



Community-engagement to support cardiovascular disease prevention in disparities populations: three case studies

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Abstract

Cardiovascular diseases remain the leading cause of death in the United States, and are characterized by socioeconomic, geographic, ethnic, and gender disparities in risk, morbidity and mortality. In response, public health efforts have moved beyond approaches focusing on individual-level behavior change toward culturally appropriate community-focused efforts. In specific, engagement of community partners is now recognized as essential to facilitate changes at multiple levels to improve cardiovascular disease outcomes.

This paper shares lessons learned to deepen appreciation for the unique challenges community-engagement in health disparities research entails, including variations in practice, time commitment, and complexity. This paper presents three case studies documenting community-engagement in the planning, implementation and evaluation processes. All projects collaborated with community partners in contexts with disproportionately high rates of cardiovascular disease but with distinct programmatic foci: the East Los Angeles, California project focused on improving access to fresh fruit and vegetables through corner store makeovers; the Boston, Massachusetts project reached out to and engaged Puerto Rican community members in a lifestyle intervention study; and the Lenoir County, North Carolina project engaged local restaurant owners and a range of community agencies in healthy lifestyle promotion activities. These cases provide examples of the unique solutions and approaches to issues common in doing community-engagement work.

Keywords

Cardiovascular disease; community-engagement; disparities; health promotion

Cover Page Footnote

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ABSTRACT

Cardiovascular diseases remain the leading cause of death in the United States, and are characterized by socioeconomic, geographic, ethnic, and gender disparities in risk, morbidity and mortality. In response, public health efforts have moved beyond approaches focusing on individual-level behavior change toward culturally appropriate community-focused efforts. Engagement of community partners is now recognized as essential to facilitate changes at multiple levels to improve cardiovascular disease outcomes. This paper shares lessons learned to deepen appreciation for the unique challenges community engagement in health disparities research entails, including variations in practice, time commitment, and complexity. This paper presents three case studies documenting community engagement in program planning, implementation and evaluation processes. All projects collaborated with community partners in contexts with disproportionately high rates of cardiovascular disease but with distinct programmatic foci: the East Los Angeles, California project focused on improving access to fresh fruit and vegetables through corner store makeovers; the Boston, Massachusetts project reached out to and engaged Puerto Rican community members in a lifestyle intervention study; and the Lenoir County, North Carolina project engaged local restaurant owners and a range of community agencies in healthy lifestyle promotion activities. These cases provide examples of the unique solutions and approaches to issues common in doing community-engagement work.

Key words: Cardiovascular disease, community-engagement, disparities, health promotion

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INTRODUCTION

Cardiovascular diseases (CVDs) are the leading causes of death in the United States (Centers for Disease Control and Prevention, 2013). While a healthy lifestyle can substantially reduce the risk for CVD (Estruch et al., 2013; Mozaffarian et al., 2011), motivating individuals to change and maintain their lifestyle is difficult. Efforts to ‘fix’ the individual with no attention to improving their environment have proven to be insufficient (Harper et al., 2011; Sallis et al., 2012; Liburd et al., 2005). Concurrently, socioeconomic, geographic, ethnic, and gender disparities in CVD risk, morbidity and mortality persist and influence individual behaviors (Harper et al., 2011). Thus, health disparities research is moving towards implementing culturally-appropriate community-focused efforts to improve opportunities, resources, health care practices and the built environment to foster heart-healthy lifestyles.

Social ecological approaches to CVD address risk factors on multiple levels including (but not limited to) the food environment, access to health services, and local resources for physical exercise (Sallis et al., 2012; Liburd et al., 2005). Generally, this translates into a community-engaged approach that actively involves members of the community to identify the most pertinent health issues as well as to design the most effective and appropriate strategies to solve them (Centers for Disease Control and Prevention, 2011). Collective action among a wide range of community members is required to effectively change environmental and organizational conditions that promote rather than inhibit healthy lifestyles.

Here, we present three case studies of academic and community partnerships employing principles of community-engagement to address cardiovascular disease in health disparities communities around the country (Centers for Disease Control and Prevention, 2011). All three projects are led by Centers for Population Health and Health Disparities (CPHHD) and funded by the National Heart, Lung and Blood Institute (NHLBI). The authors recognize that neither cardiovascular health problems nor efforts to prevent them are new public health concerns: efforts to solve them at multiple levels and many advances have been going on for decades. However, this paper emphasizes the contribution and potential of efforts that engage community members in meaningful roles to guide novel, empowering, accessible, culturally appropriate and effective programs.

