Creating a Transdisciplinary Research Center to Reduce Cardiovascular Health Disparities in Baltimore, Maryland: Lessons Learned


Cardiovascular disease (CVD) disparities continue to have a negative impact on African Americans in the United States, largely because of uncontrolled hypertension. Despite the availability of evidence-based interventions, their use has not been translated into clinical and public health practice. The Johns Hopkins Center to Eliminate Cardiovascular Health Disparities is a new transdisciplinary research program with a stated goal to lower the impact of CVD disparities on vulnerable populations in Baltimore, Maryland. By targeting multiple levels of influence on the core problem of disparities in Baltimore, the center leverages academic, community, and national partnerships and a novel structure to support 3 research studies and to train the next generation of CVD researchers. We also share the early lessons learned in the center’s design. (Am J Public Health. 2013;103:e26–e38. doi:10.2105/AJPH.2013.301297)

Racial disparities in hypertension prevalence, control rates with care, and related cardiovascular complications and mortality, are persistent and extensively documented in the United States. Cardiovascular disease (CVD) accounts for 35% of the excess overall mortality in African Americans, in large part because of hypertension. Nationwide, eliminating racial disparities in hypertension control would result in more than 5000 fewer deaths from coronary heart disease and more than 2000 fewer deaths from stroke annually in African Americans. Despite numerous studies establishing the efficacy of pharmacologic and lifestyle therapies in African Americans and Whites, blood pressure control rates remain suboptimal, even among persons receiving regular health care. Barriers to hypertension control exist at multiple levels, including individual patients, health care professionals, the health care system, and patients’ social and environmental context. Although successful interventions exist, these strategies have not been translated into clinical and public health practice.

In Baltimore, Maryland, like in the rest of the United States, CVD, including coronary heart disease and stroke, is the leading cause of death. Approximately 2000 people die from CVD in Baltimore each year; these deaths disproportionately affect African Americans, making health disparities from CVD a key factor in the racial discrepancy in life expectancy in the city. Cardiovascular disease is a key reason for the 20-year difference in life expectancy between those who live in more affluent neighborhoods (83 years) and those who reside in poorer neighborhoods (63 years) of Baltimore. Table 1 highlights the disparities between African Americans and Whites at local, state, and national levels. The focus on CVD disparities in Baltimore is not new; many initiatives have been implemented with varying results. The limited impact of these initiatives may be attributed, in part, to inadequate coordination between outreach and traditional health care programs and insufficient attention to the roles of prevention, social determinants, and public policy in perpetuating inequities in health. There is an urgent need to comprehensively integrate the best evidence-based, sustainable, multilevel strategies to overcome hypertension disparities. The Johns Hopkins Center to Eliminate Cardiovascular Health Disparities

In 2010, we created a transdisciplinary research center to reduce CVD morbidity and mortality and improve quality of life and experiences of health care for African Americans and others affected by disparities in Baltimore. Our center uses comparative effectiveness, implementation, and dissemination methods to address specific research questions. We are also using principles of community-based participatory research to build strong ties among researchers, health care provider networks, community members, and policymakers. The center includes 3 related intervention studies to improve the identification, management, and outcomes of African Americans with hypertension; 3 integrated and complementary cores (administrative, shared resources, and training), a Data and Safety Monitoring Board, and a Community and Provider Advisory Board (CPAB). Together, faculty researchers and their trainees are working closely with community partners to achieve the following specific aims:

• We seek to test comprehensive, multilevel interventions that will speed the translation of evidence-based approaches to hypertension management into clinical and public health practice in Baltimore and create a model for subsequent CVD interventions. Our studies test individual, family, and system-level interventions aimed at lowering blood pressure and reducing racial disparities in blood pressure control.

• We aim to train scholars who conduct observational and interventional research to better understand causes of CVD disparities.
and to identify sustainable interventions to prevent and overcome CVD disparities. We provide research training, pilot funds, mentorship, consultation, and technical support to researchers at various stages of training.

- We strive to facilitate the translation and dissemination of evidence generated from the center’s research into clinical and public health practice and policy.

**Conceptual Framework**

In developing the center, we recognized the need for a framework acknowledging the impact of the many influences on our target population’s health. We included in our framework the multilevel factors described in the model by Warnecke et al. for analysis of population health and health disparities. This model is made up of 3 levels—the fundamental causes of health disparities at a population level such as social conditions and policies that affect them, the intermediate social and physical effects and relationships in which these causes are experienced in a social context at an individual level, and the individual determinants of socioeconomic status, race/ethnicity, gender, level of acculturation, and biological factors—and how they interact to determine the disparate health outcomes that individuals experience.

In addition, we sought to specify the hypothesized influences on hypertension disparities in our urban, predominantly African American population and to develop a more nuanced operational model to guide our interventional research. Therefore, we modified an ecological model for self-management of diabetes mellitus described by Fisher et al. to guide the research (Figure 1). In ecological models, 4 core principles are proposed:

1. There are multiple influences on specific health behaviors, including factors at the individual (biological and psychological), interpersonal (family, friends, and other small groups), organizational, community or physical environment, and public policy levels; (2) influences on behavior interact across these different levels; (3) ecological models should be behavior-specific, identifying the most relevant potential influences at each level; and (4) multilevel interventions should be most effective in changing behavior.

