

# Healthy Eating and Exercising to Reduce Diabetes: Exploring the Potential of Social Determinants of Health Frameworks Within the Context of Community-Based Participatory Diabetes Prevention

Amy J. Schulz, PhD, Shannon Zenk, PhD, Angela Odoms-Young, PhD, Teretha Hollis-Neely, BA, Robin Nwankwo, MPH, Murlisa Lockett, MA, William Ridella, MPH, and Srimathi Kannan, PhD

Diabetes disproportionately affects African Americans and is an important contributor to African Americans' excess morbidity and mortality.<sup>1-3</sup> In 2000 in the predominantly African American city of Detroit, approximately 71 540 (1 in 10) African Americans had been diagnosed with diabetes.<sup>4</sup> Detroit residents experience higher mortality rates (deaths per 100 000) from diabetes-related causes than do Michigan residents overall, in every age group (Table 1). Age-adjusted diabetes mortality rates are substantially higher in Detroit (29.1 per 100 000) than in nearby (wealthier and predominantly White) Oakland County (21.4 per 100 000) or the nation as a whole (24.9 per 100 000).<sup>4</sup>

African American women are more likely than White men, White women, and African American men to be overweight and to have limited participation in physical activity: both overweight and limited activity contribute to the likelihood of developing type 2 diabetes. According to the most recent National Health and Nutrition Examination Survey data (1990–2002), 77% of African American women are overweight and 50% are obese; for African American men, the percentages were 61% and 28%, respectively.<sup>5</sup> Among African American women overall, 40% reported no leisure-time physical activity, and only 4% of African American women aged 20–39 years reported vigorous leisure-time physical activity.<sup>6-8</sup> Results from the East Side Village Health Worker Partnership survey,<sup>9</sup> a 2001 random-sample survey (n=365) of women older than 18 years residing in Detroit's predominantly African American East Side, are reported in Table 2. These results indicate that 15% of women reported engaging in moderate activity, and just 5% re-

**Objectives.** We examined a community-based participatory diabetes intervention to identify facilitators of and barriers to sustained community efforts to address social factors that contribute to health.

**Methods.** We conducted a case study description and analysis of the Healthy Eating and Exercising to Reduce Diabetes project in the theoretical context of a conceptual model of social determinants of health.

**Results.** We identified several barriers to and facilitators of analysis of social determinants of a community-identified disease priority (in this case, diabetes). Barriers included prevailing conceptual models, which emphasize health behavioral and biomedical paradigms that exclude social determinants of health. Facilitating factors included (1) opportunities to link individual health concerns to social contexts and (2) availability of support from diverse partners with a range of complementary resources.

**Conclusions.** Partnerships that offer community members tangible resources with which to manage existing health concerns and that integrate an analysis of social determinants of health can facilitate sustained engagement of community members and health professionals in multilevel efforts to address health disparities. (*Am J Public Health.* 2005;95:645–651. doi:10.2105/AJPH.2004.048256)

ported engaging in strenuous activity for at least 30 minutes per day. Furthermore, 23% of respondents in this Detroit study reported consuming 5 or more servings of fruits and vegetables per day, a finding similar to national estimates for African Americans in 2003 (23.6%).<sup>10,11</sup> Although research efforts have focused on behavioral risk factors as the source of chronic health conditions, individual behaviors are influenced by local contexts and the historical, social, and political forces that shape those contexts.

Social and economic factors are linked to health and well-being, and inequalities in social and economic conditions contribute to inequalities in health.<sup>7,12-15</sup> Social determinants of health include contextual factors such as features of neighborhoods or communities (income distribution, segregation), as well as individual factors (social support, disrespect).<sup>16</sup> Conceptualizing diabetes in terms of social determinants of health broadens the scope of

factors to be considered beyond individual factors like dietary intake or physical activity. These models' emphasis on social factors suggests that research and intervention efforts must include attention to social and economic policies, social and physical environments, and the implications of these policies and environments for behaviors, social interactions, and biological indicators of health.<sup>17-21</sup> For example, the availability of healthy foods influences individual dietary choices,<sup>22-24</sup> as do public policies that subsidize production of some food products (e.g., corn syrup).<sup>25,26</sup> Understanding relationships among social, economic, and biological factors enables practitioners to consider the implications of intervening at various points in these processes.

It is particularly important to focus on social determinants of health if we are to understand and address racial and socioeconomic disparities in health in the United

**TABLE 1—Diabetes-Related Mortality Rates (3-Year Average) for Detroit and Michigan, by Age: 2000–2002**

Age, y	3-Year Average <sup>a</sup>	
	Detroit	Michigan
<50	9.3 ±1.3	5.4 ±0.3
50–74	227.2 ±13.0	144.9 ±2.9
≥75	785.1 ±46.7	749.2 ±12.7
Total	104.9 ±4.0	81.3 ±1.0

Source. Adapted from Michigan Department of Community Health.<sup>4</sup>

<sup>a</sup>Rates are deaths per 100 000.

