

Developing a Research Agenda for Cardiovascular Disease Prevention in High-Risk Rural Communities

Cathy L. Melvin, PhD, MPH, Giselle Corbie-Smith, MD, Shiriki K. Kumanyika, PhD, Charlotte A. Pratt, PhD, Cheryl Nelson, MSPH, Evelyn R. Walker, MD, Alice Ammerman, DrPH, Guadalupe X. Ayala, PhD, MPH, Lyle G. Best, MD, Andrea L. Cherrington, MD, MPH, Christina D. Economos, PhD, Lawrence W. Green, ScD, DrPH, Jane Harman, PhD, Steven P. Hooker, PhD, David M. Murray, PhD, Michael G. Perri, PhD, Thomas C. Ricketts, PhD, and The Workshop Working Group on CVD Prevention in High-Risk Rural Communities

The National Institutes of Health convened a workshop to engage researchers and practitioners in dialogue on research issues viewed as either unique or of particular relevance to rural areas, key content areas needed to inform policy and practice in rural settings, and ways rural contexts may influence study design, implementation, assessment of outcomes, and dissemination. Our purpose was to develop a research agenda to address the disproportionate burden of cardiovascular disease (CVD) and related risk factors among populations living in rural areas. Complementary presentations used theoretical and methodological principles to describe research and practice examples from rural settings. Participants created a comprehensive CVD research agenda that identified themes and challenges, and provided 21 recommendations to guide research, practice, and programs in rural areas. (*Am J Public Health*. 2013;103:1011–1021. doi:10.2105/AJPH.2012.300984)

Cardiovascular disease (CVD), the leading cause of death in the United States, disproportionately burdens residents living in rural communities.^{1–4} Results from the National Health Interview Survey show CVD prevalence rates of 13.1% for those living in rural areas compared with 11.2% for those living in urban areas.^{5,6} Geographic differences in heart disease mortality emerged in the 1980s, leading Cosby et al.⁴ to describe the nonmetropolitan (rural) mortality penalty in the United States. Residents of rural counties exhibit a high-risk CVD profile with higher rates of cigarette smoking, obesity, overall (all cause) mortality, mortality from ischemic heart disease, and physical inactivity compared with residents of nonrural counties.⁴ Health disparities also vary when taking into account income inequality, measured as the gap between rich and poor residents in a county. Rural counties with the greatest income inequality exhibit greater health disparities than rural counties with smaller income inequality.⁷

Variation in CVD and associated risk factors exists within rural areas as does variation in demographic characteristics, such as racial and ethnic status,⁸ age, gender, access to primary

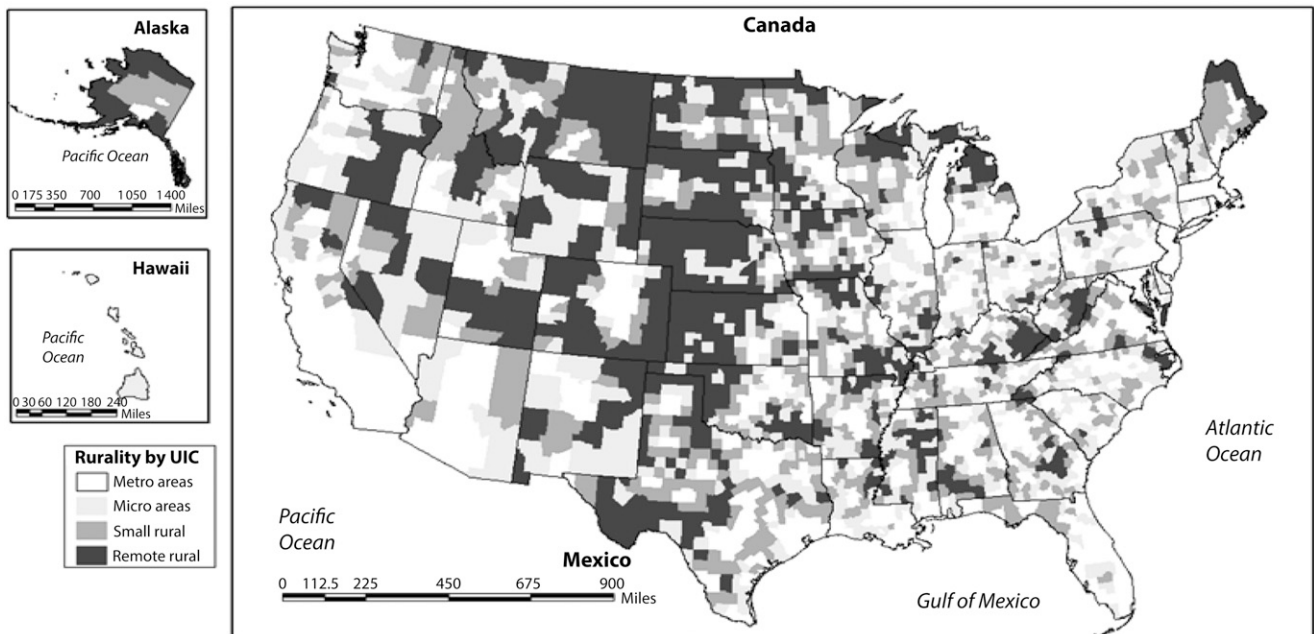
and specialty care,⁹ and insurance status. On the whole, these variations may or may not differ from similar variations in metropolitan areas.^{10,11} As much as a 15-year gap in life expectancy exists between US residents in the rural southern or Appalachian states and those in northern states. Without immediate attention, these disparities are likely to widen.^{2,9,11}