Our model addresses domains relevant to identification of hypertension, improvement of health behaviors, engagement in shared decision-making regarding treatment, delivery of guideline-concordant care, and outcomes in our targeted population. We incorporated factors identified as important mediators at each level of influence from our faculty’s previous descriptive, mechanistic, and intervention studies. Ecological models can incorporate and integrate different constructs and theories from biological, psychological, social, and organizational levels of influence; however, they are distinguished from other behavioral models and theories that emphasize individual characteristics, skills, and proximal influences such as family and friends, but do not explicitly include broader organizational, community, or policy influences on health. Each study in the center integrates its own biological, psychosocial, or organizational theories into our overall model to provide specific hypotheses for given levels. The overall center operates at community and policy levels by engaging providers and payers, community organization leaders and residents, and policymakers on our CPAB in all aspects of the research.

**Organizational Structure of the Center**

To enable testing of innovative and sustainable interventions to eliminate CVD disparities at these multiple levels of influence, the center investigators, trainees, and community partners use the structure and support from 3 cores. The center’s design facilitates the interaction of investigators across the teams and trainees with expert administrators, community outreach workers, clinicians, research methodologists, and mentors in the administrative, shared resources, and training cores. In this way, investigators in the 3 studies have access to the spectrum of available resources that form the basis for research in this transdisciplinary field. Table 2 details the rationale for the inclusion of each of the center’s components, and Figure A (available as a supplement to the online version of this article at http://www.ajph.org) displays the organizational structure.

**Administrative core.** The administrative core is led by principal investigators of the center’s studies and directors of the shared resources and training cores, who have expertise in clinical medicine, nursing, epidemiology, biostatistics, behavioral science, and health services research. The administrative core also includes an administrator and a research and academic program coordinator. This core is responsible for the overall administration of the center, including guiding and coordinating shared resources and training activities and managing the center’s studies.

**Shared resources core.** The shared resources core provides infrastructure for the other cores and center projects. Having an array of integrated resources in the core rather than within each project optimizes continuity and oversight. The resources are organized in 5 subcores: study design and data analysis, recruitment and retention, informatics, interventions, and translation and dissemination.

**Training and career development core.** This core supplements the training of predoctoral students and postdoctoral fellows who are enrolled in advanced degree programs or supported by established institutional training programs in the schools of medicine, public health, or nursing. The core also provides support to faculty who desire further training in health disparities. In response to inquiries from interested students, we added a summer internship program for undergraduates with

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**TABLE 1—Disparities Between African Americans and Whites at Local, State, and National Levels: A Comparison of Baltimore With Maryland and the United States, 2012**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baltimore</th>
<th>Maryland</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American adults with hypertension, %</td>
<td>41.3&lt;sup&gt;21&lt;/sup&gt;</td>
<td>39.2&lt;sup&gt;22&lt;/sup&gt;</td>
<td>38.6&lt;sup&gt;23&lt;/sup&gt;</td>
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<tr>
<td>White adults with hypertension, %</td>
<td>28.6&lt;sup&gt;21&lt;/sup&gt;</td>
<td>25.1&lt;sup&gt;22&lt;/sup&gt;</td>
<td>32.3&lt;sup&gt;23&lt;/sup&gt;</td>
</tr>
<tr>
<td>Life expectancy, African Americans&lt;sup&gt;a&lt;/sup&gt;</td>
<td>71.5&lt;sup&gt;24&lt;/sup&gt;</td>
<td>75.5&lt;sup&gt;24&lt;/sup&gt;</td>
<td>74.5&lt;sup&gt;25&lt;/sup&gt;</td>
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<tr>
<td>Life expectancy, Whites&lt;sup&gt;a&lt;/sup&gt;</td>
<td>76.5&lt;sup&gt;24&lt;/sup&gt;</td>
<td>79.7&lt;sup&gt;24&lt;/sup&gt;</td>
<td>78.8&lt;sup&gt;25&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

<sup>a</sup>In years, at birth in 2009.
interests in public health and disparities research careers. We have also accepted graduate students from other disciplines and nearby institutions who wish to do electives, internships, and externships. In addition, we focus on attracting persons from underrepresented groups in science, including women and minorities.

Research Studies

The 3 multilevel intervention studies complement one another with their overlap in targeted lifestyle changes, self-management behaviors, patient–provider shared decision-making, attention to community-level factors (social support, food availability, and primary care access), and their reliance on the community–academic partnership to inform all aspects of the research. Each study addresses at least 2 levels of our ecological model for hypertension self-management.