States.<sup>19,27–30</sup> Although findings of racial health disparities are reduced substantially when socioeconomic status is accounted for, some racial differences in health remain. For example, African American–White differences in the prevalence of obesity (a risk factor for diabetes) persist at every socioeconomic level: African American women are more likely than White women to experience obesity, regardless of income level, and disparities by income are smaller for African American women than for White women.<sup>31</sup> Such persistent disparities have led researchers to examine the contribution of racism—including race-based residential segregation—to health disparities.<sup>30</sup>

In our study, we applied a conceptual model of social determinants of vulnerability to diabetes that was adapted from more general models that posited race-based residential segregation as a fundamental social determinant of health disparities.<sup>32,33</sup> Our model suggests that race-based residential segregation contributes to spatial concentrations of wealth and poverty. These concentrations, in turn, affect aspects of the social environment (e.g., workplace conditions, community social relations) and of the physical, built environment (parks, retail stores, presence or condition of sidewalks) that affect health directly (by influencing risk of injury) or indirectly (via effects on proximate factors such as available foods, which in turn influence dietary practices).

Applying this model to racial disparities in diabetes allows us to postulate links between

**TABLE 2—Percentage of African American Women Residing in Detroit's East Side Neighborhood and Reporting ≥30 Minutes per Day of Moderate Physical Activity and Strenuous Physical Activity and Consumption of ≥5 Fruits and Vegetables per Day, by Age Group: Healthy Eating and Exercising to Reduce Diabetes, 2001**

Age, y	≥30 Minutes of Moderate Physical Activity per Day	≥30 Minutes of Strenuous Physical Activity per Day	Consumption of ≥5 Fruits and Vegetables per Day
18–39	12.5	3.7	20.6
40–59	18.8	5.5	21.2
≥60	13.0	7.4	28.4
Total	15.1	5.2	22.6

Note. Results reported are from the ESVHWP survey conducted on Detroit's East Side in 2001. For a description of survey sample and methods, see Schulz et al.<sup>9</sup> and Zenk et al.<sup>10</sup>

the disproportionate impoverishment of predominantly African American neighborhoods and the extent to which conditions in wealthy and poor neighborhoods facilitate or discourage healthy lifestyles. For example, residents of poor neighborhoods have fewer safe places in which to exercise and more limited access to high-quality food and are more likely to report functional limitations and physical health problems compared with residents of wealthier neighborhoods.<sup>11,34–38</sup> In the Detroit area, Zenk et al.<sup>39</sup> found that a predominately African American community with limited economic resources had considerably fewer large grocery stores and significantly lower-quality fresh produce available at retail outlets compared with a racially heterogeneous middle-income community. Previous research has linked food quality to decisions to purchase fresh produce<sup>40,41</sup> and supermarket proximity to consumption of fruits and vegetables.<sup>42</sup> Thus, residents of the predominantly African American community in our study may experience a heightened risk of diabetes because of reduced access to high-quality fresh produce.

## METHODS

The East Side Village Health Worker Partnership (ESVHWP) is a community-based participatory research (CBPR) effort initiated in 1996 to identify and address social determinants of women's health on Detroit's East Side. The ESVHWP uses CBPR to engage residents of communities that experience

disproportionate disease and health care providers and academic researchers in developing strategies to address and promote greater equity in health in this poor, racially segregated community.<sup>43</sup> The high prevalence of diabetes in Detroit is part of the everyday experience of Detroit community residents, who confront diabetes in their own lives and in the lives of their friends, family members, coworkers, and neighbors. Grounded in these experiences, community residents involved with the ESHWP identified diabetes as a priority in 1999 and developed a pilot proposal for diabetes prevention named Healthy Eating and Exercising to Reduce Diabetes (HEED).

The objectives of the HEED project (Table 3) reflect community members' personal experience of diabetes and the social and environmental factors that contribute to diabetes. The HEED project promotes good health by (1) providing in-depth information about diabetes for community members; (2) increasing community resources for and reducing barriers to healthy eating and physical activity; (3) addressing aspects of the social and physical environments that affect vulnerability to diabetes; and (4) strengthening relationships among community members, community-based organizations, health service providers, and academic institutions with a CBPR approach. In Figure 1, the points of intervention developed through the HEED project are superimposed on the framework for understanding social determinants of diabetes described in the introduc-