The choice of a definition of “rural” for research, policy, or programmatic purposes can and does influence our understanding of the scope and magnitude of health and health care issues as well as the underlying economic, social, and environmental factors that influence population risk for CVD. Although multiple standard definitions of rural exist, there is no agreement as to one and only one definition. Definitions of rural include measures of population density, distance from metropolitan areas, or combinations of these and other factors.¹² Frequently used designations include counties, rural urban commuting areas, census geography, nonmetropolitan or micropolitan areas (i.e., urban clusters of 10 000 or more persons), and zip code areas.¹² The census tract approach defines rurality as all territory, population, and housing units located outside of

urbanized areas and urban clusters, and classifies about 70 million US residents as currently residing in rural communities.¹³ Rural communities are dispersed throughout the United States¹⁴ (Figure 1). Irrespective of the definition used, key demographic, economic, or provider characteristics can be combined with a selected rural definition to more narrowly target and develop interventions,¹² improve our knowledge of how to intervene, and set research priorities. In particular, research and practice must take into account the underlying determinants of health risk disparities in rural areas, however defined. Health risk disparities include greater exposure to environmental hazards¹⁵ associated with working in agriculture, mining, and forestry occupations^{16,17}; the high prevalence of obesity¹⁸; general lack of health care access and lower health care service utilization^{19–22}; financial constraints of local governments and community-based organizations; poverty at the individual and community level⁷; and illiteracy.¹⁸

Approaches to achieving meaningful community engagement can also inform intervention development, our understanding of underlying determinants of health risk disparities, and approaches for disseminating and implementing evidence-based intervention approaches to address the CVD burden in rural areas. Just as differences in meaning and use arise when trying to define rural, definitions of community, community engagement, community-based, and community-based participatory research differ depending on the perspective of researchers and community stakeholders.

We suggest use of the term community engagement, based on the definition put forward by the Clinical and Translational Science Awards Consortium, Community Engagement Key Function Committee Task Force on the



Note. UIC = Urban Influence Codes.

Source. US Health Resources and Services Administration.¹⁴

FIGURE 1—Distribution of rural areas in the United States.

Principles of Community Engagement, to capture all of these related concepts. The consortium, composed of representatives of the Health Resources and Services Administration (HRSA), National Institutes of Health (NIH), the Centers for Disease Control and Prevention (CDC), the Agency for Toxic Substances and Disease Registry, and the Clinical & Translational Science Awards defines community engagement as the process of working collaboratively with and through groups of people affiliated by geographic proximity, special interest, or similar situations to address issues affecting the well-being of those people. Goals of community engagement are described as building trust, enlisting new resources and allies, creating better communication, and improving overall health outcomes as successful projects evolve into lasting collaborations.²³ The Consortium describes community engagement as a continuum of community involvement ranging from outreach to consultation, involvement, collaboration, and shared leadership. Community-based participatory research (CBPR) is described as part of this continuum and as being focused on collaboration and shared leadership. CBPR begins with

a research topic and a focus on the aim of achieving social change to improve health outcomes and eliminate health disparities. The CBPR model calls for consideration of 4 dimensions: context, group dynamics and equitable partnerships, intervention, and outcome.²³

The Consortium suggests at least 4 highly relevant ways to think about community. Each perspective (systems, social, virtual, and individual) offers different insights into the process of community engagement.²³ Likewise, “community-based” is used as a setting descriptor for needs or assets assessment, involvement, processes, interventions, approaches, evaluations, and policies.

We used the broader term, “community engagement,” as defined by the Consortium when describing our recommendations and guiding principles. We reported the term used by individual presenters in our description of their studies and findings. We recognized that these terms, although not interchangeable, described an active, purposeful process of engaging community stakeholders in meaningful ways depending on the anticipated outcome and purpose of the work. We also

acknowledged, along with the Consortium, that if health is socially determined, then health issues are best addressed by engaging community partners who can bring their own perspectives and understandings of community life and health to a project. If health inequalities are rooted in larger socioeconomic inequalities, then approaches to health improvement must take into account the concerns of communities and be able to benefit diverse populations.²³

In response to the need to improve cardiovascular health in rural communities, the National Heart, Lung and Blood Institute (NHLBI) convened a workshop in collaboration with the National Institute of Minority Health and Health Disparities, the CDC, and the Office of Rural Health Policy (OHRP) of the HRSA. The purpose of the workshop was to identify research areas that could be stimulated by funding agencies to advance knowledge and implementation of community interventions to reduce CVD burden in underserved rural communities. The workshop objective was to guide future research to develop, implement, and evaluate family and community interventions to reduce obesity, hypertension, diabetes, and CVD in rural communities of the United

States. The intended outcome was a set of research and practice recommendations to NHLBI and other funding partners.

The purpose of this article is to present a summary of the workshop along with recommendations to guide and frame future research, practice, and programs aimed at preventing CVD risks in rural communities.

WORKSHOP PLANNING AND PROCESS

Shiriki Kumanyika, Associate Dean for Health Promotion and Disease Prevention and Professor of Epidemiology, University of Pennsylvania, and Giselle Corbie-Smith, Professor, Department of Social Medicine, Department of Medicine and Division of General Medicine and Clinical Epidemiology, Director, Community Academic Resources for Engaged Scholarship (CARES), University of North Carolina, Chapel Hill, co-chaired the Planning Committee. Both co-chairs are known nationally and internationally for their expertise in health disparities research and community-based interventions. The planning committee, consisting of the co-chairs and staff from the NIH and ORHP of HRSA brought a mix of research, policy, and programmatic perspectives and experiences to planning the workshop. Their work together focused on addressing mutual interests to frame a workshop process and future research agenda to reduce health disparities and CVD risk commonly seen in rural and underserved communities (e.g., obesity, hypertension, diabetes) from a rural population perspective, and to identify challenges, opportunities, and resources for achieving and maintaining healthy lifestyles in rural communities.

Initial planning meetings established criteria for inviting speakers who represented the diversity of underserved and minority populations and selected research projects that illustrated a wide range of community-based, clinical or translational research, and study designs. The planning committee systematically identified a broad spectrum of presenters—scientists, leading researchers, community investigators, and representatives from public and private universities, nonprofit agencies, or community-based organizations engaged in research in rural communities or in health

disparities. The committee further sought ongoing or completed research in 3 thematic areas: (1) community-based CVD prevention approaches, (2) dissemination and implementation research of evidence-based interventions, and (3) research projects on policy and environmental interventions. Over several meetings, the planning committee generated a list of projects meeting at least 1 of these criteria. Subsequent meetings focused on sorting the list of possible presenters by research design and focus.