Reducing Disparities and Controlling Hypertension in Primary Care (Project ReDCHiP). Quality improvement interventions work to remove impediments to care at the system level. In hypertension care disparities, these barriers include inaccuracies in blood pressure measurement, clinical inertia, patient–provider communication challenges, and poor patient adherence.18,31,41,50–59 The objective of Reducing Disparities and Controlling Hypertension in Primary Care (Project ReDCHiP) is to study, in a pragmatic clinical trial, the implementation of a comprehensive, multimethod quality improvement intervention designed to overcome these barriers, improve hypertension detection and treatment, and reduce hypertension health disparities. Six practices within the Johns Hopkins Community Physicians (JHCP) network are participating in the study. These practices are all within the Baltimore metropolitan region but vary greatly in demographic characteristics of patients, which allows the examination of characteristics associated with blood pressure control and racial disparity at clinic (microsystem) and health system (macrosystem) levels.

The staged quality improvement intervention includes 3 arms. The first features improved blood pressure measurement training for providers and frontline staff along with the installation of new automated sphygmomanometers. The second provides audit and feedback in the form of an easy-to-read,
<table>
<thead>
<tr>
<th>Center Component</th>
<th>Rationale for Component</th>
<th>Activities</th>
<th>Expected Outcomes</th>
</tr>
</thead>
</table>
| Administrative core   | To provide centralized administration for center, responsible for grant administration as well as to guide and coordinate the shared resources and training activities and manage the 3 research studies | Manage the operational aspects of the center  
Provide administrative and budgetary support to the research projects and coordinate their use of resources to maximize scientific productivity  
Promote transdisciplinary collaboration via a monthly seminar series that brings investigators and trainees together to discuss ongoing and new research pertinent to the field  
Plan and coordinate all center meetings and activities  
Assist the training core in identifying appropriate candidates for the training programs, provide appropriate administrative support to trainees, and coordinate monthly disparities curriculum sessions and journal clubs  
Assist the shared resources core in contractual and IRB and HIPAA issues to obtain data from patients’ electronic medical records | Strong link between the center and constituent groups in the scientific and Baltimore community  
Removal of administrative burden for principal investigators of center’s research projects |
| Shared resources core  | To provide infrastructure for the administrative and training cores, as well as the center projects | Offer advice and consultation on study design and data analysis and on successful patient recruitment and retention methods for the 3 center projects and the trainee projects  
Create informatics infrastructure for the center to facilitate research coordination, data capture, and management tools to standardize data acquisition and analysis, and implement disease registry to support intervention components of each project  
Provide assistance in the development and delivery of interventions for blood pressure control  
Support the translation and dissemination of the center’s research findings | Optimized use of resources because projects have similar needs (e.g., recruiting similar patients, collecting data on similar outcomes)  
Greater continuity and oversight, including data requests, data security measures, standardization of definitions, recruitment burden, and dissemination of results |
<p>| Training core          | To enhance the research training in the area of CVD health disparities of individuals in degree programs from the Johns Hopkins schools of medicine, nursing and public health | Offer a cardiovascular disparities research methods curriculum that expands on existing institutional training programs | Development of the next generation of CVD health disparities researchers |</p>
<table>
<thead>
<tr>
<th>Data and Safety Monitoring Board</th>
<th>To assess the progress of the studies and ensure the safety of research participants</th>
<th>Development and dissemination of CVD disparities research methods curriculum for use by outside institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community and Healthcare Provider Advisory Board</td>
<td>To help guide the center's research projects through all of its phases from planning, intervention, implementation, evaluation, to dissemination, providing the scientific and Baltimore communities' input</td>
<td>Informed, supportive community</td>
</tr>
<tr>
<td>Project ReDCHiP</td>
<td>To study the effects from change on the organizational and individual levels and examine the influence of community-level variables on blood pressure</td>
<td>Interventions that address multilevel determinants of disparities</td>
</tr>
</tbody>
</table>

Provide mentoring teams of senior faculty with expertise in 5 core research areas—cardiovascular epidemiology, health services research, behavioral science, health disparities, and community-based participatory research

Supply pilot funds to support trainee-initiated projects

Provide salary support for junior faculty trainees

Review:
- Study protocols and consent forms
- Participant recruitment and retention
- Data completeness and quality
- Efficacy data
- Adverse events and safety data, such as procedures or hospitalizations for hypertension-related complications, psychological distress related to the interventions, or loss of privacy
- Determine whether procedures for notifying physicians about potentially dangerous situations (severe, uncontrolled hypertension) are being followed
- Report its findings and recommendations to the study investigators, the IRB, and NIH

Review all recruitment and intervention protocols

Review patient and provider intervention materials

Assist with the dissemination of the center's work

Provide input on direction of future research

Standardize blood pressure measurement by providing Omron automated blood pressure machines and training staff in their use

Set up a care management program where patients with uncontrolled blood pressure are seen by a team of registered dieticians and PharmDs to work on issues of medication adherence, diet and exercise, and self-monitoring

Put in place a dashboard for clinicians showing their panel of patients' blood pressure averages and percentages of patients with uncontrolled blood pressure by race/ethnicity

Introduce online communication skills training modules for physicians at the 6 clinical sites

Reducing disparities in blood pressure control over the course of 12 to 24 months
Web-based clinical dashboard along with patient-centered communication skills training for providers via a dedicated Web site. The final delivers care management for patients with uncontrolled hypertension by adding registered dietitians and pharmacists to the primary care team, taking into account preferences and barriers at both individual patient and community levels.