**TABLE 3—Goal and Objectives: Healthy Eating and Exercising to Reduce Diabetes, 2000–2001**

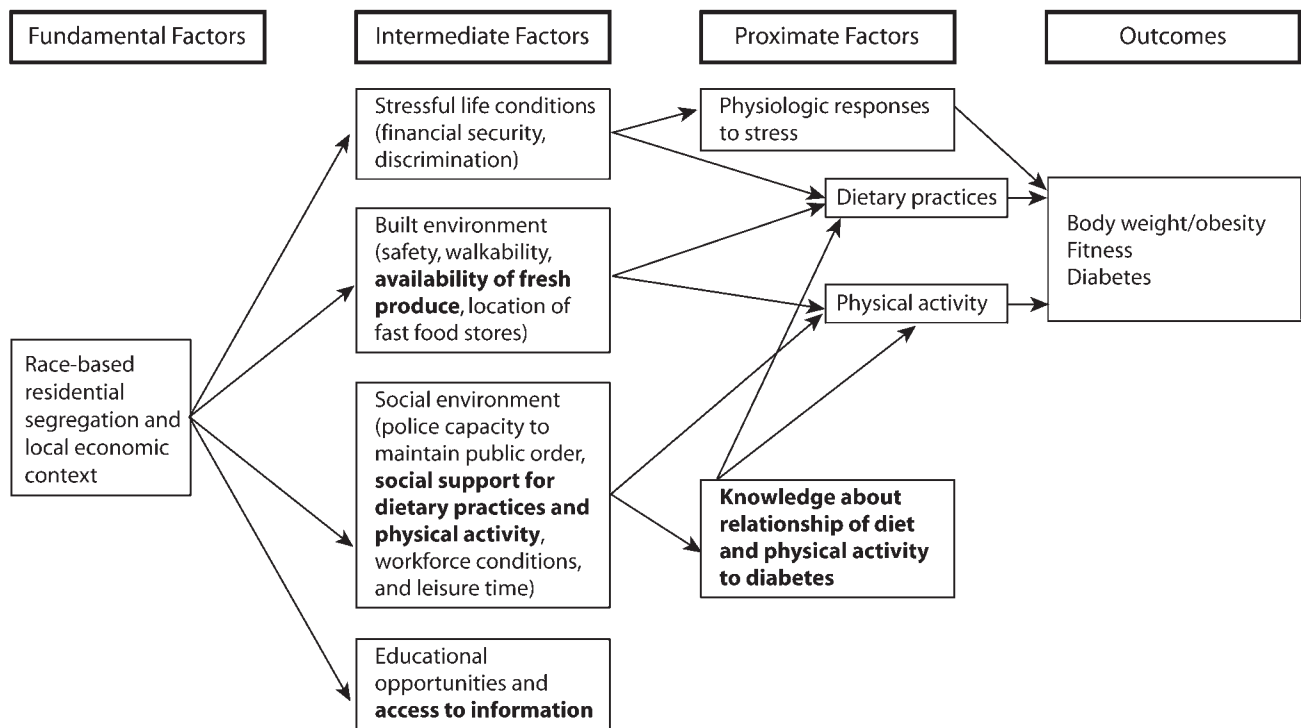
Overall goal	Reduce the risk, or delay the onset, of diabetes by encouraging moderate physical activity and healthy eating among residents of Detroit’s East Side
Objective 1	Increase knowledge about how to reduce the risk, or delay the onset, of type 2 diabetes among village health workers and other community members of Detroit’s East Side
Objective 2	Increase resources (e.g., community gardens, cooperative buying clubs, social support for a healthy diet) and reduce barriers (e.g., lack of affordable fresh produce in local stores) to healthy meal planning and preparation
Objective 3	Identify and create opportunities for safe, enjoyable, low-impact physical activities for community members of Detroit’s East Side
Objective 4	Strengthen and expand social support for practices that help to delay the onset of diabetes or reduce the risk of complications in a high-risk population in Detroit’s East Side

steering committee. Together, they developed a HEED training protocol and recruited and trained community residents. Community residents who joined the project brought many skills to their new roles, including experience as community organizers, personal trainers, youth leaders, and caregivers. The HEED training built on these proficiencies, providing detailed information about diabetes and the role of diet and physical activity in primary prevention as well as disease management. Training included specific skill-building activities such as nutrition label reading, recipe modification, and strategies for working within communities to address diabetes (e.g., community forums, improving access to health-promoting resources). The intent was to increase community awareness about diabetes and prevention and to link prevention of diabetes to the social contexts that shape, for example, food choices and physical activity.

Over a 2-year period, 18 community residents completed the 2 eight-week HEED

tion. Figure 1 illustrates the initial focus of the HEED project on proximate (e.g., knowledge, diet) and intermediate (e.g., access to fresh produce) factors. Fundamental determinants of health, such as racism and economic inequalities, although understood as part of the context, were not the direct focus of the HEED project.

Members of the ESVHWP who developed the HEED project, once it was funded, worked together to hire a community member as a half-time project coordinator. New community groups and individuals with expertise in diabetes (i.e., Southeast Michigan Diabetes Outreach Network nutritionists) joined the core group as the HEED project



Note. Bold text highlights points of intervention for the Healthy Eating and Exercising to Reduce Diabetes project.