Case Study 1: East Los Angeles, California

Community Context

East Los Angeles (ELA) is a low-income, predominantly Mexican American neighborhood (94%) where half of the residents (48.7%) are foreign-born (United States Census Bureau). ELA is saturated with retail stores and other food outlets that market inexpensive, energy dense foods of poor nutritional quality, creating a food landscape characterized as a ‘food swamp’ (Ortega et al., 2014). The limited access to high quality, affordable produce is one potential explanation for why many of the residents of ELA have elevated CVD risk factors including diabetes, hypertension and obesity in comparison to more affluent neighborhoods in Los Angeles (Ruelas et al., 2012). In response to these disparities, the University of California, Los Angeles and University of Southern California (UCLA-USC) CPHHD implemented a corner

store conversion intervention to improve food purchasing and dietary behavior of community residents with the goal of reducing CVD risk over time.

Methods

To facilitate changes in dietary behavior, we recruited and collaborated with store owners and community members to transform four corner store markets so that neighborhood residents have easier access to affordable, fresh produce. This was a complex intervention as conversions had multiple components including: 1) remodeling the exterior by installing windows, painting the stores with bright colors and health-related messages 2) remodeling the interior by installing refrigeration units at the front of the stores to store the fresh produce, moving the ‘wall of chips’ and candy to the back of the store and replacing all advertisements for energy dense snacks, alcohol and sugar sweetened beverages with messages on healthy eating and 3) providing technical assistance and training for store owners including how to buy, sell, store, display and market fresh fruits and vegetables in a way that would increase and sustain their customer base (Ortega et al., 2014).

The active collaboration of both school and community partners was integral to the successful implementation of our project. A major component of the project was the social marketing of the converted stores as safe, local businesses invested in the health and wellbeing of the community. To do this, we created an innovative community-engaged social marketing campaign led by students from two local public high schools. Participating students enrolled in an elective course on Food Justice and Social Marketing based on a curriculum that the CPPHD team developed. The course taught students about food justice, health disparities, nutrition, social marketing, video production, public speaking and leadership skills. Outside of the classroom, students worked on the store’s physical transformations and helped plan and carry-out the social marketing campaign. The students helped spread awareness of the corner stores as well as messages on healthy eating through theatrical skits, short videos, print materials, presence at community events, radio interviews and presentations for a wide range of audiences throughout their community (Ortega et al, 2014).

In addition to the youth, the members of our Community Advisor Board (CAB) have been actively and directly engaged throughout all phases of the project. The CAB helped identify the participating stores, design promotional materials, carry-out community nutrition education activities and support youth efforts on the project. The members of the CAB represent a wide range of individuals, professional and civic organizations; some with extensive experience working on academic research projects whereas for others this was their introduction to community-engaged academic research. Members included community residents including parents and retirees, teachers, Rotary Club members, a director of a local bank, urban planners, employees of local health departments, faith-based organizations, a volunteer organization and the Special Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC).

Members of the CAB have invited the research team to promote the project at various events they are involved with, including health fairs and celebrations such as the Day of the Dead (Dia De Los Muertos) and Christmas festivals, that has increased the CPPHD’s visibility and popularity in the community. Moreover, the CAB was largely involved in promoting the project’s main events, at their agencies and with local media, including corner store grand re-openings and cooking demonstrations. The CAB has provided invaluable feedback including

local strategies to address logistical challenges we've faced including break-ins at converted stores as well as recruitment of local data collectors.

Community-Engagement Data Collection

Qualitative data were collected from community members both before the conversion process took place and then again later after the last store was converted. Prospective data reported (Table 1) are based on 10 semi-structured focus group interviews conducted in both English and Spanish between September and October of 2010 with approximately 92 East LA residents, 18 years of age or older. These participants were recruited from community partners, including a nonprofit organization, schools, religious institutions, a WIC clinic, and two community housing projects. All participants identified as Latino, 88% were female, 28% reported currently receiving food stamps, and 80% were born outside of the US. Among foreign-born participants, 89% were born in Mexico. Each participant received a \$25 gift card and a light meal as an incentive for participation. Informed consent was obtained from each participant prior to each focus group. Focus group interviews lasted between 1.5-2 hours, were recorded, transcribed verbatim and analyzed to identify major themes relevant to the project by CPHHD staff members. There was high concordance between the reviewers.

