

Models of Interinstitutional Partnerships between Research Intensive Universities and Minority Serving Institutions (MSI) across the Clinical Translational Science Award (CTSA) Consortium

Elizabeth O. Ofili, M.D., M.P.H.¹, Alecia Fair, Dr.P.H.², Keith Norris, M.D.³, Joseph G. Verbalis, M.D.⁴, Russell Poland, Ph.D.⁵, Gordon Bernard, M.D.², David S. Stephens, M.D.⁶, Steven M. Dubinett, M.D.⁷, Julianne Imperato-McGinley, M.D.⁸, Robert P. Dottin, Ph.D.⁹, Jill Pulley, M.B.A.¹⁰, Andrew West, M.B.A., M.H.A.¹¹, Arleen Brown, M.D., Ph.D.³, and Thomas A. Mellman, M.D.¹²

Abstract

Health disparities are an immense challenge to American society. Clinical and Translational Science Awards (CTSAs) housed within the National Center for Advancing Translational Science (NCATS) are designed to accelerate the translation of experimental findings into clinically meaningful practices and bring new therapies to the doorsteps of all patients. Research Centers at Minority Institutions (RCMI) program at the National Institute on Minority Health and Health Disparities (NIMHD) are designed to build capacity for biomedical research and training at minority serving institutions. The CTSA created a mechanism fostering formal collaborations between research intensive universities and minority serving institutions (MSI) supported by the RCMI program. These consortium-level collaborations activate unique translational research approaches to reduce health disparities with credence to each academic institutions history and unique characteristics. Five formal partnerships between research intensive universities and MSI have formed as a result of the CTSA and RCMI programs. These partnerships present a multifocal approach; shifting cultural change and consciousness toward addressing health disparities, and training the next generation of minority scientists. This collaborative model is based on the respective strengths and contributions of the partnering institutions, allowing bidirectional interchange and leveraging NIH and institutional investments providing measurable benchmarks toward the elimination of health disparities. *Clin Trans Sci* 2013; Volume 6: 435–443

Keywords: translational research, consortium, partnerships, minority serving institutions

Introduction

Importance to society of a health disparities consciousness

The health status of the US population is characterized by marked disparities in healthcare and health outcomes among major racial/ethnic and socioeconomic groups.¹ Health outcomes across multiple disease areas such as cardiovascular disease, pulmonary disease, and cancer are substantially worse among African Americans and Hispanics than among whites.^{2–6} Health disparities levy not only a significant personal and family burden on minority communities, but a substantial economic burden with the combined direct and indirect costs of health inequalities and premature deaths from preventable diseases among minorities in the United States between 2003 and 2006 to be \$1.24 trillion.^{7,8} The causes of these observed health disparities remain incompletely understood, but appear to be multiple and complex,⁹ including interacting elements from genetics, social-behavioral factors, and a fragmented US healthcare delivery system embedded within the broader social, economic, historical, political, ethnic, and cultural context of our nation. Studies examining these issues are also complex. Race itself is considered a social construct; however, in many genetic studies, ancestral determination is the critical covariate.^{10–12} It is well known that African American populations do not always share genetic effects that are seen in European

American populations^{13–15} with respect to disease susceptibility or drug response; thus, separate analyses are needed.¹⁶ Further, for at least one approved drug (hydralazine and isosorbide dinitrate, BiDiI), race actually provides a surrogate for alternate physiologic mechanisms of action and benefit.¹⁷ Despite this apparent treatment benefit, disparities persist in the utilization of this treatment, pointing to the multiple levels of intervention that will be needed to achieve health equity. These challenges in the identification, investigation, and ultimately the prevention/intervention of key mediators of health disparities will require a comprehensive and supported multidisciplinary approach. The science of health disparities demands a concerted effort and a multidisciplinary team of clinicians and biomedical scientists.