**FIGURE 1—Social determinants of racial disparities in diabetes risk in Detroit.**

project training sessions. After completion of the training, with support from the HEED project coordinator and members of the steering committee, HEED advocates developed activities to promote healthy diets and physical activity. Activities included a weekly walking club for senior citizens and community events focused on diabetes awareness and prevention for youth, older adults, residents of a local shelter, and the community at large. The project coordinator worked with HEED advocates and the Southeast Michigan Diabetes Outreach Network (part of Michigan's diabetes control program) to host a series of healthy cooking demonstrations tailored to ensure cultural appropriateness and provide concrete skills in healthy food preparation.

HEED advocates and other community residents identified lack of access to grocery stores and fresh produce as important barriers to healthy dietary choices. Members of the HEED project established a monthly fruit and vegetable minimarket at a community site to increase access to fresh fruits and vegetables in an area with few retail outlets carrying high-quality produce. The Butzel Family Center, an East Side community center whose director was a member of the steering committee, provided space for the first HEED minimarket. Minimarkets were held monthly at this site for more than a year, and demand for expansion to other areas of the city grew.

## RESULTS

The HEED evaluation measured change among HEED project training participants and documented the development and implementation of the fruit and vegetable minimarkets and healthy cooking demonstrations. Both process and outcome evaluations were conducted and included pre- and posttraining assessments of knowledge related to diabetes prevention (e.g., how to read nutrition labels, individual and community risk factors), participant observation of training discussions, and documentation of project activities. The project evaluator discussed preliminary evaluation results from the first training with the steering committee and project coordinator. On the basis of feedback from the evaluation

of the first training series, some objectives, training sessions, and “taking-it-to-the-streets” exercises (exercises to be completed by trainees between sessions) were adjusted for the second training series, as were the pre- and posttraining examinations themselves, to more closely reflect specific objectives.<sup>44</sup> The evaluator attempted to track participation and sales volume at HEED minimarkets, with the dual goal of documenting the demand for fresh produce and allowing the project coordinator to tailor the quantity and types of products for future markets. In part because of limited funding, this aspect of the evaluation was not fully implemented. The evaluation documented a strong interest among participants in healthy cooking demonstrations in recipes and healthful cooking techniques for familiar foods. The HEED project subsequently joined forces with another community initiative to obtain funding to expand the minimarkets and food demonstrations (described in the Weathering the Funding Climate section): this effort is now in progress and includes resources for a more extensive evaluation.

## DISCUSSION

We learned several lessons in the process of applying a social determinants model to the HEED project. We discuss their implications for community partnerships with an eye toward addressing underlying social determinants of priority health concerns.

### Starting Where People Are

Initiated by residents of Detroit's east side who identified diabetes as a priority concern, the HEED project reinforces the importance of a fundamental principle of community organization: starting where the people are.<sup>45</sup> Detroit residents confront diabetes as an immediate and pressing health concern within the context of limited access to medical resources (e.g., primary and preventive care, health insurance). Residents' desire for assistance with clinical and personal disease management reflects their limited access to needed health care in communities disproportionately affected by diabetes. Many community members sought out HEED training to increase their knowl-

edge about and capacity to manage their own diabetes or that of family members and to reduce the disproportionate rates of disability and death in their communities that result from diabetes. Trainees' impromptu testimonials highlighted the importance of this forum for obtaining basic information and support. Such discussions offered opportunities to recognize these concerns and to provide support and referrals; at the same time, participants made connections between social contexts and health.

As participants increased their knowledge about the connections among physical activity, diet, and diabetes, they also described the dearth of stores offering high-quality produce in their neighborhoods and the limited availability of space for physical activity. A training exercise in which HEED advocates were asked to conduct nutritional audits of local grocery stores quickly became focused on food quality and safety, as participants noted the poor quality of and expired fresh dates on food in local stores. One participant, who did not drive or own a car and faced an absence of quality foods in neighborhood retail outlets, described waiting until her niece was able to drive her to a suburban supermarket to purchase fresh produce.

Thus, community members' desire for information (the “proximate factors” column in Figure 1) led to dialogues in which participants drew connections among social and physical environmental contexts, food preparation practices, and dietary intake, articulating the contributions of “intermediate factors” to increased vulnerability to diabetes. These dialogues helped to build a “shared” analysis (common to members of the partnership) of social determinants of diabetes while helping us recognize that some participants may prioritize (along with work and family obligations) medical management of their own diabetes. Thus, even as the HEED project's main focus remained on community-level prevention, it recognized the importance of access to competent and thorough medical care and improved management of diabetes. Health service providers who were members of the steering committee helped to provide links to health care and other resources for community members seeking to manage medical concerns.