Invitees were selected to ensure the full breadth of diversity in study populations, community and research perspectives, and type of research. Invitees were specialists in sociology, preventive medicine, community engagement methodology, statistics, health psychology, nutrition, pediatrics, community health, and health disparities (the list of participants is available as a supplement to the online version of this article at <http://www.ajph.org>). Each presenter had either ongoing or completed research in 1 of the thematic areas of focus for the workshop. The resulting presentations represented projects targeting many ethnic and minority groups and different types of rural communities while focusing on research, programmatic approaches, health services research, community-based participatory approaches, and partnerships with community agencies.

The agenda for the workshop, held on June 14–15, 2010, focused on issues relevant to research and practice in rural areas, including NIH and CDC research priorities and research findings related to workshop themes. Discussion sessions were guided by considerations of research or program design, practice methods or intervention strategies, and current practices, opportunities, or barriers to conducting research in rural communities. Projects and community-based approaches targeting minorities in rural communities (African Americans, Hispanics, and American Indians) and those that focus on youths (e.g., tobacco control and school-based obesity prevention), adults (obesity), and entire communities were prominent in the discussions. Practice-based evidence using lessons from existing community interventions to develop evidence and intervention design approaches were also discussed. Findings from the literature and experiences from

ongoing research and programs in rural communities were also used to frame discussions in 2 breakout sessions: (1) recruitment, intervention, and outcomes; and (2) capacity building through community development, training, and partnership.

Presenters were asked to review the research or programs related to their topic area(s), use relevant theoretical and methodological principles to describe research and practice examples from their work in rural settings, illustrate approaches to translating research evidence into practice, or highlight major considerations for framing research, practice, and programmatic agendas in rural areas (see the box on page 1014). Each of the projects faced or faces challenges likely shared by other researchers involved in community-based CVD intervention research, whether in rural areas or not. The workshop agenda, roster, and executive summary are available online at http://www.nhlbi.nih.gov/meetings/workshops/cvd_rural_workshop/report.htm.³⁵

WORKSHOP SUMMARY

For each research area of focus for the workshop, we presented overall cross-cutting themes and challenges identified through presentations and discussions and highlighted at least 1 research project as an example of identified themes and challenges. A complete list of projects presented at the workshop is shown in the box on page 1014.

Community-Based Cardiovascular Disease Prevention Approaches

Although the list of research-tested community-based CVD prevention approaches is growing, workshop participants acknowledged the continuing need to conduct research and achieve clarity on how to design, implement, and evaluate behavioral, health systems, and policy interventions at the individual, family, community, state, and national levels. Community-based research to engage and address the needs of specific population groups within rural areas is also needed. Presentations of community-based research findings and processes provided examples of cross-cutting themes aimed at improving research of community-based CVD prevention approaches.

Workshop Presentations

- American Indian Communities in the Dakotas-CVD Prevention Initiatives: The CVD prevention projects include the Pathways Study, a school-based dietary initiative to address healthy eating; SANDS (Stop Atherosclerosis in Native Patients with Diabetes Study); and tobacco abuse interventions at the Black Hills Center for American Indian Health. (Presenter: Best)
- Coronary Artery Risk Detection in Appalachian Communities (CARDIAC): The objective of this project is to improve student risk profiles for CVD, including obesity, and explore the feasibility of taking evidence-based approaches to scale in the school setting. The project uses a chronic disease risk surveillance and intervention initiative to provide opportunities for West Virginia's health science students to learn concepts of health promotion and disease prevention, and partnerships with state government, secondary and higher education, and the private sector to reverse the obesity epidemic in West Virginia. This project combines school-based CVD risk screening with evidence-based approaches to address risk among fifth grade students and high-risk youth.²⁴ (Presenters: Stollings and Neal)
- Creating Healthy Active and Nurturing Growing-up Environments (CHANGE): This project, a partnership between Tufts University and Save the Children, a nonprofit community-based organization, aimed to adapt and test the effectiveness of a 2-year community-based intervention for obesity prevention in rural regions of South Carolina, the Mississippi Delta, the Central Valley in California, and portions of the Appalachia area of Kentucky.²⁵ (Presenter: Economos)
- Delta Health Alliance: Working to improve the health of the men, women, and children who call the Mississippi Delta their home, this project focuses on multilevel activities to increase access to health care and wellness programs and to increase awareness of ways to enjoy lifestyles that are more healthful among residents of the Mississippi Delta Region. Approaches address access to healthy food and health care and shortages of health care professionals.²⁶ (Presenter: Fox)
- East Tennessee 2-Step Healthy Weight Initiative: This project uses best available evidence to design a community-based weight initiative focused on both physical activity and nutrition and on combinations of environment and policy and education and counseling in 4 settings (schools, worksites, health care systems, and communities).²⁷ (Presenter: Haughton)
- ESENCIAL para vivir Project: The objective of this project was to develop and test a weight-loss intervention for Latina immigrants; community health workers (*promotoras*) delivered a weight management program in Alabama, 1 of 6 southeastern states with the highest rates of population growth and numbers of recent immigrant Latinos. (Presenter: Cherrington)
- Entre Familia: Reflejos de Salud: This project examined results of a family-based intervention delivered by trained, paid *promotoras* to promote healthy eating among Latino families in Imperial County, California.²⁸ (Presenter: Ayala)
- Healthy Kids, Healthy Communities: This project, 1 of several Robert Wood Johnson Foundation-funded sites, engages community-academic partners in Knox County, Tennessee in efforts to implement multilevel, evidence-based active living and healthful eating initiatives to reduce childhood obesity by building and sustaining systems, policies, and environmental changes. (Presenters: Haughton and Welch)
- Puentes hacia una mejor vida: This community-academic partnership research project evaluates a peer-support intervention led by unpaid volunteers to improve diabetes control in Imperial County, California using family home visits, small groups, and clinic tours. Comparison is with paid *promotoras* offering services through the Entre Familia: Reflejos de Salud project (see previous text). (Presenter: Ayala)
- Telecardiology Program: The objective of this project is to provide timely cardiology consultations for patients seeking care and treatment at Union Hospital-Clinton, Indiana for low-risk acute coronary syndromes (ACS) (chest pain rule in or out) utilizing live, video interactive telemedicine technologies along with workflow analysis, evidence-based risk stratification, and clinical education.²⁹⁻³² (Presenter: Laws)
- The Treatment of Obesity in Underserved Rural Settings (TOURS): TOURS was conducted to test the effectiveness of various approaches for providing nutrition and physical activity counseling (dissemination) to healthy obese women, 50-75 years of age in rural communities in northern Florida.³³ (Presenter: Perri)
- Vida Sana: Hoy y Mañana: This project explores social and physical changes in small grocery stores to improve access to healthy foods among Latina residents in Alamance County, North Carolina.³⁴ (Presenter: Ayala)