Retrospective findings reported (Table 2) are based on semi-structured key informant interviews conducted in September 2014 with 3 community members actively involved in the CAB throughout the project's timeline. Each interview was conducted in English and was approximately 90 minutes in duration. Each participant provided verbal consent to participate. Interviews were audio-recorded and transcribed by a CPHHD staff member. Interview data were analyzed and coded by two staff members. All material presented here was approved by the UCLA Institutional Review Board.

Community-Engagement Results

Our interviews with members of the East LA community, both before and after the corner store conversions, revealed that there was an overwhelming sense of support for the project. This sentiment was largely driven by two factors: 1) there was community 'buy-in' as residents identified cardiovascular disease, obesity and nutrition as major concerns and they understood the link between obesity and the overwhelming presence of 'junk' food marketing, especially to children, in their neighborhood so this project was considered timely and relevant and 2) corner store conversions were regarded as viable and appropriate strategies for improving the health of their community. Our retrospective interviews suggested that the project's emphasis on youth development and community-engagement were specific components that were also well received. Community leaders also expressed a great deal of interest in participating as this was the first time both UCLA and USC, academic institutions more commonly referred to as 'rivals,' were explicitly collaborating to improve health and quality of life for residents in their communities. Characteristics of the project less favorable for community residents included incorporating too few local personnel/sub-contractors, too little ongoing translation and dissemination of research findings for community members, ongoing and overall limited marketing of the converted stores.

Table 1. Focus Group Results: Community Members' Feedback about Corner Store Conversion Intervention in East Los Angeles (ELA) (Prospective View)

Theme	Community Members and Partners (n=92)
Perception of Local Food Environment	<ul style="list-style-type: none"> • Fresh produce is only at the farmers market. • Fast food is easier and cheaper. • Fruits and vegetables are expensive. • Produce from stores in ELA often goes bad quickly. • Meats, fruits and vegetables are of poor quality. • Many people do not eat healthy food.
Negative Perceptions of Corner Stores	<ul style="list-style-type: none"> • They are dirty and sell unhealthy products. • Fruits and vegetables are of poor quality and expensive. • People who drink and loiter nearby make these stores unsafe. • The stores are old, smelly, and not well maintained. • Sometimes the food they sell is spoiled or expired.
Positive Perceptions of Corner Stores	<ul style="list-style-type: none"> • They are convenient. • They are open in the evening. • Some storeowners are friendly. • They sell Mexican food products not found elsewhere. • Some corner stores do sell fruits, vegetables and other produce. • Corner stores in residential neighborhoods are better and more family friendly.
Considerations for Corner Store Conversions	<ul style="list-style-type: none"> • Pick stores in residential neighborhoods, not in commercial strip malls. • Cleaner stores would be an improvement. • They should stock fresh and healthy food with good prices. • We need to educate our community about healthy eating as it prevents many diseases. • Don't put the healthier food in the back of the store. • Get rid of the beer ads. • Convert corner stores near schools to encourage kids to eat healthier.

Table 2. Key Informant Interview Results: Community Members’ Feedback about Corner Store Conversion Intervention in East Los Angeles (Retrospective View)

Theme	Community Members and Partners (n=3)
Characteristics the Community Believed “Went Well”	<ul style="list-style-type: none"> • Cardiovascular disease, nutrition and improving overall health are top concerns. • A “different” approach (i.e., the focus on community-engagement). • Emphasis on youth. • Capacity building opportunities for the youth, businesses and local organizations. • Allowed for community economic development opportunities. • Unique partnership of universities known as cross-town “rivals.”
Characteristics the Community Would Have Preferred “Went Differently”	<ul style="list-style-type: none"> • Community was provided infrequent updates and progress reports from the research staff. • Lack of ongoing technical assistance provided to store owners, particularly for marketing the produce. • Actual marketing activities for stores too narrowly concentrated near the intervention stores. • Many materials and some personnel for project were not from local community.
Lessons Learned/Advice for Future Projects	<ul style="list-style-type: none"> • Provide ongoing feedback to the community on the project in a language that they will “get” and “appreciate.” • More translational science: bring all “players” (academic, business, schools, community) to the table throughout the process. • Redefine role of the Community Advisory Board (CAB): increase their direct involvement at all phases, as opposed to just sharing with them “what happened and what we did.” • Focus on including local agencies and businesses for all components of the project, including local media.