Federal response to address health disparities

Accordingly, at the national level, The National Institutes of Health in 2010 announced the elevation of the National Center on Minority Health and Health Disparities (NCMHD) to the National Institute on Minority Health and Health Disparities (NIMHD). This congressional action gave the institute a more substantive role in the NIH research agenda to eliminate health disparities, which it defines as differences in the incidence, prevalence, mortality, and burden of diseases and other adverse

¹Atlanta Clinical Translational Science Institute (ACTSI), RCMI Center of Excellence for Clinical and Translational Research, and Department of Medicine, Morehouse School of Medicine, Atlanta, Georgia, USA; ²Vanderbilt Institute for Clinical Translational Research (VICTR), Vanderbilt University, Nashville, Tennessee, USA; ³UCLA David Geffen, School of Medicine (DGSOM) Division of General Internal Medicine and Health Services Research, University of California Los Angeles, Los Angeles, California, USA; ⁴Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS), Division of Endocrinology and Metabolism, and Georgetown University, Washington, District of Columbia, USA; ⁵Vanderbilt Institute for Clinical Translational Research (VICTR) and the Meharry-Vanderbilt Focused Partnership on Eliminating Health Disparities, and Meharry Medical College, Nashville, Tennessee, USA; ⁶Atlanta Clinical Translational Science Institute (ACTSI), Woodruff Health Sciences Center, and Emory University School of Medicine, Atlanta, Georgia, USA; ⁷UCLA Clinical Translational Science Institute, University of California, Los Angeles, Los Angeles, California, USA; ⁸Clinical and Translational Science Center, Weill Cornell Medical College, New York, New York, USA; ⁹Center for Study of Gene Structure and Function, and Department of Biological Sciences, Hunter College of the City University of New York, New York, New York, USA; ¹⁰Vanderbilt Institute for Clinical Translational Research (VICTR) and Division of Medical Education and Administration, Vanderbilt University, Nashville, Tennessee, USA; ¹¹Atlanta Clinical & Translational Science Institute (ACTSI), Emory University, Atlanta, Georgia, USA; ¹²Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS), Center for Clinical and Translational Research and Stress/Sleep Studies Program, and Howard University College of Medicine, Washington, District of Columbia, USA.

Correspondence: Elizabeth O. Ofili (eofili@msm.edu)

DOI: 10.1111/cts.12118

health conditions that exist among specific population groups. In order to engage a diverse constituency, NIMHD implements several strategic approaches to address health disparities such as awarding traditional investigator initiated awards, supporting centers of excellence and providing research infrastructure for minority serving institutions (MSIs). For example, the Research Centers at Minority Institutions (RCMIs) program has successfully improved the research infrastructure and the scientific output of its participating institutions. Recently, some RCMI institutions have forged critical partnerships with institutions funded through Clinical and Translational Science Awards (CTSAs) originally housed in the same institute but now housed within the National Center for Advancing Translational Science (NCATS). CTSAs are an initiative designed to accelerate the translation of experimental findings into clinically meaningful practices and bring new therapies, devices and disease-prevention strategies to the doorsteps of all patients and communities.¹⁸ In the past 6 years, 61 CTSAs have been established to address a key objective in the NIH roadmap for medical research, to facilitate new treatments in a more efficient manner and to test new ideas for removing the hurdles that currently prevent the fluid exchange of ideas and evidence between research and clinical practice.

Historically black institutions and MSIs

The Higher Education Act of 1965 defines Historically Black Colleges and Universities (HBCUs) as those institutions of higher education established before 1964 whose principal mission was, and remains, the education of African Americans.⁹ As specified by the Higher Education Act, Part B, Historically Black Graduate Institutions (HBGIs) defined as graduate or professional program that provides a program of instruction in the physical or natural sciences, engineering, mathematics, or other scientific discipline in which African Americans are underrepresented and eligible for funding support under the rubric of HBCUs.¹⁹ The histories of these minority-serving institutions are varied, but many originated during the era of *de jure* segregation in education in the United States. Their mission was to educate generations of promising young people of color at a time of widespread racial discrimination and of serving their surrounding communities. HBCUs/HBGIs in the modern era have maintained as part of their mission the aim of reaching those who otherwise might not have higher education opportunities that unfortunately continue to disproportionately affect promising young people of color.²⁰

