Committee submitted an application to attend the 4th Annual Walkability Action Institute, hosted by the National Association of Chronic Disease Directors in Decatur, Georgia. An interdisciplinary group of Bicycle Pedestrian and Advisory Committee members — including a coalition member from Weslaco and coalition partners from McAllen and San Carlos — was selected to attend the workshop. The team developed an action plan with PSE outcomes to improve walkability in Hidalgo County. The Bicycle Pedestrian and Advisory Committee formally adopted the Hidalgo County Walkability Team Action Plan in August 2018.

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WoW staff and coalition partners collaborated with the HCMPO to implement the plan. This plan included organizing a Complete Streets Workshop, delivered in October 2018.

Implications for Public Health

Building healthy communities calls for transformative changes that address systemic barriers to public health. WoW efforts demonstrate that such change is possible through PSE interventions that apply community participatory-based principles. These principles include building on the strengths and resources of the community; mobilizing collaborative, equitable partnerships; and fostering colearning and capacity building among all partners. These underlying principles are necessary across all phases of PSE interventions to create and foster long-term multisector partnerships that promote and sustain activities (11). In Hidalgo County, residents now have access to additional opportunities for active living, and coalition members continue to collaborate and secure resources to expand physical activity infrastructure. Moreover, coalition members have expanded activities outside the original 4 intervention communities.

Communities with similar challenges related to physical activity infrastructure gaps in the built environment should consider PSE-focused interventions that involve community members at the outset. Meaningful community engagement can help public health practitioners better understand community challenges and formulate solutions that effectively address systemic barriers. This engagement is especially important in advancing policy efforts that require substantial support from the community and political will from elected officials.

Although PSE-focused interventions can enhance and expand the reach of public health initiatives, sustaining such efforts requires significant resources related to community involvement, technical expertise from subject matter experts, and organizational backbone support from public health partners. In Hidalgo County, Texas A & M University staff members continue to engage with coalition members, albeit in a much more limited capacity. Further research is needed to explore how PSE strategies can be broadly incorporated into traditional community health programming to maximize impact, reach, and sustainability of public health interventions.

Box. Summary of actions and time to increase access and physical activity in Hidalgo County, Texas

2015 – Working on Wellness (WoW) coalitions were established to increase access to physical activity and healthy food in Hidalgo County, Texas. Coalition members and partners identified bicycle infrastructure as key to promoting and increasing physical activity access. Collaboration began with community members and governmental partners to address gaps in bicycle infrastructure.

2016 – Five miles of bicycle lanes were installed in Weslaco.

2017 – The Weslaco Master Trails Plan was adopted. Coalition members partnered with the Hidalgo County Metropolitan Planning Organization to implement the Bicycle Friendly Business program.

2018 – Weslaco installed an additional one-half mile of bicycle lanes. WoW staff and coalition partners collaborated with the Hidalgo County Metropolitan Planning Organization to implement the Hidalgo County Walkability Team Action Plan.

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GUEST EDITORIAL

The High Obesity Program: A Collaboration Between Public Health and Cooperative Extension Services to Address Obesity

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In the United States, obesity is a major risk factor for chronic disease, and related medical costs are estimated to increase by at least \$48 billion annually through 2030 (1). Interventions that use policy, systems, and environmental (PSE) approaches at the population level, such as increasing the availability of healthy foods in local corner stores or incorporating activity-friendly routes into community planning and design, can expand the reach of public health efforts by establishing frameworks in which the simple, default choices are the healthier choices in the places Americans work, live, and play (2).

The Centers for Disease Control and Prevention (CDC) is committed to improving the health of Americans through evidence-based public health programs; the agency supports these programs through funding mechanisms called cooperative agreements that are awarded to state and local public health entities. A cooperative agreement provides for substantial involvement between a federal awarding agency and a nonfederal entity in carrying out defined activities. This editorial describes activities designed to strengthen partnerships to improve health through PSE approaches.

In 2014, CDC's Division of Nutrition, Physical Activity, and Obesity launched a program called Programs to Reduce Obesity in High Obesity Areas, also referred to as HOP. The program was a result of congressional funding authorization for land-grant universities (LGUs) to work with the US Department of Agriculture's Cooperative Extension Services (CES) to launch an outreach program to combat obesity where obesity rates are the highest.

From 2014 through 2018, CDC's HOP provided funding to 11 LGUs in states with counties in which the prevalence of adult obesity was greater than 40% according to data from the 2013 Behavioral Risk Factor Surveillance System. CDC staff members provided substantive guidance to the LGUs through program support from CDC project officers and evaluators. These CDC staff members have expertise in HOP areas and provided technical assistance and guidance to LGUs on evidence-based nutrition and physical activity interventions, community-based participatory approaches, community needs assessments, coalition development, performance measures, and leveraged resources (eg, financial, in-kind donations, volunteer hours, additional grant funding). CDC provided this expertise and technical assistance through monthly calls, work plan reviews, and community site visits. LGUs provided direct support and guidance to their respective CES to conduct evidence-based nutrition and physical activity interventions in eligible counties.

HOP uses the knowledge and relationships of CES and communities to improve the nutrition and physical activity environments in primarily rural counties. CES aims to "advance agriculture, the environment, human health and well-being, and communities" (3) by supporting research, education, and extension programs in the LGU system and other organizations. HOP funding supported and facilitated LGUs' and CES' expansion of focus to also include PSE as an approach to obesity interventions and strategies. Working with CES is a benefit for CDC because CES agents have established relationships with partners in the communities in which they work and an intimate knowledge of assets and needs in those communities.