### Relationships Between Dialogue, Research, and Intervention

An iterative process of dialogue, research, and intervention both was informed by and helped to inform participants' understanding of social determinants of diabetes. Discussions that occurred during the HEED planning and training contributed to subsequent research conducted by the ESVHWP. A series of items included in a community survey conducted by ESVHWP in 2001 collected information about respondents' intake of fruits and vegetables; the specific location of the store in which they shopped for food; and the quality, selection, and price of fresh produce at those stores. Results provided systematic documentation of the locations and types of store at which residents shopped and allowed analysis of the relationship between store type and location and fruit and vegetable consumption.<sup>10</sup> Subsequent research assessed the spatial distribution of supermarkets in metropolitan Detroit; the prevalence (per area) and locations of several types of food stores in 4 socioeconomically and racially disparate Detroit area communities; and the availability, selection, quality, and cost of fruits and vegetables at retail food outlets in these communities.<sup>39,46</sup> These efforts illustrate the important role of community residents in shaping the research conducted by ESVHWP and the role of the research in supporting intervention efforts.

### Weathering the Funding Climate

Community initiatives to address health concerns must act within particular funding environments. Funding priorities shape the types of initiatives that unfold and influence their chances of success. Funding that targets the provision of education, information, screening, or services for specific diseases is grounded in models of health promotion that focus on changing individual behaviors without addressing the more fundamental social determinants of health.<sup>47–49</sup> Although an important aspect of reducing racial disparities in health and a critical component shaping excess risk in racially segregated and economically marginalized communities,<sup>50</sup> health services alone (without other actions taken to intervene in the social conditions that create disparities in diabetes risk) are insufficient to address the multiple factors that contribute to racial disparities in di-

abetes.<sup>51</sup> Furthermore, efforts to change individual behaviors without also changing the social and physical contexts that influence those behaviors are unlikely to be successful.<sup>7,52–55</sup>

The HEED project was established with a small grant that supported a half-time staff member for 1 year. Additional support for the development and implementation of the HEED project was provided through in-kind contributions of time, expertise, and resources from a wide network of partner organizations and from the “village health workers” (community residents involved in the East Side Village Health Worker Partnership as lay health advisors) themselves. This support allowed the HEED project to continue its efforts to improve community access to fruits and vegetables during a 2-year gap in external funding. The Detroit Department of Health and Wellness Promotion provided transitional salary and supervisory support for the project coordinator, while program support (e.g., materials, space, training, evaluation expertise) was provided by members of the ESVHWP, the HEED project steering committee, and other individuals and organizations. Funding acquired in 2002 supported expanded efforts to increase access to produce in Detroit communities as part of a larger Centers for Disease Control and Prevention–funded initiative, Promoting Healthy Eating in Detroit.<sup>56</sup> Funding to support such sustained attention is necessary to bring about changes in the local environments to promote health. Support for transformations of the fundamental social inequalities that create those environments is yet another step in this process. Elimination of racial disparities in health will require funders as well as practitioners to identify connections between the factors that contribute to diabetes and other health concerns that disproportionately affect African Americans and to establish clear priorities for interventions that address intermediate and fundamental as well as proximate factors.

### Attention to Process and Capacity Building

The CBPR approach used to develop and implement the HEED project brought together representatives from a wide range of organizations and groups within Detroit, each with specific resources. The HEED project

emerged within the context of an ongoing partnership with a history of collaboration. As they worked together to implement and sustain the HEED project, these organizations were joined by others who extended ESVHWP's capacity by contributing time, expertise, and other resources. These relationships have been sustained over several years, allowing continued exchange of resources and information as well as development of a shared analysis of health that extends beyond biomedical explanations to include social determinants of health. The shared understanding of social determinants of diabetes and the realities faced by those seeking to manage this complex disease provide the current foundation for continued collective efforts to address health disparities on Detroit's East Side.

### Conclusions

Residents of communities with excess burdens of chronic disease face pressing demands for basic resources, including information, fresh produce, safe environments, and access to quality health services. Within the United States, deeply embedded cultural frameworks emphasize individual or biomedical models of health and disease, shaping both our understanding of causality and the solutions we propose to address health disparities.<sup>57</sup> Making connections between social factors (e.g., racial and economic segregation) and diseases such as diabetes requires dialogue and discussion that is respectful of diverse perspectives and priorities. Community residents struggling to gain access to needed services to manage diabetes or other chronic illnesses may focus their energies on obtaining these services. However, despite this focus, they may also support efforts to change aspects of the social context that limit access to fresh produce or remove fundamental racial or socioeconomic inequalities. Such changes require time and sustained collective effort, and their implications for health are likely to unfold over a period of years or decades. It is essential that efforts to reduce health disparities by changing social determinants of health also target inequalities in access to care to address the very pressing and complex health concerns of disadvantaged populations.