By using motivational interviewing and tailoring advice to address issues such as preferred food choices and preparation methods, we deliver culturally relevant education and support. Blood pressure measurement training occurs first at all clinics. We then vary the order of the other 2 interventions among sites to determine if each intervention is independently effective in each local context and if the effect is repeatable in other contextual situations within the same macrosystem. In addition, we are using stakeholder interviews and surveys to study organizational and local contextual factors associated with implementation and success in achieving blood pressure control and reducing racial disparities in blood pressure control over 12 months. We will also examine sustainability of the interventions over 24 months.

Using statistical process control charting, we will determine the stability of blood pressure control in the system before and after the introduction of each intervention, stratified by patient race, at each site. Statistical process control is used to measure how a process changes over time. A rigorous time series analysis performed with historical and new paired data generates a graphical chart, which clearly shows if there is detectable improvement, or if a high level of performance against average is visible. The results provide easy-to-understand insights that are accessible to a broad audience.60

Achieving Blood Pressure Control Together (The ACT Study).

Evidence suggests that some African Americans with hypertension experience difficulties carrying out hypertension self-management behaviors. Current approaches to improving this deficit may be limited by their focus on solely patient- or health care system factors while ignoring other important determinants of hypertension self-management, including patients' immediate and extended community environments.61-68

TABLE 2—Continued

<table>
<thead>
<tr>
<th>Study</th>
<th>Intervention</th>
<th>Primary Outcome</th>
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<tbody>
<tr>
<td>ACT Study</td>
<td>To understand the effects of change on the community, interpersonal, and individual levels on blood pressure</td>
<td>Improving hypertensive patients' blood pressure control</td>
</tr>
<tr>
<td></td>
<td>Randomized, controlled trial to test the effectiveness and long-term sustainability of a patient, family, and community-level intervention through self-management or problem-solving training for patients and family members</td>
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<tr>
<td></td>
<td>Home-based monitoring and support and follow-up from community health workers</td>
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<tr>
<td></td>
<td>Communication skills training for patients and family members</td>
<td></td>
</tr>
<tr>
<td>Five Plus Nuts and Beans Study</td>
<td>To examine the effects of intervening at the individual level while accounting for community-level variables</td>
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<tr>
<td></td>
<td>Randomized, controlled trial to compare 2 strategies for translating the results of the DASH Study into practice for African American participants who are on stable doses of antihypertensive medications by testing 2 approaches:</td>
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<td></td>
<td>Offering minimal DASH-oriented dietary advice along with a food credit at a local supermarket where participants make their own decisions of what to eat</td>
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<tr>
<td></td>
<td>Providing a 1-hour session with a nutrition expert who provides choices and places an order from a community grocery with targeted purchases of fruits, vegetables, nuts, and beans, with follow-up weekly calls with the coordinator for a $30 per week food delivery</td>
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</table>

Note. ACT = Achieving Blood Pressure Control Together; CVD = cardiovascular disease; DASH = Dietary Approaches to Stop Hypertension; HIPAA = Health Insurance Portability and Accountability Act; IRB = institutional review board; NIH = National Institutes of Health; RedDCHiP = Reducing Disparities and Controlling Hypertension in Primary Care.

The ACT Study To understand the effects of change on the community, interpersonal, and individual levels on blood pressure

The Five Plus Nuts and Beans Study To examine the effects of intervening at the individual level while accounting for community-level variables

Primary outcomes include effects on glucose, uric acid, urine potassium excretion, and self-report consumption of fruits and vegetables during the same period.
We designed the Achieving Blood Pressure Control Together study (the ACT Study), a randomized, controlled trial, to test the effectiveness and long-term sustainability of patient, family and community-level interventions for improving hypertensive patients’ blood pressure control by enhancing patient engagement in positive health behaviors and their involvement in their hypertension care. A total of 375 African American patients with uncontrolled hypertension will be enrolled in the study and randomly assigned to receive (in 3 study arms) (1) a community health worker (CHW) intervention to enhance patient blood pressure self-management, (2) the CHW intervention along with a patient and family communication skills training intervention to improve patient engagement in hypertension care, and (3) the CHW intervention combined with patient problem-solving training peer group self-management sessions. For each patient enrolled in the second arm, a companion who accompanies the patient to a doctor’s visit may be enrolled, up to 125 total additional participants. After extensive focus group discussions with patients and family members, meetings with insurers and clinic leaders, and feedback from CPAB members regarding our recruitment and intervention strategies, we are currently pilot testing the interventions. The main study outcomes of this trial are blood pressure control over 12 months, direct and indirect costs, and sustainability of the intervention after the study is completed.