HOP recipients used a community-based participatory approach during the first 6 months to 1 year of the cooperative agreement to engage community coalitions and conduct community needs assessments. HOP recipients worked on the following 3 strategy approaches:



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1. Providing education and promotional support for environmental approaches.
2. Implementing evidence-based practices to increase consumption of healthy foods and beverages.
3. Implementing evidence-based strategies to increase opportunities for physical activity.

On the basis of CDC guidance, HOP recipients elected to work in either the community or the early care and education setting.

The purpose of this collection of articles related to HOP in *Preventing Chronic Disease* is to highlight the program's approach and describe both overarching and program-specific evaluation findings. The collection comprises 8 articles, 7 that highlight the work of LGUs (4–10), and one that describes HOP's implementation approach, evaluation framework, and key findings (11).

Powers and colleagues described a 9-week, multilevel, faith-based health promotion initiative that used PSE approaches in 14 Alabama faith communities (4). A one-group pretest–posttest study evaluated faith community policies and environments, interpersonal support, and individual behaviors. Seventy-two sessions with 737 adults were implemented in 14 faith communities. Participants in the small group sessions reported feeling more supported to engage in healthy eating behaviors. The authors outlined an approach that faith communities can use to support and evaluate healthy lifestyles.

Carter and colleagues summarized findings from a community-based obesity reduction and prevention initiative implemented to increase opportunities for physical activity among residents in rural Alabama (5). This initiative worked with 14 community coalitions to implement 101 interventions related to physical activity throughout 16 communities. To better assess community needs and areas to implement a community-based obesity intervention, the authors conducted focus groups with each of the coalitions. They explained how the use of a community-based participatory research approach may be an effective way to identify and address health concerns at the local level.

Gustafson and colleagues examined the effectiveness of community-based interventions implemented in rural Kentucky (6). They reported findings from a random-digit–dialing cross-sectional survey from 2 random samples of adult residents in 6 participating rural counties before and after community-based interventions were implemented. From year 1 to year 2 of the intervention, fruit and vegetable intake significantly increased; moderate physical activity, as measured in days per week, did not significantly change; and attitudes among residents about places to be phys-

ically active improved. The findings illustrate how community involvement in promoting obesity prevention initiatives may have a significant effect on dietary intake and community perception about places to be physical active.

Kendall and colleagues described findings from a community-based project implemented in 3 rural Louisiana parishes that focused on promoting healthy eating and physical activity through PSE approaches (7). After conducting coalition assessments, the initiative implemented multipronged interventions in 5 food stores across the participating parishes. This community-based project identified several important factors to consider when implementing environmental rural food interventions: store size, owner preferences, distributor contracts, in-store marketing, and intervention strength.

Stluka and colleagues examined collaborations with residents of rural communities in South Dakota to implement and evaluate garden-based interventions (8). The authors reported that 13 gardens were established through 18,136 hours of volunteer work. Evaluation findings showed that an average of 138 pounds of food were harvested per garden site. The authors indicated that the implementation of community gardens could generate substantial amounts of produce and provide opportunities for collaboration among local community members and organizations.

Wallace and colleagues described an initiative implemented in 4 rural western counties in Tennessee that engaged community residents in activities to reduce obesity and used a PSE framework and a community-based participatory approach (9). Evaluators conducted various assessments (focus groups, audits, pedometer monitoring, and mapping) to determine the number of community members potentially served as a result of the initiative and how the initiative affected attitudes and behaviors. The authors reported improvements in physical activity and healthy eating among participating community members.

Castillo and colleagues described how needs assessments were used to identify components of a PSE-centered initiative implemented in 4 communities in Hidalgo County, Texas, to increase access to physical activity and healthy foods (10). The needs assessments identified gaps in active living infrastructure for physical activity and recommended individuals to help establish local community coalitions. The program successes demonstrated that community-driven PSE interventions can be a strategy in establishing long-term solutions for obesity prevention.

This special collection in *Preventing Chronic Disease* describes approaches to improve the nutrition and physical activity environments in rural areas that have a high prevalence of adult obesity. Articles in this collection support the approaches of previous stud-

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ies on interventions to improve health outcomes, such as the use of tailored community-based participatory approaches and a focus on using PSE when improving the nutrition environment and opportunities for physical activity in communities. The collection provides examples of community interventions that aim to increase the healthfulness of food and access to physical activity, such as improving healthy food options in retail outlets (7), creating opportunities for physical activity through local organizations (5), and collaborating with nontraditional public health partners, such as CES (4–10). The approaches described in this collection may provide organizations and community-based programs ideas for implementation of future work to improve the nutrition and physical activity environments in rural areas with a high prevalence of obesity.

The findings from HOP influenced the approach and expectations of the subsequent HOP funding period, which began in 2018, and other cooperative agreements funded by CDC. CDC used the emerging approach of collaboration with CES in its current cooperative agreements. CDC continues in its expectation that state and local recipients engage coalitions through community-based participatory approaches, use the results of community needs assessments to drive the selection of interventions, and tailor approaches to meet the unique needs of priority populations and communities. Other funding organizations addressing obesity may consider these approaches for implementation of future community-level work.

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