Ecological frameworks that create explicit links between immediate individual health

concerns and community or broader social dynamics, and that do not pit one against the other (e.g., health care services against broader changes to address fundamental inequalities), may facilitate sustained engagement of diverse partners in community efforts to address social determinants of health. If we are to succeed in extending efforts such as the HEED project to their logical ends—that is, to reduce or remove underlying social inequalities that create health inequalities—it is imperative that community members, health care providers, and academic researchers perceive such efforts as addressing both current health needs and fundamental social inequalities with the goal of producing more equitable health outcomes. Programs that offer access to information and health care resources need not be understood in opposition to efforts for broader change. Recognizing that unequal access to medical care is one of many socially structured inequalities and includes unequal access to the resources necessary to maintain healthy diets or environments conducive to physical activities, allows partnerships both to address short-term needs and to build capacity to address more fundamental changes necessary to eliminate racial disparities in health.

Social determinants of health models highlight the importance of addressing social factors across multiple levels. Intervention efforts such as the HEED project, initially focused on improved access to information, healthier diets, and increased physical activity, offer a model for beginning with health concerns of local residents and moving to encompass an analysis of broader social determinants of health and disease. Community residents are essential to this process, as are community organizations and professional networks that can provide coherence and continuity in efforts for sustained community change even as individual members' engagement varies with changing life circumstances, including their own health. Working in partnership facilitates development of an analysis of causality that encompasses multiple perspectives and realities and may provide a foundation for broader social movements to address fundamental factors that produce racial disparities in health. ■

### About the Authors

Amy J. Schulz and Srimathi Kannan are with the University of Michigan School of Public Health. Shannon Zenk is with the University of Illinois at Chicago. Angela Odoms-Young is with Northern Illinois University. Teretha Hollis-Neely, Murtisa Lockett, and William Ridella are with the Detroit Department of Health and Wellness Promotion. Robin Nwankwo is with the University of Michigan Medical Center.

Requests for reprints should be sent to Amy Schulz, PhD, Health Behavior and Health Education, University of Michigan School of Public Health, 1420 Washington Heights, Ann Arbor, MI 48109 (e-mail: ajschulz@umich.edu).

This article was accepted October 8, 2004.

### Contributors

A.J. Schulz originated the study, supervised its implementation, and led the writing. S. Zenk and A. Odoms-Young conceptualized and implemented the evaluation of the project, helped to develop ideas, and reviewed drafts of the article. R. Nwankwo, T. Hollis-Neely, and M. Lockett assisted with developing and implementing the project and helped to develop ideas, interpret findings, and review drafts of the article. W. Ridella and S. Kannan contributed to the project and reviewed drafts of the article.

### Acknowledgments

The work reported here was initiated and undertaken with the support of the East Side Village Health Worker Partnership (ESVHWP), a project of the Detroit Community–Academic Urban Research Center. ESVHWP consists of representatives from community-based organizations (Butzel Family Center, Friends of Parkside, Kettering/Butzel Health Initiative, and Warren/Conner Development Coalition [the Butzel Family Center and the Kettering Butzel Health Initiative were partners in the ESVHWP until 2002, when their participation ended because of changes in leadership and the end of funding, respectively]), health service organizations (Detroit Department of Health and Wellness Promotion, East Side Parish Nurse Network, and Henry Ford Health System), academic institutions (University of Michigan School of Public Health), and community residents serving as village health workers. Partial support for this effort was provided by the Centers for Disease Control and Prevention and the Michigan Women's Foundation.

We thank Sue Andersen for assistance with the preparation of this article.

### Human Participant Protection

This study was approved by the University of Michigan institutional review board on January 12, 2003.

### References

1. Burt VL, Whelton P, Roccella EJ, et al. Prevalence of hypertension in the US adult population: results from the Third National Health and Nutrition Examination Survey. *Epidemiology*. 1995;25:305–313.
2. Harris MI, Flegal KM, Cowie CC, et al. Prevalence of diabetes, impaired fasting glucose and impaired glucose tolerance in US adults. *Diabetes Care*. 1998;21:518–524.
3. Tull ES, Roseman JM. Diabetes in African Americans. In: National Diabetes Data Group, ed. *Diabetes in*

America. 2nd ed. Bethesda, Md: National Institutes of Health; 1995:613–630.