East Los Angeles: Lessons Learned

The interviews both before and after our corner store intervention provided specific suggestions on how the project could more directly involve members of the community. For example, members of the CAB would have preferred to be more involved throughout the project, from participating in the grant writing, to attending scientific meetings. The quarterly/annual CAB meetings were perceived to be general updates on “this is what happened and this is what we did.” Some CAB members explained that they could have found ‘local solutions’ to

challenges we faced during the implementation phase had they been present at team meetings. However, overall community members expressed satisfaction with project accomplishments.

The concern about involving too few local personnel could have been prevented by capitalizing on existing community assets by either: 1) hiring local subcontractors or 2) hiring subcontractors from outside the community who emphasized local capacity building, i.e. a train-the-trainer model. Although our project received high profile media attention on a national level, more efforts on local media and marketing were needed. For example, the marketing of the brand, Proyecto MercadoFresco, could have been expanded to the larger East LA community as opposed to our strategy of concentrated marketing within close proximity of the converted stores.

Case Study 2: Boston, Massachusetts

Community Context

Puerto Rican adults living on the US mainland are at increased risk for CVD and experience high prevalence of type 2 diabetes, elevated plasma triglycerides and indicators of inflammation, and low HDL cholesterol (Tucker et al., 2010; Kok et al., 2004; Orsega-Smith et al., 2007; Marquez & McAuley, 2006). The Boston Puerto Rican Health Study at the University of Massachusetts (UMass) Lowell works with older adults, ages 45-75 years of age, living in the Boston area to develop interventions to reduce the risk of CVD in Hispanic communities. In one project, the UMass Lowell CPHHD partnered with community based organizations to design and implement a heart healthy initiative program (HIP) for Puerto Rican older adults ages 45-60 years. The HIP team worked extensively with trusted community partners to assure that it was culturally sensitive and focused on reducing modifiable CVD risk factors of diet, exercise and stress management among Puerto Rican adults. Program components included weekly group education sessions on heart disease prevention, Zumba fitness classes and tailored health messages delivered through a computer generated character that helped reinforce healthy lifestyle practices.

Methods

The UMass Lowell CPHHD has a long history of working with the Puerto Rican community of Boston. Hence the design of HIP drew on the expertise of both existing partners and new partners with strong ties to the community. These individuals were invited to provide input on the program through key informant interviews, focus group interviews and regular meetings. Thus, the community was engaged from the initial phase of the project and provided continuous feedback throughout the implementation process. First, we worked collaboratively to develop a culturally- and linguistically-appropriate health education curriculum that promoted heart healthy behaviors and addressed barriers to a healthy lifestyle. Community partners and members contributed to the curriculum development by emphasizing the importance of cultural meaning in lifestyle choices and social relationships and highlighting the need for multilevel changes.

Secondly, with input from the community, an 8-week curriculum was developed to train bilingual peer leaders, recruited from the community. Peer leaders were trained to carry out the HIP activities and deliver the group education sessions in Spanish. The curriculum covered main topics for behavior change, including diet, exercise and stress, and also incorporated

motivational interviewing, listening skills, teaching skills, and cultural sensitivity. Community partners helped identify potential peer leaders and provided space for training.

Thirdly, we worked closely with our community partners to recruit program participants. Community partners recruited participants at social events, health fairs and cultural activities and worked with study staff to post flyers in key community locations and venues. Our partners facilitated access to local Spanish media, including radio stations, local cable television shows and newsprint, all of which helped increase awareness of the program. We became regular guests on a Spanish radio show and worked with our community partners to provide weekly talks on a variety of health issues impacting the Hispanic community. Lastly, during the implementation phase, our community partners provided space for the group sessions and assisted with program logistics, including classroom set up and participant reminders.