Five Plus Nuts and Beans. Unhealthy diets have many social determinants; however, there is a markedly lower availability of components of the Dietary Approaches to Stop Hypertension (DASH) diet—recommended foods (such as fresh fruits and vegetables, skim milk, and whole-grain foods) in predominantly African American and lower-income neighborhoods compared with White and higher-income neighborhoods. Unhealthy dietary consumption patterns contribute, in part, to hypertension through deficiencies in potassium, magnesium, and vitamin C—all micronutrients with independent blood pressure–lowering effects. Furthermore, use of thiazide-based antihypertensive therapy often worsens deficiencies through increased urinary excretion.

The Five Plus Nuts & Beans Study is a randomized, controlled trial to compare 2 strategies for translating results of the DASH Study into practice among 120 African Americans on stable doses of antihypertensive medications. The first study arm offers minimal DASH-oriented dietary advice with a $30-per-week food credit at a local supermarket where participants make their own purchase decisions. The second arm consists of an initial 1-hour session with a nutrition expert who provides choices and helps the participant place and purchase weekly orders of targeted fruits, vegetables, nuts, and beans from a community grocery store. Following the initial contact, each participant in this arm receives a weekly nutritionist call and delivery of $30 of food per week to their neighborhood library, a convenient, safe, central location in one of Baltimore’s food deserts, for the participant to pick up. The primary outcome for this trial is change in systolic blood pressure at 8 weeks. Secondary outcomes are effects on glucose, lipids, and urine sodium and potassium excretion; self-reported consumption of fruits and vegetables during the same period; and intervention costs. After completion of the active phase of the trial, we will follow blood pressures in the electronic medical record (EMR) for 1 year to assess long-term effects.

TRAINING THE NEXT GENERATION OF RESEARCHERS

We devote considerable time and resources to training the next generation of researchers to ensure a lasting legacy for the work of our center. Our curriculum uses a transdisciplinary approach that integrates theories, concepts, and methods used by investigators in our 3 partner schools. It combines original elements with proven training tools. Along with coursework taken for degree programs, trainees attend sessions covering disparities-specific research lessons learned, research in progress, roundtables with experts, journal clubs, and community-based research and service learning. The training core also holds a monthly seminar, in collaboration with the other health disparities centers at our university, and sponsors 2 guest speakers annually. Trainees are encouraged to pursue independent research with support from faculty mentorship teams and to participate in one of the center’s current studies.

Twenty-seven trainees have been accepted to our programs since 2010. Already several alumni have gone on to prestigious fellowships, and 2 have obtained academic positions to conduct disparities research. All 3 faculty trainees have obtained federal and private funding to conduct health disparities research, and a junior faculty trainee has been promoted to associate professor.

PARTNERSHIPS AND COLLABORATIONS

Our center is 1 of the 10 National Cancer Institute; National Heart, Lung, and Blood Institute; and Office of Behavioral and Social Sciences Research Centers for Population Health and Health Disparities (CPHHD). The CPHHD supports transdisciplinary research to improve knowledge of the causes of disparities in cancer and CVD and identify effective interventions that promote equitable health outcomes. It has established working groups to encourage collaboration and integration of ideas across centers. One outcome of these efforts is the development of core measures and the protocol for collecting them. Because the centers represent diverse populations across the United States, the resultant data will allow for cross-national comparisons. Other working groups include interventions, genetics, dissemination, community outreach, and training.

Through participation in an ad-hoc workgroup on costs, we are collaborating with health economists at our institution and other CPHHD Centers to conduct a collection of cost-effectiveness analyses from the health system, patient, and societal perspectives, based on data from several of the ongoing interventions currently being studied by the CPHHD. Each year, the CPHHD gathers investigators, trainees, staff, and community members together for a conference to present current work, foster collaboration, and promote translation and dissemination. Interacting with this large transdisciplinary group and taking part in CPHHD activities entails an investment of time and resources. However, we believe these investments are paying off in a larger national conversation about the complex problem of disparities, more scientific innovation, and the engagement and synergism of a broader group.
of stakeholders to mitigate the impact of disparities.

**Academic**

The Johns Hopkins University schools of medicine, public health, and nursing have a cadre of independently funded scientists with significant experience in conducting internationally recognized cardiovascular intervention research to improve CVD outcomes of vulnerable populations including ethnic minorities. In addition, the physical proximity of the schools encourages close collaboration: the 3 schools are located within 2 blocks of each other. Furthermore, the Welch Center for Prevention, Epidemiology, and Clinical Research is an interdisciplinary, collaborative unit of Johns Hopkins University that serves as home to 30 faculty, including the leaders of our center, who integrate clinical expertise with a comprehensive knowledge of clinical research methods. Thus, our center is well-positioned to establish cross-disciplinary collaborations with leading scientists and to translate scientific discoveries into clinical and public health practice. Many of our faculty have collaborated on earlier studies; however, we have created additional linkages by fostering new collaborations with faculty from other disciplines (e.g., pharmacy, nutrition, economics, psychology) and providing junior investigators with further access to mentorship teams and resources.