Note. CVD = cardiovascular disease.

Cross-cutting themes. Each presentation employed community-based research approaches to harness community resources, talents, and insights, and to involve local investigators in co-learning relationships with individuals and organizations within target communities. Projects used a multilevel approach to community-based prevention intervention design and implementation to increase the likelihood of achieving and sustaining healthful lifestyles among individuals and families in rural communities. For example, a group of 3 projects (*Vida Sana: Hoy y Mañana* funded by National Cancer Institute;

Entre Familia: Reflejos de Salud funded by American Cancer Society; and *Puentes Hacia una Mejor Vida* funded by Peers for Progress, American Academy of Family Physicians) recognized the importance of designing interventions to address shared characteristics of rural Latino communities.^{28,34} Members of Latino communities face challenges common to many rural residents with regard to improving their dietary choices, such as longer distances from stores offering healthful food and fewer resources for accessing these stores. Latino communities have stronger social ties that reflect the importance of family in making healthful

choices.²⁸ Investigators used these characteristics to frame issues and develop interventions from an assets perspective. Working with community partners, they developed a multilevel approach for improving access to healthful food in small grocery stores (*Vida Sana*).³⁴ Strong social ties among Latino residents led investigators and community partners to develop a family-based intervention to promote fruit and vegetable consumption (*Entre Familia*)²⁸ and a peer-support intervention to help manage and control diabetes (*Puentes*).

Projects also described engaging specific community organizations such as churches,

grocery stores (*tiendas*),²⁸ primary and secondary schools, and universities^{24,25,27,34,36}; health care systems, emergency departments, worksites,²⁷ and state and local health departments; and using community health advisors or workers³⁷ in their efforts to develop and test new and innovative approaches to reducing CVD and CVD risk factors.

Other projects sought to increase access to quality health care. One promising approach is to utilize technology more fully by putting electronic health records into the hands of primary care physicians and linking all electronic health records among physicians and hospitals in a specific area.^{29,38} Participants discussed tests of telemedicine and electronic intensive care unit–based approaches underway in the various rural locations to improve cultural sensitivity and address comorbidities related to CVD. Intervention components include the use of telemedicine to increase the reach of clinical resources into underserved communities, and of workflow analysis and productivity studies and analysis to decrease health care costs.^{30–32}

Each of these projects also faces the reality of limited material resources, shortages of qualified personnel, and smaller numbers of supportive organizational structures in the rural areas they serve. To address and potentially overcome these limitations and barriers, each project depends on robust community-academic-funder partnerships^{24–26,28,34,36,39} to support ongoing community engagement, increase the likelihood of sustained effort over time, contribute to economic development in each community, and evaluate progress and process for program and practice improvement. Elements of successful partnerships include having (1) clearly defined mission, vision and goals; (2) the right people “at the table” to meet the stated need for collaboration; (3) measurable outcomes that benefit the community, researchers, and practitioners; and (4) mutual trust. Partnerships take time to form and sustain as well as consistent commitment from organizations and individuals. Sustained partnerships can increase competitiveness for funding opportunities and maximize opportunities for successful program and policy implementation.

Building on the strengths of professionals already in these communities, specific

strategies undertaken in projects to build individual and organizational capacity include the use of community health workers, continuous adult learning, medical education, workshops, and career awards supported by NIH. Local investigators and clinicians provide an essential source of community sensitive and practice-based feedback,⁴⁰ making it essential to identify support systems intended to maintain their commitment and continued involvement in rural communities and in research conducted in these communities. Presentations provided examples of how projects meet these goals. To increase the likelihood of recruiting and keeping key clinicians, the Delta Health Alliance and its partners recruit Mississippi Delta high school students into non-MD health care provider fields, like nursing, at local academic institutions. After graduation, graduates recruited in this way often stayed to work in the Delta region. Similarly, rural health scholars from the University of Mississippi Medical Center completed rotations with residents coming to work in the Mississippi Delta and learned firsthand about issues and opportunities in these practices.²⁶

Challenges identified. Each of the projects face challenges likely shared by other researchers involved in community-based CVD intervention research. Administrative and other cost burdens incurred by community agencies participating in research in rural areas remain inadequately addressed and poorly resourced. Mechanisms for covering community agency direct and indirect costs associated with participation in research studies, for expanding the skills of local researchers, and for contributing financially to career development of local professionals (e.g., K-Awards) are lacking and hamper the development of full, sustainable partnerships.

Practicing health professionals also need access to information and resources to translate what we know works to improve practice. Strategies include helping local health professionals increase their awareness of recent findings and changes in standards of quality of care and assisting them in efforts to adapt, implement and apply those findings and standards in practice.

Challenges facing partnership development and maintenance often arise in situations where partner motivations are misunderstood

or unappreciated, relationship boundaries are unclear, and roles for all partners are either not defined or inappropriate. Conflict can and likely will arise within partnerships. Additional research into how to assess, monitor, and improve partnerships in rural settings could provide insight into how to anticipate and proactively address inevitable conflict and needs for improvement, and identify ways to achieve successful resolution of competing interests and motivations for change.