Community-Engagement Data Collection

Prior to implementing the program, a qualitative study was conducted with the Puerto Rican community to elicit their perspectives on the design and implementation of the HIP program. Described in detail elsewhere (Todorova et al., 2014), five focus groups were conducted in Spanish with 28 community members, between the ages of 45 to 60. Participants were recruited through a community health center and La Alianza Hispana, a well-known, trusted community organization that has served the Puerto Rican community of Boston for over 40 years. With approval from the Institutional Review Board at Northeastern University, participants provided written consent and were provided with a \$25 gift card for their participation. Key informant interviews were also conducted with 9 community leaders, including directors of Latino serving agencies, community service advocates, and health care providers. Interviews were audiotaped, transcribed verbatim and analyzed using content analysis.

Community-Engagement Results

As illustrated in Table 3, community members and partners shared several recommendations with regard to program design and implementation. As previously described (Todorova et al, 2014), community members recommended that the program take place in community trusted locations that were easily accessible and that we address potential barriers to participation such as time, cost, transportation, child care and language barriers. They emphasized that program activities should be “fun” and include hands on activities, such as cooking classes and dancing. When asked to explain reasons for why they would not participate, community members frequently mentioned lack of motivation, illness, competing priorities (e.g., caring for family member) and weather conditions as major barriers.

Table 3. Community suggestions on the design of the Heart Healthy Initiative for Puerto Rican Adults Program in Boston (HIP)

Theme	Community Members (n=28)	Community Partners (n=9)
Program Logistics	<ul style="list-style-type: none"> • Prefer program geared towards older adults • Hold close to home, in a community setting • Offer program more than once a week • Free/low cost • Offer childcare • Flexible program hours • Make program short in length (weeks or a few months) 	<ul style="list-style-type: none"> • Offer shorter program • Hold program at community location easily accessible by train and bus • Partner with community health centers to deliver intervention • Provide incentives for participation • Promote program through local Spanish media (e.g., radio)
Program Activities	<ul style="list-style-type: none"> • Include culturally appropriate forms of physical activity, such as dancing • Offer nutrition and cooking classes • Provide healthy foods to participants • Make classes fun and interactive. Include activities such as crafts and games • Encourage a welcoming atmosphere and good group dynamics 	<ul style="list-style-type: none"> • Design program that is culturally sensitive and relevant to the community • Employ a Latino health educator • Connect participants to available community resources • Clearly outline benefits of the program • Incorporate a family component in the program • Offer social activities such as walking groups, cooking classes, parties, health fairs
Motivating Factors for Participating in the Program	<ul style="list-style-type: none"> • Past illness, such as high blood pressure and cholesterol • Opportunity to learn about health 	<ul style="list-style-type: none"> • Better health and increased knowledge of heart disease prevention • Incentives for participation

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- Prevent future heart disease
- Want to live longer for children and grandchildren
- Better physical/ mental health
- Opportunity to meet new people and speak (Spanish)
- Social activities and opportunities to interact with other people
- Previous health concerns, including obesity and heart disease

Potential Barriers to Program Participation

- Fear of deportation because of immigrant status
- Lack of motivation
- Busy traveling to home country throughout the year
- Caring for family members
- Too ill to participate
- Weather conditions, including the cold, snow and rain.
- Bad weather conditions
- Transportation barriers
- Low levels of literacy
- Program staff not well connected with the participants and community
- Lack of trust from community members
- Other competing family obligations, such as work and caring for a loved one.
- Program does not appeal to participants

Both community members and partners cited better health and improved knowledge and understanding of heart disease as factors that would encourage participation. Community partners felt the program would be well received if done in partnership with health centers and if promoted via local Spanish media (e.g., radio, newspaper). Programs that were short in length (e.g., a few weeks), conducted in Spanish by a bilingual health educator and that offered incentives were also preferred (Kok et al., 2004). Both groups also recommended the program expand participation to Hispanic subgroups beyond Puerto Ricans.