Historically black/MSIs- and CTSA-funded institutions: creating novel partnerships

A mechanism fostering formal collaborations between HBCUs/HBGIs or some MSI and CTSA institutions can activate unique translational research approaches to reduce health disparities. There are 18 institutions across the United States and its territories including Hawaii and Puerto Rico that receive RCMI program awards. These 18 RCMI programs have individually and collectively established track records of training and mentoring underrepresented minority students and conducting research on health disparities, by supporting basic research (T1) and/or clinical research and community-based research (T2–T4). The clinical and community-based research programs have community partners as key stakeholders in ensuring the acceleration of the quality and pace of transformative research on diseases that disproportionately affect racial and ethnically diverse, low-income, geographically remote, and/or medically

underserved populations. The 18 RCMI institutions form the RCMI Translational Research Network that is designed to facilitate collaborations and partnerships among RCMI institutions, as well as promoting similar interactions with CTSA and other research-intensive institutions. Five formal partnerships, now exist with subcontracts and a Notice of Grant Award formalizing the partnerships between research intensive universities and HBCUs/HBGIs/MSIs with RCMI programs, have formed as a result of the CTSA program. These are Emory University/Morehouse School of Medicine in Atlanta, Georgia; Georgetown University (GU)/Howard University (HU) in Washington, D.C.; Vanderbilt University/Meharry Medical College in Nashville, Tennessee; University of California, Los Angeles/Charles Drew University in Los Angeles, California and Weill Cornell Medical College/Hunter College in New York, New York. These partnerships present a multifocal approach for addressing health disparities, shifting cultural change and consciousness towards disparities, and training the next generation of minority scientists.

Collaborative Research Education, Training and Career Development (RETCD): a framework for diversifying the biomedical research workforce

Increasing the racial and ethnic diversity of the healthcare workforce is essential for the adequate provision of culturally competent care to our nation's burgeoning minority communities and to ensure that these issues are deemed a priority for national health research investigation agenda. Providing targeted resources for disparities focused work (e.g., pilot funds, researcher support programs), developing important foundational methods development (such as statistical support and grantsmanship trainings) and providing mentorship for minority investigators are critical to the success of these partnerships and the reduction of health disparities. The HBCU/MSI partnerships with CTSAs leverage NCATS and NIMHD investments in the respective CTSA and RCMI research education programs, in order to sustain national efforts toward a diverse biomedical research workforce. The example below from the Atlanta Clinical and Translational Science Institute (ACTSI) and other examples described in the individual institutions' partnership highlights sections illustrate how collaborative research education is working across the partnering institutions.

The ACTSI Collaborative RETCD truly illustrates the synergy across ACTSI institutions. RETCD was built upon a foundation of individual programs (e.g., Emory K30 and K12, MSM R25, GT Engineering) that existed prior to the establishment of ACTSI but often worked in isolation. Through ACTSI collaboration, RETCD enhanced and expanded clinical and translational research training opportunities to a broad and diverse spectrum of trainees, including PhD graduate students (PhD/MSCR track), medical students (MD/MSCR track), PhD level scientists (postdoctoral trainees and junior faculty), physicians, (residents, clinical fellows, and junior faculty), and other health sciences professionals. Scholars from all three academic institutions (Emory, MSM, and GA Tech) compete for ACTSI sponsored KL (postdoctoral), and TL (predoctoral) awards.²⁶ By working under the umbrella of the ACTSI, the partnering institutions successfully competed for new awards, such as the Howard Hughes (HHMI) *MED into GRAD grant*, to establish an official, 16-credit **Certificate Program in Translational Research (CPTR)** conferred by the Emory Laney Graduate School. The program began in September 2010 and includes PhD graduate students from all three collaborating

institutions. The CPTR was carefully constructed, so it does not add additional time to the PhD degree. The CPTR responds to the need to provide opportunities for translational research training to PhD students (in biomedical sciences, biomedical engineering, and bioengineering) interested in clinical and translational research across the three institutions but who had few opportunities for such training, and focuses on enhancing T1 translational research training. The program began with 11 trainees including nine PhD graduate students (six from Emory including two MD/PhD students and one PhD nursing student, two from MSM, and one biomedical engineering student from Georgia Tech). In the first cohort of 11 students in the CPTR, five (45%) are underrepresented minorities (three African-American, two Hispanic) and seven (64%) are women. The CPTR will be leveraged to provide training to other types of trainees in the current ACTSI renewal application.