4. Detroit Facts. Michigan Department of Community Health. Available at: <http://www.michigan.gov/documents/detroitfacts.pdf>. Accessed June 2, 2004.
5. Hedley AA, Ogden CL, Johnson CL, Carroll MD, Curtin LR, Flegal KM. Prevalence of overweight and obesity among US children, adolescents, and adults, 1999–2002. *JAMA*. 2004;291:2847–2850.
6. Crespo CJ, Ketejian SJ, Heath GW, Sempes CT. Leisure-time physical activity among US adults: results from the Third National Health and Nutrition Examination Survey. *Arch Intern Med*. 1996;156:93–98.
7. James SA. Primordial prevention of cardiovascular disease among African Americans: a social epidemiological perspective. *Prev Med*. 1999;29:S84–S89.
8. Kuczmarski RJ, Flegal KM, Campbell SM, Johnson CL. Increasing prevalence of overweight among US adults: the National Health and Nutrition Examination Surveys, 1960 to 1991. *JAMA*. 1994;272:205–211.
9. Schulz AJ, Gravelee CC, Williams DR, Israel BA, Rowe Z. Discrimination, symptoms of depression, and self-rated general health among African American women in Detroit: results from a longitudinal study from the East Side Village Health Worker Partnership. Paper presented at: 9th International Conference on Social Stress Research, May 31, 2004; Montreal, Quebec.
10. Zenk S, Hollis-Neely T, Nwankwo R, et al. Physical and social environment and fruit and vegetable consumption among women living on the east side of Detroit: a formative evaluation of the Healthy Eating and Exercise to Reduce Diabetes (HEED) project. Paper presented at: 131st Annual Meeting of the American Public Health Association, November 11, 2002; Philadelphia, Pa.
11. Centers for Disease Control and Prevention. *Behavioral Risk Factor Surveillance System Online Prevention Data, 1995–2003*. Available at: <http://www.cdc.gov/brfss>. Accessed December 27, 2004.
12. Sacker A, Bartley MJ, Frith D, Fitzpatrick RM, Marmot MG. The relationship between job strain and coronary heart disease: evidence from an English sample of the working male population. *Psychol Med*. 2001;31:279–290.
13. Wing S, Dargent-Molina P, Casper M, Riggan W, Hayes CG, Tyroler HA. Changing association between community occupational structure and ischemic heart disease mortality in the United States. *Lancet*. 1987;2(8567):1067–1070.
14. Wing S, Barnett E, Casper M, Tyroler HA. Geographic and socioeconomic variation in the onset of coronary disease mortality in white women. *Am J Public Health*. 1992;82:204–209.
15. Marmot MG, Wilkinson RG, eds. *Social Determinants of Health*. New York, NY: Oxford University Press; 1999.
16. Schulz AJ, Krieger JW, Galea S. Addressing social determinants of health: community-based participatory approaches to research and practice. *Health Educ Behav*. 2002;29:287–295.
17. Baum A, Garofalo JP, Yali AM. Socioeconomic status and chronic stress: does stress account for SES effects on health? *Ann N Y Acad Sci*. 1999;896:1131–1144.