Boston: Lessons Learned

Our community-engaged approach formed a solid foundation for the planning and implementation of the program and for communication and collaboration with community partners. One important lesson from the community-engagement process was the importance of expanding the program to all of those in the community who were interested, regardless of Puerto Rican Heritage. Community members would often agree to participate in HIP only if they could attend with a friend or family member, who may be of a different Latino origin or a younger age group. The program was therefore expanded to include all Hispanic subgroups, which helped enhance recruitment and strengthened relationships between the research team and community members. The program was also renamed the Heart Healthy Initiative for Hispanic

Adults Program to reflect the expansion to all Hispanic subgroups. Community-engagement also played a key role in ensuring the program was sensitive to the cultural and ethnic background of the community. For example, the curriculum was modified to incorporate the family and the role that family plays in making and reinforcing health behaviors. Moreover, a participatory approach was instrumental in obtaining community buy-in of the project, recruiting and retaining program participants, and proved to be an effective way to engage in meaningful dialogue with community members about heart health.

Case Study 3: Lenoir County, North Carolina Community Context

Lenoir County, centered in the “stroke belt” of the southeastern United States (Howard et al, 2007), is a low-income, rural county in eastern North Carolina whose residents have CVD rates substantially higher than state and national averages (Centers for Disease Control and Prevention; North Carolina Department of Health and Human Services Division of Public Health, 2013). Within this geographic context, there are substantial racial, ethnic, and socioeconomic disparities in CVD rates, partially due to lifestyle factors, as disadvantaged, rural populations are more likely to consume a poor diet and be inactive than their more advantaged, urban-dwelling counterparts (Morbidity and Mortality Weekly Report, 2007; Morbidity and Mortality Weekly Report, 2008; Blanck et al., 2008; Haskell et al., 2008). The University of North Carolina (UNC) Chapel Hill CPHHD, in collaboration with community partners, developed and implemented the Heart Healthy Lenoir (HHL) Project (Pitts et al., 2013; Jilcott Pitts et al, 2013) with two major components: 1) an evidence-based individual level diet and physical activity intervention for community members to reduce CVD risk (the lifestyle study), and 2) multiple community level initiatives to increase healthful lifestyle behaviors, in collaboration with our Community Advisory Committee (CAC), local businesses, health care organizations, schools, worksites, volunteer organizations, and media. Thus, this project exemplifies the power and innovation that can occur when very different types of organizations and individuals participate in community-engaged research.

Methods

The study began with a formative phase (Pitts et al., 2013; Jilcott Pitts et al, 2013) that involved extensive collaboration with multiple partners in Lenoir County. These collaborations began before the grant writing process and have continued during the intervention phase through quarterly meetings with our CAC, which includes 20 community members representing: the Chamber of Commerce, the Cooperative Extension Office, health department, local hospital, community college, schools, churches, community-based organizations, and businesses. The CAC provided a community perspective on the study and reviewed, provided feedback on, and approved all major study activities. Moreover, to increase acceptance of the project in the community, all project field staff were hired locally and the study field office was housed in a Lenoir County business incubator.

The goals of the lifestyle study were to offer community members an individual-level intervention program, divided into three distinct phases, to improve diet quality, increase physical activity, and promote weight loss. We created a Community Resource Guide for

participants listing local healthy food (farmers' markets, produce stands) and physical activity (parks, gyms) venues.

For the community-level intervention, the goals were to 1) collaborate with local agencies and businesses to promote healthy lifestyle choices, services, and products and 2) identify priorities to inform policy level interventions that promote a healthy lifestyle. Community level activities focused on improving food access and choices including that served in restaurants, public schools, community events and worksite wellness initiatives, which were then listed and promoted in the community resource guide.

For the restaurant project, all licensed restaurants in the county were invited to collaborate to encourage customer selection of healthy menu items based on 10 dietary tips displayed on table tents. These table tents also directed customers to brochures available at the restaurants that included a brief assessment of current diet behaviors, tailored tips for improving behaviors, and a link to the study website for more detailed information. In addition, coupons for discounts on healthful items were distributed to both lifestyle study participants and community members. The local newspaper and Chamber of Commerce assisted in promoting this program.

Other community-level interventions included collaborating with the local school system for healthy food options in the school cafeterias, school gardens, and creation of a Childhood Obesity Task Force. We also collaborated with the Cooperative Extension Service to improve options for purchasing affordable local produce, and participated in community events including the annual "BBQ Festival on the Neuse" and "Living the Good Life" Chamber of Commerce Expo, where we promoted the HHL project, provided heart-healthy samples of traditional local foods (e. g., barbecue and hush puppies), and distributed information on diet and health. We also linked project to local worksite health promotion programs.