The cornerstones of the ACTSI RETCD program are the Masters of Science in Clinical Research (MSCR) degree programs at Emory and MSM. The MSCR programs provide a mechanism for formal didactic and mentored clinical and translational research training in Atlanta at the predoctoral, postdoctoral, and junior faculty level. The Emory and MSM MSCR programs are funded through separate mechanisms (Emory-ACTSI and MSM R25 NIMHD award from the RCMI program). The programs collaborate closely and have leveraged their complementary strengths to expand mentorship, coursework, and career development options for participating scholars. One example of a very successful collaboration is the jointly developed and extremely popular course titled “Community Engagement and Health Disparities in Clinical and Translational Research” that is described in the highlights section below. Another innovative collaboration that was enabled by the CTSA/RCMI collaboration is the pipeline program called ACTRE, which is jointly sponsored by PIs from Emory and MSM, and is recruiting underrepresented minority undergraduate students for mentorship by ACTSI research scientists focused on endometriosis, a major cause of infertility among African American women.

Pilot testing a CTSA/RCMI national mentorship model: a national research mentoring network proposal

Building on the successful ACTSI RETCD collaboration, Morehouse School of Medicine and Emory University have proposed a CTSA/RCMI collaborative national mentoring model that will leverage the infrastructure and resources of RCMI and CTSA institutions to lead a transformative culture that values the power of diverse and collaborative teams of mentors, as the necessary foundation for a biomedical research workforce that mirrors the nation's diversity. Mentors in this network will serve as catalysts and incubators of innovative mentorship models using social network tools to connect underrepresented minority students and junior faculty with experienced mentors. In order

to develop and sustain the mentorship network, the program will collaborate with NIH-funded diversity programs, institutions participating in the new NIH BUILD (Building Infrastructure Leading to Diversity) initiative, the association of American Medical Colleges, professional societies, community stakeholders, and industry partners in order to establish the framework that will (i) identify and scale up best practices in mentoring of underrepresented minority students and faculty; (ii) test the effectiveness of social network mentor-mentee “matchmaker” tools; and (iii) create a repository of rigorously evaluated mentor resources and models for the career advancement of underrepresented minority students and faculty.

The five existing CTSA/RCMI partnerships described in this manuscript, joined with all 18 RCMI institutions, and 10 CTSA and research intensive partner institutions, to propose a six month planning grant in order to develop a pool of national mentors that will support this innovative mentoring initiative.

Engaging and empowering local communities toward the elimination of health disparities

The three HBCUs partners, one HBGI partner (Charles Drew University), and one MSI partner (Hunter College) within the CTSA consortia support the research mission of investigating causes of, and ways to prevent, health disparities, and also embrace the service mission to care for vulnerable populations. Academic health centers and community hospitals can be valuable partners in developing solutions to healthcare disparities as the surrounding geographic areas and the demographic groups that seek care at HBCUs/HBGIs and associated clinics are disproportionately comprised of racial/ethnic minorities who typically suffer from low socioeconomic status and live in low resource urban neighborhoods (see *Table 1*). Examples of successful community partnerships are in respective highlight sections below.

Models of Governance

Ideally, by partnering, these academic health centers and their RCMI partners will share governance of these projects and leverage resources in a mutually beneficial way, advancing an overarching vision of mitigating health disparities and training a new generation of clinical and translational researchers. Mutual recognition of and respect for the strengths of each institution have been critical in achieving successful collaborations. Specific models of governance reveal some variation in design.