18. Evans RG, Stoddard GL. Producing health, consuming health care. *Soc Sci Med*. 1990;31:1347–1363.
19. House JS, Williams DR. Understanding and reducing socioeconomic and racial/ethnic disparities in health. In: Smedley BD, Syme SL, eds. *Promoting Health: Intervention Strategies From Social and Behavioral Research*. Washington, DC: National Academy Press; 2000:81–124.
20. Kaplan G. What is the role of the social environment in understanding inequalities in health? *Ann N Y Acad Sci*. 1999;896:116–119.
21. Navarro V, Shi L. The political context of social inequalities and health. *Soc Sci Med*. 2001;52:481–491.
22. Cheadle A, Psaty BM, Curry S, et al. Community-level comparisons between the grocery store environment and individual dietary practices. *Prev Med*. 1991;20:250–261.
23. Swinburn G, Egger G, Raza F. Dissecting obesogenic environments: the development and application of a framework for identifying and prioritizing environmental interventions for obesity. *Prev Med*. 1999;29:563–570.
24. Travers KD. The social organization of nutritional inequities. *Soc Sci Med*. 1996;43:543–553.
25. Brownell KD, Horgen KB. *Food Fight: The Inside Story of the Food Industry, America's Obesity Crisis, and What We Can Do About It*. Chicago, Ill: Contemporary Books; 2003.
26. Nestle M. *Food Politics: How the Food Industry Influences Nutrition and Health*. Berkeley, Calif: University of California Press; 2002.
27. Rose G, Marmot MG. Social class and coronary heart disease. *Br Heart J*. 1981;45:13–19.
28. Marmot MG. Socio-economic factors in cardiovascular disease. *J Hypertens Suppl*. 1996;14:S201–S205.
29. Link BG, Phelan J. Social conditions as fundamental causes of disease. *J Health Soc Behav*. 1995;36:80–94.
30. Williams DR, Collins C. Racial residential segregation: a fundamental cause of racial disparities in health. *Public Health Rep*. 2001;116:404–416.
31. Zhang Q, Wang Y. Socioeconomic inequality of obesity in the United States: do gender, age, and ethnicity matter? *Soc Sci Med*. 2004;58:1171–1180.
32. Schulz AJ, Williams DR, Israel BA, Lempert LB. Racial and spatial relations as fundamental determinants of health in Detroit. *Milbank Q*. 2002;80:677–707.
33. Schulz AJ, Northridge ME. Social determinants of health and environmental health promotion. *Health Educ Behav*. 2004;31:455–471.
34. Brownson RC, Baker EA, Housemann RA, Brennan LK, Bacak SJ. Environmental and policy determinants of physical activity in the United States. *Am J Public Health*. 2001;91:1995–2003.
35. Dunn JR, Hayes MV. Social inequality, population health and housing: a study of two Vancouver neighborhoods. *Soc Sci Med*. 2000;51:563–587.
36. Ellen IG, Turner MA. Does neighborhood matter? Assessing recent evidence. *Housing Policy Debate*. 1997;8:833–866.
37. Geronimus AT, Bound J, Waidmann TA, Colen CG, Steffick D. Inequality in life expectancy, functional status, and active life expectancy across selection black and white populations in the United States. *Demography*. 2001;38:227–251.
38. Kumanyika S. Racial and ethnic issues in diet and cancer epidemiology. In: Jacobs MM, ed. *Diet and Cancer: Markers, Prevention and Treatment*. New York, NY: Plenum Press; 1994:59–70.
39. Zenk SN, Schulz A, Israel BA, James SA, Wilson ML. Spatial distribution of food stores shapes the availability, quality, and cost of fresh produce in four Detroit area communities. Paper presented at: 132nd Annual Meeting of the American Public Health Association, November 8, 2003; San Francisco, Calif.
40. Furst T, Connors M, Bisogni CA, Sobal J, Falk LW. Food choice: a conceptual model of the process. *Appetite*. 1996;26:247–266.
41. Schultz KE, Yeh MC, Katz DL. Using intercept interview techniques to assess determinants and barriers related to fruit and vegetable consumption in multi-ethnic populations. Paper presented at: 131st Annual Meeting of the American Public Health Association, November 15–19, 2003, San Francisco, Calif.
42. Morland K, Wing S, Diez-Roux A. The contextual effect of the local food environment on residents' diets: the atherosclerosis risk in communities study. *Am J Public Health*. 2002;92:1761–1767.
43. Eng E, Young R. Lay health advisors as community change agents. *Fam Community Health*. 1992;15:24–40.
44. Odoms A, Robinson M, Allen A, Rodgers M, Schulz AJ, Kannan S. Working with East Side village health workers to reduce the risk of diabetes: evaluation of the Healthy Eating and Exercising to Reduce Diabetes Project (HEED). Paper presented at the 129th Annual Meeting of the American Public Health Association, November 12–16, 2000; Boston, Mass.
45. Minkler M, Wallerstein N, eds. *Community-Based Participatory Research for Health*. San Francisco, Calif: Jossey-Bass; 2003.
46. Zenk SN, Schulz AJ, Israel BA, James SA, Bao S, Wilson ML. Neighborhood racial composition, neighborhood poverty, and supermarket accessibility in metropolitan Detroit. *Am J Public Health*. 2005;95:660–667.
47. Duncan C, Jones K, Moon G. Health-related behavior in context: a multilevel modeling approach. *Soc Sci Med*. 1996;42:817–830.
48. McLeroy KR, Steckler AB, Simons-Morton B, Goodman RM, Gottlieb N, Burdine JN. Social science theory in health education: time for a new model? *Health Educ Res*. 1993;8:305–312.
49. Syme SL. Social determinants of health: the community as an empowered partner. Preventing Chronic Disease [serial online] 2004 January [date cited]. Available at: [http://www.cdc.gov/pcd/issues/2004/jan/03\\_0001.htm](http://www.cdc.gov/pcd/issues/2004/jan/03_0001.htm). Accessed February 8, 2005.
50. Smedley BD, Smith AY, Nelson AR, eds. *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Washington, DC: National Academy Press; 2004.
51. Blocker DE, Freudenberg N. Developing comprehensive approaches to prevention and control of obesity among low-income, urban, African American women. *J Am Med Womens Assoc*. 2001;56:59–64.
52. Emmons KM. Health behaviors in a social context. In: Berkman LF, Kawachi I, eds. *Social Epidemiology*. New York, NY: Oxford University Press; 2000:242–266.
53. Institute of Medicine. *Health and Behavior: The Interplay of Biological, Behavioral, and Societal Influences*. Washington, DC: National Academy Press; 2001.
54. Stokols D. Establishing and maintaining healthy environments: toward a social ecology of health promotion. *Am Psychol*. 1992;47:6–22.
55. Stokols D. Translating social ecological theory into guidelines for community health promotion. *Am J Health Promot*. 1996;10:282–298.
56. Kieffer EC, Schulz AJ, Hollis-Neely T, Trice R, Guzman G, Waechter J. Promoting healthy eating in Detroit: a community strategy to address social determinants of health. Paper presented at the 131st Annual Meeting of the American Public Health Association, November 15–19, 2003; San Francisco, Calif.
57. Hummer RA. Black-white differences in health and mortality: a review and conceptual model. *Sociol Q*. 1996;37:105–125.