Community-Engagement Data Collection

As previously described in detail (Pitts et al., 2013), members of the HHL research team conducted in-depth interviews with key informants from community agencies and businesses (n = 8). We also conducted face-to-face interviews with community members to learn about their eating and physical activity behaviors, knowledge of heart disease risks, and their perception of community barriers and resources relevant to healthy lifestyle choices. Participants (n = 22) were over 18 years, and lived in Lenoir County. All interviews were conducted in English. To help prepare for the restaurant project, we co-sponsored a focus group of restaurant owners with the Chamber of Commerce to gain insights on how best to collaborate.

We also interviewed 11 local stakeholders (e.g., parks and recreation personnel, school nurse, county commissioner), and conducted a focus group among 19 members of the CAC asking participants to rank obesity prevention policy change strategies they considered most feasible and "winnable" (Jilcott Pitts et al, 2013). Examples included "Communities should limit advertisements of less healthy foods and beverages" and "Communities should improve access to outdoor exercise and recreation places, such as parks and waterways." The strategies were adapted from those recommended by the Centers for Disease Control and Prevention (Khan et al., 2009)

Community-Engagement Results

Overall, community members and key informants agreed on many of the facilitators and barriers to lifestyle behavior change promoting heart health (Table 4). Key facilitators included availability of healthy food and physical activity resources and options, and a strong agricultural heritage promoting gardening and farming. Key barriers, especially noted for low-income and rural residents, included the distance to supermarkets, farmers’ markets, gyms, and parks and the cost of healthy foods and access to private gyms. Also, for physical activity, there was concern about traffic safety issues in rural areas and crime in some neighborhoods.

Table 4. Structured interview results: Community and policy-level facilitators and barriers to improving lifestyle behaviors to reduce cardiovascular disease risk among Lenoir County residents.

Theme	Community Members and Partners
	Community Members (n=22)
Community facilitators	<ul style="list-style-type: none"> • Availability of options to purchase healthy foods: farmers markets and local food stands • Agricultural heritage, with many gardening • Availability of venues that promote physical activity: (parks with walking paths, community centers, senior centers, boys and girls clubs and hospital wellness center
Community barriers	<ul style="list-style-type: none"> • Location: while resources were available in the county, many were not located close the their homes transportation to store with healthy food and gyms could be challenging • Costs: healthy food perceived to be costly, as were newer health clubs.
	Key Informants (n = 8)
Community facilitators	<ul style="list-style-type: none"> • Availability of stores and farmers markets with healthy foods and facilities in which to be physically active • Strong community agencies including cooperative extension, health department, local hospital, and parks and recreation programs • Rich agricultural history with versatile farm land, thriving farmers market, and some restaurants interested in local foods
Community barriers	<ul style="list-style-type: none"> • For rural and poor residents, lack of access to healthy foods and physical activity venues, due to location and cost • Inadequate environment in support of physical activity, such as sidewalks and bike lanes • Lack of safety for physical activity, including concerns about walking

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and high speed traffic in rural areas and personal safety in some neighborhoods

- Fatalism with regard to high likelihood of developing heart disease, stroke, and or diabetes
- Low customer volume at food stands and farmers markets

Key Informants (n = 11)

Policy facilitators

- Funding for parks and recreation
- Mandates for healthy foods and physical activity in public schools might be more well received, given that taxpayers fund public schools
- Rural environment conducive to promoting local produce/agriculture
- Community support, collaboration, and innovation for additional recreational facilities

Policy barriers

- Limited funding for increasing healthy food access and walking and biking infrastructure in rural communities
- Lack of community support for government mandates and regulations
- Rural environment not conducive to additional walking infrastructure

*For more detail concerning community and policy assets and barriers, see prior publications addressing these issues.(23,24).