Research on community-based CVD prevention approaches also faces study design and methodological challenges.⁴¹ The small and often dispersed numbers of residents in rural areas, the challenges of achieving recruitment and enrollment targets, and the need for multilevel and less costly intervention approaches are shared research issues.

Dissemination and Implementation Research of Evidence-Based Interventions

The NIH Office of the Director, along with the Office of Behavioral and Social Sciences Research and 10 NIH Institutes and Centers, define dissemination research in the Program Announcement Reviewed in an Institute PAR-10-038 on Trans-NIH Dissemination and Implementation Research in Health as the targeted distribution of information and intervention materials to a specific public health or clinical practice audience. The intent is to spread knowledge and the associated evidence-based interventions. Implementation research is the use of strategies to adopt and integrate evidence-based health interventions and change practice patterns within specific settings. This distinction is necessary because interventions developed in the context of efficacy and effectiveness trials are rarely transferable without adaptations to specific settings. Therefore, research is needed to examine the process of transferring interventions into local settings, settings that may be similar to but also somewhat different from the ones in which the intervention was developed and tested.⁴⁰

Although other definitions exist, including those by other federal agencies, such as the CDC, the ultimate goal of dissemination and implementation research is to close the knowledge and practice gaps between what we know works to prevent, control, and treat CVD and

other chronic diseases and what we do in public health and clinical practice and policy. The evidence for “what we know” comes primarily from research in populations, settings, and circumstances unlike those of rural life and rural professional practice. Research to replicate and adapt interventions for rural practice settings will give greater confidence that evidence-based practices can be implemented and achieve comparable outcomes.^{42–46}

Presentations focused on research to adapt, disseminate, implement, or scale up evidence-based approaches to CVD screening and treatment or to reduce major risk factors for CVD prevention, such as obesity, physical activity, nutrition, and tobacco use.

Cross-cutting themes. Research on ways to adapt, transfer, and scale up proven interventions originally developed and tested in non-rural settings was described as particularly important to rural program developers and service providers. Similarly, research on the use of local organizational and community infrastructure was also discussed. The Treatment of Obesity in Underserved Rural Settings (TOURS) project based its intervention on a modified version of the Diabetes Prevention Program lifestyle intervention for weight management³³ and used an existing infrastructure to deliver the intervention. TOURS offered participants an initial program of 24 weekly group sessions. Family and consumer sciences staff of the US Department of Agriculture Cooperative Extension Service (USDA-CES) delivered the intervention along with 1 year of extended care via randomized assignment to face-to-face counseling, telephone counseling, or information provided by mail. The *ESENCIAL para vivir* project arose, in part, from experiences with Friendship Circles for Health, an NIH-funded community-based trial to prevent cervical cancer among Latinas.⁴⁷ The active control arm in Friendship Circles for Health was a *promotora*-delivered culturally tailored nutrition and lifestyle program.⁴⁷ Investigators adapted this intervention by developing a weight management program for Latina immigrants that combined the *promotora* model with an interactive DVD to meet community needs and overcome barriers. The Creating Healthy Active and Nurturing Growing-up Environments (CHANGE) project adapted methods from the Shape-up

Somerville project^{36,48,49} for use in schools and communities, including methods to gather information such as PhotoVoice,⁵⁰ the community-readiness model to assess readiness at the community level, and community-based participatory approaches.⁴⁸ The need to establish partnerships across multiple sectors in the community and to leverage organizational and other resources also characterized these projects. For example, the TOURS project demonstrated the usefulness and effectiveness of training USDA-CES staff for dissemination and implementation of obesity interventions in rural communities.³³

Multilevel comprehensive approaches to address the challenges of improving CVD health were also highlighted in workshop discussions. For example, creation of smoke-free environments within a community may require a number of dissemination strategies. Possible choices include changing legislation, increasing public awareness of harms associated with secondhand smoke exposure, sharing data on increased restaurant business receipts with conversion to smoke-free status, and engaging employees in discussion and action to protect their health by preventing exposure to secondhand smoke and using available resources to quit smoking themselves. Similarly, qualitative assessments conducted by the *ESENCIAL para vivir* Project revealed disordered and unwalkable neighborhoods, social isolation, resistance from family members, limited availability of community-based organizations, cultural and language barriers, and low-literacy rates as major barriers to physical activity and changes in dietary behavior.²⁸ Addressing these barriers requires a comprehensive approach, including policy changes to insure safety and assure language accessibility, building environment and public safety strategies to improve neighborhood walkability, and educational approaches to address low literacy rates. Although efforts to improve 1 or 2 components of a comprehensive approach are helpful and can result in meaningful change and improvement, implementing all components of a comprehensive approach may achieve a more synergistic effect that increases the impact on complex outcomes.⁵¹

Challenges identified. The complexities and challenges facing dissemination and implementation research and practice in rural

communities help to maintain the gap between what we know works and what we do. Individuals and organizations in rural areas are often without the capacity, resources, or authority to fully implement evidence-based approaches to address 1 or more major risk factors for CVD; this is especially the case with multicomponent, comprehensive strategies.

Research on disseminating interventions to prevent CVD or its major risk factors often faces challenges when the effect of a particular intervention is “small,” meaning that positive changes in project outcome indicators may have improved significantly from a statistical perspective but only modestly from an operational perspective. Although research may be well-received in the community, its affect on chosen outcome indicators may be too small to motivate continued investment or policy change necessary for program sustainability.

Research on Policy and Environmental Interventions

Research to address policy and environmental interventions to promote behavior and systems change for CVD prevention can advance rural capacity to control CVD risk factors. Research and funding initiatives may focus on how to use proven policies to create supportive environments with greater choices for achieving a healthful lifestyle or on ways to identify and adopt policies to change underlying factors that inhibit adoption of evidence-based approaches and reduce access to services and community supports for rural residents.^{51–55} Such studies must be fashioned and implemented in rural sites because they are less likely to mirror the environmental and policy circumstances in which urban and suburban research are conducted. Presentations highlighted policy and environmental interventions to improve health care systems and intervention sustainability. Examples came from research and programs to establish policies related to health care reform, healthful eating and physical activity, sustainable food systems, and tobacco prevention and control.