Emory University/Morehouse School of Medicine in Atlanta, Georgia; ACTSI

The ACTSI engages a leading biomedical research university (Emory University); a preeminent medical school dedicated to achieving health equity through research and by increasing the diversity of the physician and biomedical workforce (Morehouse School of Medicine—MSM); a leading engineering school

	Meharry/Davidson county, North Nashville, Tennessee	Morehouse/Fulton county, Georgia	Howard/District of Columbia	Drew/South Central Los Angeles	Hunter/New York County, New York	National average
Race % AA	92.7	44.1	60.0	35.0	15.6	12.6
Ethnicity % Hispanic	0.8	7.9	7.9	60.0	25.4	16.3

Table 1. Profile of general demographic characteristics from the US census: neighborhoods surrounding partnering HBCUs/HBGIs/MSI and US National Average Demographics.^{21–25}

(Georgia Institute of Technology); and public and private not-for-profit healthcare systems working together to improve the health of one of the most diverse cities in the country.

Each governance level of ACTSI includes leaders from all academic institutions at the programmatic (Leadership Council), executive (Executive Council), and institutional (Executive Oversight Council) level. Dr. David Stephens of Emory University serves as the Principal Investigator (PI) of the ACTSI and Dr. Elizabeth Ofili of MSM serves as the Senior Co-PI reflecting the important relationship of the two academic medical institutions to the ACTSI collaboration.

At the program level, a single program director is responsible for operations across institutions. Co-program directors from MSM work with respective program directors to assure full participation of the broader MSM faculty and students across ACTSI programs. Recognizing MSM's strength in community engagement, the ACTSI Community Engagement and Research Program (CERP), is directed by Dr. Dan Blumenthal of MSM. CERP builds on two existing Centers for Disease Control and Prevention (CDC) funded Prevention Research Centers (PRCs) at MSM and Emory, both of which have a strong track record in developing community-based research initiatives that are responsive to the needs and priorities of the communities served by each center. The two PRCs provide outstanding models of academic–community partnerships through which academic scientists, in collaboration with community members, are able to conduct community-engaged research, build community capacity, and train students and junior investigators in community-engaged research approaches. The ACTSI CERP is unique among ACTSI programs as it is the only program guided by a Community Steering Board whose majority is comprised of community members. This approach in governance is critical to building credibility and lasting relationships among the communities partnering with ACTSI.

GU/HU in Washington, D.C.; Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS)

A distinguishing aim of the GU and HU Partnership is to enhance clinical and translational research on underserved populations, both in the Washington DC region and nationally, prominently including minorities, the aged, and the disabled.

This partnership entails a shared governance model via the multiple PI mechanism, where a PI representing GU and the other representing HU work closely together and are involved with all components of the CTSA. The Georgetown–Howard Universities Center for Clinical and Translational Science (GHUCCTS), formulated in 2008, which serves as the academic home for the CTSA, for the clinical and translational research (CTR), and associated training programs conducted at each institution. GHUCCTS is a single center with shared resources and programs, which integrates CTR activities at both Georgetown and Howard Universities, but it is geographically distributed so that offices for investigator support are available at each GHUCCTS institution. The model of shared governance has the PI from GU as the Notice of grant award holding institution serving as the permanent Executive PI, for the purpose of assuring consistency in certain administrative functions, and otherwise co-leading the program with the PI from HU. The PI at GU is responsible for the overall operational administration of the Biomedical Informatics, Clinical Research, Novel Translational Methodologies, RETCD, and Translational Technologies and Resources (TTR) components. The HU PI has primary oversight