The center’s consolidated resources for established and pilot studies generate collective energy for solving conceptual and methodological problems. Our monthly disparities seminar also creates a forum for investigators, providers, community members, and organizations with diverse perspectives to learn from and build on each other’s work toward our common purpose. We have overcome some structural barriers such as time and space for interactions; however, we continue to address funding and infrastructure hurdles and are making efforts to overcome cognitive barriers to collaboration, such as lack of awareness and common vocabulary, and differences in theories, frameworks, and methods.

**Johns Hopkins Community Physicians Health Care Delivery System**

One key center partnership has been with JHCP, a group of Johns Hopkins Medicine practices with multiple locations throughout the state. We selected 6 of their sites to work with us (Table 3). A 2008 study highlighted that rates of ambulatory care–sensitive inpatient hospitalizations and emergency department use in Baltimore City were substantially higher than those in other Maryland counties, in Maryland as a whole, and in the District of Columbia. Of particular relevance to our center, the study showed that neighborhoods surrounding Johns Hopkins Hospital and the JHCP clinic site “B” are disproportionately represented among hospitalizations and emergency room visits for ambulatory care–sensitive conditions, suggesting inadequate accessibility and effectiveness of primary care services. In the same study, hypertension was one of the leading diagnoses among ambulatory care–sensitive inpatient hospitalizations for individuals aged 65 years and older. In 2011, data from the National Healthcare Quality Report showed ongoing large racial and income disparities in hospital admissions for hypertension and congestive heart failure among adults in Maryland.

The partnership with JHCP works because we learned from and responded to several challenges that have arisen in the course of our work together. The first hurdle to overcome was building consensus among the researchers, leadership, clinicians, and staff regarding the evidence-based interventions to be implemented. We conducted in-depth interviews, focus groups, and surveys to assess the attitudes of organizational leaders, central administration, and clinic providers and staff. After tailoring our interventions to respond to the issues raised, we provide the rationale of each intervention strategy to front-line personnel and clinicians, keep them informed each time a new initiative rolls out, and respond to their concerns. The presence of several concurrent research and performance improvement initiatives at some sites has led to conflicting priorities for clinical staff, overlaps in targeted patient populations, multiple interventions aimed at the same disease management objectives, and limited space to interact with patients. Frequent check-ins with clinic staff has been central to keeping our projects as a top priority and free from competing influences.

Another challenge occurred in capturing data for Project ReDCHiP where much of the information is from individual patient records in the EMR. This study is considered to be performance improvement rather than human participant research. Because of Health Insurance Portability and Accountability Act regulations, our nonclinical research team members cannot view original patient records, and our data analyst and manager cannot be involved in creating a hypertension disparities dashboard for providers or accessing data in the EMR. Fortunately, we have engaged the information technology professionals at JHCP who are helping us identify and obtain the data we need from the EMR and build the hypertension disparities dashboard.

**Johns Hopkins HealthCare LLC, Insurer**

Johns Hopkins HealthCare LLC (JHHC) provides health insurance for diverse populations in Maryland. The company develops and manages medical care contracts with organizations, government programs, and health care providers for more than 250,000 plan members. This insurer has significant expertise in implementing practice-integrated case-management programs and member outreach programs.

Taking advantage of the company’s existing expertise and a track record of collaboration with members of our center, we have partnered with JHHC to hire, train, and place care management workers in clinical sites as part of our interventions, where they also helped to develop treatment protocols and patient educational materials. The center supports salary and benefits costs for the workers, while JHHC handles the training and human resources issues for us. We jointly provide administrative oversight.

**Community**

Community-based participatory research offers the opportunity to reduce health disparities through the development of sustainable community-based interventions and relevant policy. All partners are involved in sharing their expertise and assuming responsibilities, and experience co-ownership of the outputs of the projects and the overall research program. The center has relied on the Baltimore community since its inception, incorporating community input to shape the center, interventions tested in our research projects, and plans for...
dissemination of our work. The process of working together in planning, intervention development and implementation, evaluation, dissemination, and policy development has allowed us to begin bridging the cultural gap between researchers and the Baltimore community and for traditionally marginalized communities to gain power through the acquisition of new knowledge.89

To guide the center’s goals and objectives, a CPAB has been formed, which includes important stakeholders—political leaders, health care providers and administrators, patients, insurers, the Baltimore City Health Department and state of Maryland Department of Health and Mental Hygiene, faith community representatives, and community organizations. The advisory board meets as a group 4 times a year. Community input has been vital to the success of the center, with faculty and staff asking the community for feedback on study protocols and materials and support of our training activities. In addition, center faculty attend community forums where they educate the public about CVD and connect individuals with local health-related resources. We also provide technical support to community partners seeking funding for their initiatives. To further strengthen the relationship between the community and the center, we are currently planning a retreat with the CPAB to plan future research projects and explore additional ways the center can benefit the community.