Workshop participants discussed research on how to make it easier for individuals to make healthful choices and for community-research partners to work together on policies to change community norms, improve communications, and alter physical and social environments. One

example of the linkage among policy issues is the relationship of the food environment to healthful eating. Measures of the food environment include both objective enabling factors (e.g., availability, accessibility, and affordability of healthful foods) and barriers as perceived by the community.⁵⁶ Research on sustainable food takes into account the whole, integrated system of food production, all the way from farm to fork, with a special emphasis on increasing access to energy- or nutrient-dense food. By getting farmers closer to consumers, it is possible to not only provide access to more healthful foods for consumers, but also to sustain an economically viable way of life for farmers. For example, local farmers' markets and home gardening are increasing in some rural areas, and some food distributors see this trend as a business opportunity. Farm-to-institution and farm-to-school distribution mechanisms may offer economic and health benefits to rural communities and individuals.

As with food access policy, measures to influence physical activity change can range from legislative regulations to ways to change social norms. A physical activity policy research framework,⁵² as well as a policy and environmental research agenda in support of physical activity,⁵³ were recently developed, but there is little, if any, mention of their applicability to rural settings. Policy can serve as both a dependent and independent variable. For example, policy changes may affect the built environment as well as interact with and change aspects of the broader social or economic environment. Increasing awareness of changes in built environment policies among an informed electorate could lead to additional support, passage, and enforcement of similar policies.⁵⁴ Understanding the effect on health outcomes of both the direct effect from policy to individual behavior and the indirect effect from changing social norms to influence policy is an area of research focus that can be especially important.

Environmental policies related to physical activity and rated as important for new research pertaining to diverse rural populations include those affecting schools; park, recreation, or trail facilities; worksites; and transportation. The need for policy research is manifest by first-generation studies indicating vast differences in built environment elements and their associations with physical activity

between adults living in urban and rural settings.⁵⁷ To strengthen this area of research, the reliability and validity of policy and environmental assessment tools and their usefulness in rural communities need to be investigated and strengthened.

Rural areas exhibit high levels of youth tobacco use initiation, tobacco use among adults and youths, and exposure to secondhand smoke in home, work, and public places. As a result, rural residents face a disproportionate burden of tobacco-related mortality and morbidity, including that associated with CVD. Comprehensive, evidence-based approaches to tobacco prevention, control, and cessation were the topic of 1 presentation. Research to understand how to best adapt, disseminate, and implement these approaches in rural areas, the role of partnerships, the relative benefit of implementing 1 or 2 components of a comprehensive approach, and ways to overcome challenges found in rural settings were highlighted during the discussion.

Cross-cutting themes. Local economic issues were identified as central to considerations of environmental and policy approaches to improving CVD health status and reducing risk in rural areas. For example, the clinical impact of possible changes in rural health and preventive policies associated with the Affordable Care Act, and in particular, the mandated use of US Preventive Services Task Force recommendations graded as A or B could dramatically alter the health care delivery system and its support and requirements in rural settings. Additional foci include the need to develop research questions and methods to understand the effect of policy advocacy on initiating and achieving policy change in rural settings and to assess the impact of policy changes on project and program implementation and impact.

Similarly, the intersection of healthful food environment with consumer characteristics should consider social, physical, and economic facilitators or barriers that determine whether local residents see change areas as useful and healthful. An assessment of retail sources of food in rural areas includes mass merchandisers, convenience stores, and dollar stores, and in areas like south Texas, Georgia, and other southern states, the *pulgas* or flea markets that sell fresh produce as well as micromerchandisers—local mobile food

vendors—and secondary businesses and *tienditas de casa* (food sold inside the home). Understanding the role of these food sources and their impact on access to healthy and unhealthy foods in rural areas is necessary for developing and testing interventions to improve the food environment. Similarly, community engaged research can help clarify community opinions on the availability and affordability of more healthful foods, the role of traditional and nontraditional food sources and preparation methods, and the expected impact of changes in policies affecting food availability and pricing.

Challenges identified. Participants identified challenges addressing environmental and policy issues related to CVD prevention. Decision makers need additional research to help them choose among alternative policies.⁵⁸ Factors of particular interest were the impact of these policies on local revenue streams, the relative cost-to-benefit ratio of specific policies, the long-term effectiveness and sustainability of policy and environmental interventions, and the acceptability and appropriateness of some policies for rural communities. Discussions also included ways to develop transdisciplinary collaborations among state and local entities to address shared issues, such as transportation, and assess the impact of policy changes on behavior, health, and economic well-being for all major stakeholders in rural areas.

WORKSHOP CONSENSUS

Many key concepts and principles relevant to CVD research in rural areas emerged during the planning phase and informed the selection of experts and examples included in the workshop. The aforementioned programmatic and research examples reinforced and further expanded upon these ideas. Complementary presentations by the methodological and content experts drew upon relevant theoretical and methodological principles to highlight major considerations for framing research, practice, and programmatic agendas in rural areas. Consensus emerged among workshop participants during the workshop and in subsequent correspondence and conversations. Workshop participants collaboratively developed guiding principles underlying appropriate and effective research in rural settings (see the box on page 1018).

Guiding Principles for Cardiovascular Disease Research in Rural Settings

Research in Rural Settings

- Researchers and community members should carefully consider various definitions of rural, explicitly define rural for their proposed work, communicate the definition they choose to all stakeholders, and take into account the underlying premises and constraints of their chosen definition when developing, disseminating, implementing, or evaluating an intervention, program, or practice change.
- Researchers should consider the rural context (e.g., the socioeconomic status of rural communities, built environment, limitations of existing resources) in intervention design and include a comprehensive quality of life assessment to capture participants' general health status.
- Research in rural areas must address poverty as one of the most important underlying causes of health disparities and use when possible designs to improve health while creating opportunities for entrepreneurship and economic development.
- Researchers should select appropriate primary outcomes, and design and power studies, appropriately recognizing the importance of evaluating multiple risk factors as secondary outcomes.
- Researchers should consider the use of appropriate, methodologically sound designs given the stage of the research and the feasibility of randomization (e.g., individual or group-randomized trials or regression discontinuity designs for efficacy and effectiveness studies, and time series, multiple baseline, and quasi-experimental designs for preliminary studies).