of the Community Engagement and Research, Design, Biostatistics, and Population Science, Regulatory and Ethics Knowledge and Support, Pilot and Collaborative Studies Program and Tracking and Evaluation components. These distributions of administrative oversights are consistent with the research interests and previous administrative experience of each of the PIs thereby increasing the nimbleness and efficiency of GHUCCTS. The partnership is also represented in the leadership of these components, with most components having a director or co-director from Georgetown or Howard. The other contributing institutions, MedStar Health Research Institute, the DC Veterans Administration, and Oak Ridge National Laboratories are also represented in the component and executive leadership of GHUCCTS. The partnership is also represented in the leadership of these core components, with most components having a director or co-director from Georgetown or Howard. The other contributing institutions, MedStar Health Research Institute, the DC Veterans Administration, and Oak Ridge National Laboratories are also represented in the component and executive leadership of GHUCCTS. Activity of the GHUCCTS supported clinical research units located at Georgetown, Howard, MedStar, and the DC VA indicate a high representation of African Americans. Among the close to 2,000 participants in the portfolio of 174 research protocols during the third fiscal year of the award, the majority of participants are African American (57% of the men, 50% of the women). The pilot and collaborative studies of the GHUCCTS are designed to incentivize interinstitutional and interdisciplinary collaboration. Among the 25 studies supported since the inception of the program, 52% have representation of more than one institution among its investigators and 52% reflect multidisciplinary collaboration. Among the 16 protocols that feature human subjects, seven (44%) have a specific focus on minority populations and three (19%) focus on Veterans.

University of California, Los Angeles/Charles Drew University in Los Angeles, California

UCLA CTSI

The greater UCLA CTSI includes Charles Drew University (CDU), Cedars Sinai Medical Center and Harbor UCLA/LA Biomed. It is an academic–clinical–community partnership designed to accelerate scientific discoveries and clinical breakthroughs to improve health in the most populous and diverse county in the United States. Its mission is to create a borderless clinical and translational research institute that brings the UCLA consortia-wide innovations and resources to bear on the greatest health needs of Los Angeles. A formal governance model exists between the consortia led by Dr. Steven M. Dubinett as the CTSI Program Director. Dr. Keith Norris serves as an Associate Director and the lead for Charles Drew University. Dr. Norris is the PI for the RCMI Clinical and Translational Research Center and Co-PI of the NIMHD Health Disparity Center of Excellence with Dr. Martin Shapiro at UCLA. Dr. David Carlisle, President of Charles Drew University serves on the CTSI Institutional Steering Committee and Dr. Richard Baker, Provost Emeritus, serves on the Internal Advisory Committee. Dr. Jaydutt Vadgama, Associate VP for Research and PI of the NIH funded CDU/UCLA Cancer Center serves as the co-lead at CDU and CDU lead for the CTSI Center for Translational Technologies. Dr. Norris also serves as co-chair for the community engagement function. Charles Drew University has at least one faculty member serving as a member of the leadership team for each CTSI function.

Vanderbilt University/Meharry Medical College in Nashville, Tennessee; Vanderbilt Institute for Clinical Translational Research

The CTSA partnership supports and facilitates joint programs in research, teaching, clinical care, and community service with a special focus on promoting diversity within each institution, and in reducing health disparities through research, education, and more effective patient care. Meharry has been committed to improving the health and healthcare of minority and underserved communities. A formal governance model exists between Vanderbilt University and Meharry Medical College. Dr. Gordon Bernard serves as Program Director. Russell Poland, PhD, is the Co-Program Director for the Vanderbilt Institute for Clinical Translational Research (VICTR) and for the Meharry-Vanderbilt Focused Partnership on Eliminating Health Disparities. He is responsible for fostering the Meharry-Vanderbilt alliance, including the seamless integration of VICTR programs and resources into Meharry. Dr. Poland represents Meharry as a voting member of the VICTR Executive Committee. Dr. Poland is supported on site by additional CTSA funded faculty and staff who attend VICTR Operations Committee meetings and work closely with VICTR staff on the implementation of programs and promotion of those programs to Meharry faculty and staff. Two Meharry representatives serve as voting members on the VICTR Scientific Review Committee and Meharry key study personnel participate in other operations-related committees. Charles Mouton is a member of the VICTR advisory board and Dean of the School of Medicine at Meharry Medical College. Dr. Mouton is also the Director for the Community Engagement and Research Core and has a long history of community-engaged research activities. He was the lead of the community core on GHUCCTS before relocating to Meharry.