**DISSEMINATION AS A FOCUS**

We prioritized dissemination of research findings early on. Communication with our community and health system partners is of paramount importance. To reach them, we publish a weekly newsletter and maintain a comprehensive Web site.90 We participate in events such as health fairs, and use the popular media, including local radio talk shows, to reach community members. Our dissemination focus with the community during these early days of the center is based primarily on our previous research and on presenting the evidence that has shaped the interventions being tested in our current research. In addition, at the quarterly meetings of our CPAB we provide updates on the work of the center and the progress of the studies.

For the scientific community, we have presented the data we gathered at baseline through interviews, focus groups, and surveys of the various stakeholders, which influenced the design and implementation of our studies. We have taken part in conferences such as Society of General Internal Medicine, Academy Health, the National Institutes of Health Annual Conference on Implementation and Dissemination Research, the Department of Health and Human Services Summit on the Science of Eliminating Health Disparities; invited talks; and in journal articles. We firmly believe that early sharing of our development work benefits those who suffer from health and health care disparities by stimulating ongoing conversations among stakeholders, changing policy, and sparking innovation and new collaborations that can have an impact on the multiple levels of influence on health disparities. We look forward to sharing the outcomes of our interventions with both the Baltimore

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**TABLE 3—Johns Hopkins Community Physicians Clinical Practices Participating in the Johns Hopkins Center to Eliminate Cardiovascular Health Disparities, 2013**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Clinic A</th>
<th>Clinic B</th>
<th>Clinic C</th>
<th>Clinic D</th>
<th>Clinic E</th>
<th>Clinic F</th>
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<tbody>
<tr>
<td>Practice characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary care physicians, no.</td>
<td>9</td>
<td>11</td>
<td>11</td>
<td>5</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Patients, no.</td>
<td>7755</td>
<td>4733</td>
<td>14 887</td>
<td>3681</td>
<td>5628</td>
<td>6161</td>
</tr>
<tr>
<td>African American patients, %</td>
<td>65.6</td>
<td>90.1</td>
<td>23.3</td>
<td>18.4</td>
<td>17.7</td>
<td>20.2</td>
</tr>
<tr>
<td>White patients, %</td>
<td>28.0</td>
<td>4.4</td>
<td>68.9</td>
<td>77.7</td>
<td>73.3</td>
<td>72.6</td>
</tr>
<tr>
<td>African American patients with HTN, no.</td>
<td>2940</td>
<td>2777</td>
<td>1493</td>
<td>359</td>
<td>331</td>
<td>593</td>
</tr>
<tr>
<td>African American patients with uncontrolled HTN, %</td>
<td>33.1</td>
<td>38.8</td>
<td>29.7</td>
<td>40.1</td>
<td>40.5</td>
<td>42.8</td>
</tr>
<tr>
<td>White patients with HTN, no.</td>
<td>705</td>
<td>80</td>
<td>4209</td>
<td>1362</td>
<td>650</td>
<td>1477</td>
</tr>
<tr>
<td>White patients with uncontrolled HTN, %</td>
<td>29.2</td>
<td>33.8</td>
<td>24.3</td>
<td>34.9</td>
<td>37.1</td>
<td>30.6</td>
</tr>
<tr>
<td>Local characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Medically underserved areaa</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Median household income, in 2011 US$b</td>
<td>47 472</td>
<td>36 652</td>
<td>58 488</td>
<td>50 459</td>
<td>47 472</td>
<td>99 155</td>
</tr>
<tr>
<td>Below poverty line, %b</td>
<td>19.0</td>
<td>21.0</td>
<td>8.9</td>
<td>10.6</td>
<td>18.2</td>
<td>7.8</td>
</tr>
<tr>
<td>Employed, %b</td>
<td>55.5</td>
<td>54.8</td>
<td>70.7</td>
<td>60.3</td>
<td>59.0</td>
<td>64.4</td>
</tr>
<tr>
<td>Population African American, %b</td>
<td>71.7</td>
<td>59.1</td>
<td>19.5</td>
<td>16.9</td>
<td>34.1</td>
<td>27.6</td>
</tr>
<tr>
<td>High-school graduate or equivalent, %b</td>
<td>81.4</td>
<td>76.9</td>
<td>85.6</td>
<td>78.7</td>
<td>78.2</td>
<td>92.7</td>
</tr>
<tr>
<td>Vacant housing units, %b</td>
<td>16.7</td>
<td>19.6</td>
<td>6.7</td>
<td>10.6</td>
<td>14.5</td>
<td>5.6</td>
</tr>
</tbody>
</table>

Note. HTN = hypertension.

aBy site address.

bBy Zip Code Tabulation Area, American Community Survey, 2007-2011.85 The zip codes representing the residence of the majority of the patients at each site were included. Zip codes were ranked by median income and the income level for the zip code where the 50th percentile of total residents occurred is the reported median income for the clinic.
and scientific communities once data are available.

**PLANNING FOR SUSTAINABILITY AND TRANSLATION**

We believe an increasing national focus on quality, cost-effectiveness, and equitability of care provides incentives for health care organizations to focus on improving cardiovascular outcomes and reducing health care disparities. To ensure that our work furthers these aims, we have planned from the outset for the sustainability of the work of the center and each of the interventions in our 3 studies by considering community, patient, intervention design, and organizational factors. If we can demonstrate meaningful and cost-effective improvement, we expect that JHCP and JHHC will continue their partnership to deliver the current adaptable interventions.