Community Engagement

- Community engagement is a prerequisite, integral part of undertaking any and all phases of research development, dissemination, implementation, and evaluation. The type and level of community engagement should always be considered in planning rural CVD research.
- Training on principles of community engagement is a prerequisite for community members as well as researchers before their participation in community research.
- Research in rural areas must build on existing community strengths and infrastructure whenever possible while recognizing and addressing or accommodating the unique characteristics of each rural place and its inhabitants.
- Partnership-led interventions and policy efforts are keys to community engagement, collaboration, and sustainability.
- Sustainability should be a considered a primary objective in all research and practice improvement activities in rural areas. Achieving sustainability is more likely if efforts to build local capacity at the organizational and individual level are planned and implemented.

Evidence-Based Practice

- Evidence-based approaches, whether derived from research synthesis or practice-based evidence should be considered first when looking at options for disseminating and implementing approaches to reduce identified CVD risk, including interventions to improve access to care.
- Researchers should make use of evidentiary or preliminary studies that may describe, among other things, lessons learned from practice to inform recruitment and planning of efficacy and effectiveness trials.
- Researchers should explore combined use of qualitative and quantitative research to better understand the complexity of factors associated with rural health.

Note. CVD = cardiovascular disease.

Recommendations for Cardiovascular Disease Research in Rural Settings

The workshop dialogue focused on research issues viewed as either unique or of particular relevance to rural areas, key content areas needed to inform policy and practice in rural settings, and ways rural contexts may influence study design, implementation, assessment of outcomes, and dissemination. Participants created a comprehensive, challenging CVD research agenda for 6 broad categories with 21 specific opportunities to guide and frame research, practice, and programs in rural areas (see the box on page 1019).

Limitations

Several approaches exist to inform development of a research agenda whether for reducing CVD in rural areas or for other topics. Each viable option, including our choice of a workshop format carries its

own limitations, benefits, and resource requirements.

Assessments of the literature to inform a research agenda are generally accomplished through meta-analyses or systematic reviews of literature ranging from randomized controlled trials published in peer-reviewed journals to gray literature. Content and other analyses of case studies, exemplar programs and projects, anecdotal evidence, practice-based evidence, or consensus expert opinion also offer options.

When choosing an approach, it is important to consider its limitations and benefits. Reviews of the literature are expensive, subject to publication bias, often sharply focused on a few narrowly defined key questions, frequently unable to address specific concerns of population subgroups, and generally out-of-date before or soon after publication. Findings from practice-based evidence and evaluations

of programs and projects are frequently unpublished, and if published, may not find their way into these reviews if the study design is not a randomized trial. Anecdotal evidence, case studies, and expert opinion are often practice- or experience-based, unlikely to be replicated using systematic methods, and subject to the vagaries of individual bias in interpreting implications for research and research methods.

By contrast, systematic reviews and meta-analyses often use well-defined approaches to searching the literature, grading the evidence, and generating results, whereas other methods build on the real-world experiences and findings of individuals engaged in practice, academia, and policy. No single approach, including our workshop approach, provides the full breadth of knowledge necessary to inform a timely research agenda.

Opportunities for Cardiovascular Disease Research in Rural Settings

Capacity Building

- Explore how to best facilitate community development, training, and partnerships in support of CVD prevention.
- Define roles, opportunities to support financially and otherwise, and expected outcomes for engagement and involvement of community health workers, community champions, and care coordinators in advancing the adoption of evidence-based approaches to reduce CVD burden.

Collaboration

- Determine efficacious approaches to develop and sustain effective collaborations among local, state, and national entities.

Community Engagement

- Evaluate unique approaches to engage community members in intervention and policy change related to CVD.

Research Approaches and Designs

Dissemination/Effectiveness Studies, Including a Focus on Sustainability

- Explore options for “taking to scale” those interventions demonstrated to work in rural settings.
- Identify ways to modify and adapt efficacious interventions developed and tested in nonrural settings for use in rural communities.
- Identify effective components of successful efficacy trials and understand how these components might be adapted in rural areas.
- Conduct research to examine the effectiveness of existing CVD prevention programs in rural areas.

Practice-Based Evidence

- Evaluate how use of existing networks and systems can accelerate dissemination of evidence-based approaches for CVD prevention. For example, create and evaluate mechanisms to utilize research funds (e.g., rapid response funds) for “natural” experiments and short-term intervention studies to evaluate successes and failures.

Implementation

- Develop and evaluate targeted approaches to trial recruitment and enrollment in rural communities. Identified approaches should follow (or be tailored to) the type of intervention proposed. (e.g., for studies on childhood obesity, target caregivers or families, but not children alone).
- Research ways to make recruitment relevant and meaningful to target population groups.

Study Design

- Use intermediate outcomes as the basis for evidentiary trials and encourage assessments of mediators and moderators (effect modifiers) of intervention outcomes.

Research Funding Mechanisms

- Explore the use and impact of flexible funding schemes (e.g., capacity building or planning grants) and diverse level and type of funding (e.g., pilot, “natural experiments”, prototype, implementation, and dissemination) on accelerating the pace of either discovery or implementation of evidence-based approaches for CVD prevention.
- Incorporate mechanisms to provide funds for community leader involvement and assess the effectiveness of such approaches (e.g., as subcontractors to allow community-based organizations or leaders to obtain indirect costs for their services).
- Designate research support, including K-Awards, for clinicians residing in rural communities and facilitate coordination of research among health care providers.