Weill Cornell Medical College/Hunter College in New York, New York Weill Cornell—Hunter College Clinical Translational Science Center (CTSC)

Weill Cornell Medical College, the lead institution, and its partner institutions, the Hunter College Center for the Study of Gene Structure and Function (HGC)/Research Centers of Minority Institutions (RCMI), Hunter College School of Nursing (HCSN); the School of Public Health (SPH); Memorial Sloan-Kettering Cancer Center (MSKCC); and the Hospital for Special Surgery (HSS) are superb centers of academic excellence and diversity, each with a distinctive character that has served to enhance multidisciplinary interaction since 2007 when it received a CTSA. Other key cohorts in the CTSC include Cornell University, Ithaca (CU-I) and Cornell University Cooperative Extension-New York City (CUCE-NYC). A striking example of positive interinstitutional collaboration between private and public entities is the partnership between the Weill Cornell CTSC and Hunter College, a public institution with designated minority status.

Dr. Julianne Imperato McGinley of Weill Cornell is the PI of the CTSA grant and Program Director of the CTSC, with Dr. Timothy Wright of Hospital for Special Surgery as Coordinating Program Director. Dr. Robert Dottin, Director and Dr. Jesus Angulo, Program Director of the Hunter Gene Center provide leadership and coordination with the CTSC. The Hunter Gene Center is an RCMI program at Hunter College. Besides the Gene Center, Hunter College's School of Public Health and School of Nursing also actively contribute to this mutually beneficial partnership. The Hunter College student body reflects the diversity

of NYC's urban population and with the CTSC it is committed to the reduction of healthcare disparities in underserved areas.

The Gene Center faculty, themselves a diverse group now with about 50% minority representation as full members, conducts research with predoctoral students and undergraduate students from diverse racial and ethnic minority groups, many of which are underrepresented in biomedical sciences or health professions. The RCMI and the CTSC sustain and strengthen the research infrastructure of the Gene Center by expanding human and physical resources for conducting basic, clinical, and translational research.

The model of governance highlights Hunter College's interactions as well as the other partners at all levels: student, faculty, programmatic, and institutional. Hunter's leadership is represented at the Governance (Operations) Committee. The CTSC has a multifaceted structure of expertise organized by key functions of which many provide services through their support cores. Leadership faculty from Hunter College/RCMI participates in all major key function committees.

CTSA Partner Highlights

Each partnership specializes in research education, mentoring and career development, multiple collaborative pilot studies, and joint participation in designing and implementing research programs.

Emory University/Morehouse School of Medicine in Atlanta, Georgia; ACTSI

Leadership. Dr. David Stephens of Emory University serves as the PI of the ACTSI and Dr. Elizabeth Ofili of MSM serves as the Senior Co-PI reflecting the important relationship of the two academic medical institutions to the ACTSI collaboration.

Science focus. The ACTSI leverages existing discovery, community, and training efforts supported by programs at MSM including the RCMI to help address health disparities.

Selected partnership focus area. One of many highlights involving the partner institutions of the ACTSI includes the Minority Health-GRID Network. The goal of this \$13.3M NIH funded project is to integrate clinical, environmental, and deep sequencing genetic information to better understand the causes of and the remedies for cardiovascular health disparities including contributions of genetic markers in the context of social-environmental factors and comorbidities such as diabetes and obesity. Developed by Dr. Gary Gibbons of MSM (who was recently named the director of NHLBI) with Dr. Joel Saltz of Emory as the Biomedical Informatics lead, this project has a strong ACTSI base, with contributors from MSM, Emory, and Kaiser Permanente Georgia, and collaborators from Baylor College of Medicine, Jackson Hinds Clinic, and Stanford University.