Table 4 also summarizes results of policy facilitators and barriers as assessed by key informants. Facilitators included funding for parks and recreation, a rural landscape conducive to supporting local agriculture, and community support, collaboration and innovation for creating recreational facilities that promote physical activity. Barriers included lack of funding to promote healthy food access and walking and biking infrastructure in rural areas, and lack of support for government mandates and regulations promoting healthy lifestyles. CAC members ranked policy change initiatives to improve physical activity as most winnable and also voiced support for policies to promote healthy food production and distribution of food from local farms. CAC members felt the public was not supportive of government mandates, taxes, and incentives, and indicated that the least winnable policy was limiting advertisement of unhealthy food and beverages.

Lenoir County: Lessons Learned

A major key to the HHL project's success was working with a CAC that included broad representation from local government and health agencies, complemented by key elected officials and community representatives. The diversity of CAC members and the different sectors they represent provided helpful guidance and insights during the grant preparation phase and throughout the project. CAC members were particularly helpful in identifying community resources and members with expertise and insights relevant to the work of the project. Moreover, the CAC also helped inform our recruitment and enrollment methods and has continued to help in dissemination and additional grant-writing efforts. The Chamber of Commerce, a unique partner not commonly involved in community-engaged health disparities

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research, helped to facilitate collaboration with the local business community. In addition, key informants and community stakeholders provided crucial insights into the specific challenges and assets that rural and low-income community members faced when attempting to engage in healthier behaviors.

DISCUSSION

These three case studies suggest that community-engaged research is both challenging and rewarding. In any one community there are a wide range of community assets to identify and work with and given the problem, population, culture and community, those configurations, and the solutions generated to address the problems are not only unique, but dynamic. However, common across all three projects is the notion that building and maintaining collaborative inter-organizational and interpersonal relationships that engender trust and productive work is time- and labor-intensive, yet essential to project success.

In East Los Angeles, a complex intervention was facilitated with and through a range of community partners who ‘sold’ the intervention to their community. A distinctive strategy of this project was the active involvement of high school youth, who alongside other community members became involved in the store transformations and effective health advocates in their community. A strong partnership with a Community Advisory Board helped recruit stores, smooth over community relations, and engage students and community volunteers in community-wide events promoting the converted corner stores. Another unique approach of this project was the collaboration between two academic institutions that have a long-standing history and reputation of otherwise being ‘rivals.’

In Boston, trust established over many years of successful partnerships with community-based organizations was important in program design, implementation and sustainability. The engagement of a wide range of trusted community leaders and the partnership with a local Latino media outlet helped recruitment and ongoing participation. Importantly, project experience suggests demands on and adequate resources from community agencies must be considered when implementing ‘new’ activities.

In rural Lenoir County North Carolina effective partnerships with a CAC, local government, voluntary agencies, and local businesses assured that community level activities met community needs, culture and ‘tastes’. Intensive engagement of broad range of community partners, including local businesses, in all phases of the project, and the focus on hiring local field staff, built community acceptance and sustainable set of activities to promote health. This approach, moreover, proved effective in a small rural where social ties are deep.

A major concern in all three studies has been accounting for the intervention impacts on CVD risk in the participating communities. However, each study has taken a slightly different approach to measuring the outcomes and has distinct main outcomes of interest, including at the individual and community levels. In the East Los Angeles project, household surveys, patron surveys and qualitative methods assess changes in attitudes about corner stores, perceptions of neighborhood food environment, and changes in behavior including patronage at converted stores and food purchasing. The study in Boston is administering questionnaires and collecting biomarker data to assess improvements in dietary intake, increase in physical activity, improvements in plasma vitamin status (vitamin B6, total carotenoids), plasma lipids, plasma

glucose and C-reactive protein (indicator of inflammation). In addition, the study is evaluating changes in body mass index (BMI), waist circumference and blood pressure. The Lenoir County study is also using a mixed-methods approach to understand changes in access to healthy foods including fresh fruits and vegetables, weight management practices and increases in physical activity. Outcome studies are in-progress for all three studies.

These three studies make it apparent that while ‘outsiders’ can bring fresh ideas, they must be balanced with active and ongoing input and involvement from community residents. This paper aims to show the importance of involving community members in the planning and implementation activities as essential to project success. These case studies exemplify that community-engaged research is a dynamic process that requires careful and culturally appropriate recognition of the unique needs, strengths and limitations within each setting. While there are commonly encountered challenges to community engaged research, there is great potential for rewards, especially when community members are involved in the development of context-specific strategies and solutions.

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