Research Topics

- Develop and test strategies to improve policies and infrastructure shown to reduce CVD risk (e.g., modify the built environment to increase the likelihood of exercise, increase access to healthy foods, assure regulation of tobacco sales and promotion laws, and increase the number of public smoke-free places).
- Develop and evaluate the cost effectiveness, sustainability, and impact of supporting community coordinators through grant-writing initiatives and through community-researcher partnership development (e.g., in data collection, determination of priority health needs, and communication of community health status to researchers and community members).
- Evaluate the utility of various technologies for prevention activities in rural communities (e.g., telemedicine, electronic health records).
- Examine the potential impact and unintended consequences of implementing national recommendations (e.g., the Institute of Medicine’s School Nutrition Recommendations and the USDA/DHHS Dietary Guidelines for Americans) in rural areas.
- Explore approaches for translating proven and efficacious studies into practice in rural communities. Examples of possible implementation studies in rural communities include extension of CDC best practices for tobacco control, of the Diabetes Prevention Program (DPP), the Dietary Approaches to Stop Hypertension (DASH), and the coordinated school wellness mandate.

Note. CDC = Centers for Disease Control and Prevention; CVD = cardiovascular disease; DHHS = US Department of Health and Human Services; USDA = US Department of Agriculture.

Our workshop approach stopped short of including several topics that could form the basis for future discussion and more robust reviews. These topics might focus on clarifying the various types of community engagement, assessing the type and extent of disparities within rural areas related to population

characteristics (e.g., race, ethnicity, and income) or to health and other infrastructure availability and accessibility, understanding the overlap of issues faced by rural residents with those faced by residents of other under-resourced areas, and considering political and special interest influences on decision-making in rural areas.

DISCUSSION

Efforts to more clearly define a research agenda to address the disproportionate burden of CVD and related risk factors borne by the more than 70 million US residents currently residing in rural communities prompted

this workshop and presentation of its findings. Geographic differences in heart disease mortality and associated risk factors persist, although these differences have been recognized in the United States since the 1980s. Identification and implementation of a focused, evidence, and practice informed research agenda are necessary and timely pursuits for reducing these disparities. This workshop was designed to provide expert- and practice-based advice and recommendations regarding CVD research conduct and priorities in rural areas of the United States for federal funders, the public, and the research community.

The workshop format chosen to establish this research agenda allowed timely, comprehensive discussion from a variety of viewpoints. Expert presentations focused on the nuances of conducting research in rural areas, providing summaries of available literature on ways to define rurality, the rural context in research design, engage communities in research design and conduct, develop practice-based evidence, and use appropriate research design and methods. Examples of research on community-based CVD prevention interventions, of dissemination and implementation of evidence-based interventions, and of policy and environmental interventions informed discussions of cross-cutting themes, challenges, and opportunities for research in rural areas.

This composite, workshop approach resulted in an evidence, expert, and practice informed set of guiding principles and opportunities for future CVD research in rural areas. The consensus derived workshop products could be used either alone or with other sources to guide research on the development, implementation, and evaluation of interventions to reduce obesity, hypertension, diabetes, and CVD and their associated disparities in rural communities of the United States. ■

About the Authors

Cathy L. Melvin is with the Medical University of South Carolina, Charleston. Giselle Corbie-Smith, Thomas C. Ricketts, and Alice Ammerman are with the University of North Carolina at Chapel Hill. Shiriki K. Kumanyika is with the University of Pennsylvania, Philadelphia. Charlotte A. Pratt, Cheryl Nelson, Evelyn R. Walker, and Jane Harman are with the National Heart Lung and Blood Institute, National Institutes of Health, Bethesda, MD. Guadalupe X.

Ayala is with the San Diego State University, San Diego, CA. Lyle G. Best is with the Missouri Breaks Industries Research Inc., Timber Lake, SD. Andrea L. Cherrington is with the University of Alabama-Birmingham. Christina D. Economos is with the Friedman School of Nutrition Science and Policy, Tufts University, Medford, MA. Lawrence W. Green is with the University of California-San Francisco. Steven P. Hooker is with the University of South Carolina, Columbia. David M. Murray is with Ohio State University, Columbus. Michael G. Perri is with the University of Florida, Gainesville.

Correspondence should be sent to Cathy Lee Melvin, PhD, MPH, Medical University of South Carolina, MSC 955, Charleston, SC 29425 (e-mail: melvinc@musc.edu).

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This article was accepted July 9, 2012.

Contributors

C. L. Melvin was the principal author and a presenter at the workshop. G. Corbie-Smith was the co-chair of the planning committee for the workshop, a contributor to the article, and a presenter at the workshop. S. K. Kumanyika was the co-chair of the planning committee for the workshop, a contributor to the article, and a presenter at workshop. C. A. Pratt was an NIH partner, a convener of the workshop, and contributed to the article. C. Nelson was an NIH partner, convener of the workshop, and contributed to the article. E. R. Walker was an NIH partner, a convener of the workshop, and contributed to the article. A. Ammerman contributed to the article and was a presenter at the workshop. G. X. Ayala contributed to the article and was a presenter at the workshop. L. G. Best contributed to the article and was a presenter at the workshop. A. L. Cherrington contributed to the article and was a presenter at the workshop. L. W. Green contributed to the article and was a presenter at the workshop. J. Harman was an NIH partner, a convener of the workshop, and contributed to the article. S. P. Hooker contributed to the article and was a presenter at the workshop. D. M. Murray contributed to the article and was a presenter at the workshop. M. G. Perri contributed to the article and was a presenter at the workshop. T. C. Ricketts was a presenter at the workshop.

Acknowledgments

The June 14–15, 2010, workshop, Developing a Research Agenda for Cardiovascular Disease Prevention in High-risk Rural Communities: Guiding Principles and Recommendations, was funded by the National Heart, Lung and Blood Institute and in collaboration with the National Institute of Minority Health and Health Disparities, the Centers for Disease Control and Prevention (CDC), and the Office of Rural Health Policy (OHRP), Health Resources and Services Administration (HRSA).

Human Participant Protection

No human participant protection was required because no human participants were involved in this study.

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