The active engagement of health care providers and community stakeholders on the CPAB (e.g., CHWs, grocery store owners) also increases the likelihood that our interventions will be adopted and disseminated if demonstrated to be effective. For instance, in the Five Plus Nuts and Beans study, we have used the infrastructure of a citywide health department program to arrange for the food deliveries. Should the dietary intervention prove successful, there will be minimal barriers to the continuation of the program. Should the interventions be shown to be ineffective, we will undertake a process evaluation, using feedback from participants at all levels of our ecological model, to determine what went wrong and why, examining the lessons learned and what can be adapted for future use. We believe this experience in a community—academic—insurer—clinician partnership will help guide future collaborations around cardiovascular disease disparities and other health issues.

**WORKING FOR CHANGE AT THE POLICY LEVEL**

Laws and initiatives have an impact on the social determinants of health, and can cause or alleviate health disparities, yet researchers often lack skills to engage at this level and may be concerned about restrictions on lobbying. Our center leadership has sought out opportunities to work on policy issues.

In 2011, the center’s director served on the Maryland Health Quality and Cost Council’s workgroup to develop the Maryland Health Improvement and Disparities Reduction Act of 2012,91 signed into law last year. The law authorizes a pilot program that will create “Health Enterprise Zones” in underserved communities with the aim of reducing health disparities. Local health departments and community-based organizations are able to apply for grant funds to increase their services. Physicians within the enterprise zones will be eligible for incentives, including tax credits and loan repayment assistance, for participating. The law represents a significant policy step aimed at elimination of health disparities in the state. The center’s active participation in the workgroup helped to highlight the impact of disparities in the state and offer evidence-based actions to help combat their effects. We will continue to work to effect change at the policy level, not just in health care, but also in education, zoning, and other areas where decisions have an impact on the health of vulnerable populations.

**PRACTICAL LESSONS LEARNED**

A key lesson learned is the importance of proper staffing for the center. Because of the complexity of our structure, it quickly became clear that additional investment in administrative infrastructure would help the center flourish. We hired an experienced administrator to manage day-to-day operations and serve as the primary liaison with institutional budget and human resource managers. We also hired a community program coordinator to facilitate interactions with the community. If not constrained by budget, we would have added several key staff, including a communications expert to assist with the dissemination of the center’s work and a dedicated staff member with expertise relevant to the work of each core. Fortunately, we have benefited from the contributions of talented interns and externs to meet some of these needs. Furthermore, we are considering hiring a trained public health researcher to serve as associate director, representing the center’s current research agenda at meetings with scientific collaborators and potential trainees and assisting with further development of the center’s scientific priorities.

We have also learned the value of clear, frequent, and bidirectional communication among the study principal investigators, JHCP senior administration, and site leadership in keeping all parties involved and informed. Operationalizing communication through standing meetings and mechanisms such as the center’s newsletter have been instrumental in keeping the channels of communication open and information flowing in all needed directions. Finally, we have learned that to effect change at all levels that influence health disparities, we need to be truly engaged at all levels, from policy to community to individuals. By working at each level, we are optimistic that our center will contribute to the reduction of CVD disparities in Baltimore and beyond.

**CONCLUSIONS**

Disparities in cardiovascular care and outcomes contribute to overwhelming human suffering and costs to our society. Thus, the task of eliminating disparities is an urgent one. We believe it can be accomplished and hope that work we have done in creating our center will be a leading contributor toward realizing that goal in Baltimore. We also hope it will serve as a model for other urban areas plagued by similar health and health care disparities.

The most important lessons we have learned during the development of our center are the importance of leadership skills that foster collaboration and integration across disciplines; effective interpersonal processes (e.g., clear, respectful, and participatory communication using appropriate channels for targeted audiences); balance in the needs and goals of various stakeholders; careful prioritization of objectives and allocation of time and resources to each aspect of the center’s work; and flexibility and adaptability to contextual factors. In addition, we urge others considering adopting similar strategies in their research endeavors to seek perspectives of diverse research collaborators, providers, community members, and policymakers, and to foster the next generation of researchers. Their ideas and input can contribute to current goals and help build a legacy that furthers research, practices,
and policies to address complex problems such as health disparities.

In the future, we see our center’s work broadening to include other cardiovascular conditions and other disadvantaged groups, such as the small but growing Hispanic and Asian populations in the Baltimore area. We will also expand our training efforts to support disparities researchers from different disciplines. We will seek additional sources of funding and continue to strengthen our ties to community stakeholders to enhance the sustainability of the center’s programs and to maximize its impact on population health.

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Human Participant Protection
The Johns Hopkins institutional review board approved all study protocols. Where the board deemed necessary, all patients provided written informed consent. All clinicians and staff provided either oral or written informed consent.

References