Innovation. The ehealthystrides project was supported by an NCATS administrative supplement involving the leadership of Dr. Priscilla Pemu of MSM and Dr. Joel Saltz of the ACTSI Biomedical Informatics Program. The project implemented a church-based pilot study of an interactive, Web-based, patient-driven, diabetes self-management support and social networking forum. Twenty members of Big Bethel AME Church's health ministry were enrolled, trained, and certified as coaches. These coaches provided motivation and support in the acquisition of self-management skills using the ehealthystrides Web application for 120 diabetic participants of Big Bethel and three other area churches in downtown Atlanta. The study showed that by engaging health coaches, who worked as peer leaders, high-risk

diabetic participants were willing and able to enhance their self-management skills. This was manifested through statistically significant improvements in blood pressure, blood glucose, and amounts of physical activity engagement. The improvements in clinical outcomes observed were better than a clinic-based pilot of the ehealthstrides application. This led to speculation regarding interactions between the community-based health coaches and the diabetic participants and further analysis to define the successful elements of this interaction to improve any dissemination activity. The effort was featured in the Atlanta-Journal Constitution twice and on a local television news show, *Good Day Atlanta*.

The Community Engagement and Health Disparities in Clinical and Translational Research course was developed and taught by MSM and Emory faculty and launched during Fall Semester 2008 to Master of Science in Clinical Research students at both schools. This 18-week course takes place at the Jane Fonda Center for Adolescent Reproductive Health located centrally between the two medical schools. The 32 students of the 2013 MSCR class were very diverse. (Emory, 28; Morehouse School of Medicine, 4). Current Degrees Held (30 out of 32) MPH-1, PhD candidate PhD-4, PhD-1, BS/BA-8 (includes eight Emory medical students, MD/MSCR), MD-14, MS-1, MBChB-1. This course is an introduction to the concepts, methods, and issues involved in community-engaged research. Special emphasis is given to social and behavioral science concepts and methods; principles and historical roots of community engagement; clinical and translational research partnerships and multidisciplinary research collaborations; ethical issues; and practical considerations in planning, implementing, evaluating, and disseminating community-engaged research. The course has remained very popular with scholars because of its emphasis on community engagement to address real-world health challenges.

GU/HU in Washington, D.C.; Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS)

Leadership. Dr. Joseph Verbalis, MD of GU, serves as the Executive PI of GHUCCTS and Dr. Thomas Mellman, MD of HU, serves as the PI. This leadership model exemplifies two PIs with complementary expertise who share the leadership of an innovative partnership between two leading educational and healthcare institutions in the greater Washington, D.C., region.

Science focus. Research collaborations between HU and GU include NIH-funded collaborations in stroke prevention, neural processing of sensory information, more recent collaborations with pending applications in weight-loss metabolomics and interventions targeting stress disorders and sleep problems, career development in hypertension research, collaboration in cultural competency training, and mutual involvement in a National Science Foundation-funded initiative to develop international collaboration in training in neuroscience.

Selected partnership focus area. A unique partnership with Oak Ridge National Laboratory (ORNL), the Novel Translational Methodologies (NTM) component capitalizes on ORNL's unparalleled prowess in high-performance computing and systems genetics to catalyze interdisciplinary and cross-institutional CTR; through this collaboration, NTM will facilitate the development of novel translational methodologies in drug discovery and genome-environment interactions.

Innovation. The formation of this CTSA partnership has accelerated the collaborative utilization of the considerable diversity of knowledge and resources contained within the GHUCCTS institutions. Specific areas of innovation are within each component of this CTSA. Examples of innovative programs are the TTR component, which creates an infrastructure that will provide new and established CTR investigators with mentored access to 27 different shared resources, many of which are unique. This CTSA is characterized by a novel focus on the development and utilization of methods for population-based studies. The Design, Biostatistics and Population Studies (DBPS) component was created to drive focused research into underserved populations of our communities, including minorities, the aged and the disabled.

University of California, Los Angeles/Charles Drew University in Los Angeles, California

UCLA CTSI

Leadership. Dr. Steven M. Dubinett serves as the CTSI Program Director. Dr. Keith Norris serves as an Associate Director and the lead for Charles Drew University.

Science focus. The UCLA/Charles Drew partnership capitalized on longstanding collaborations in disparities research with an emphasis on aging, depression, diabetes, and cancer research using methodologies ranging from molecular biology to health services research and community engagement. The partnership has expanded the culture of interinstitutional collaboration, enhanced systems for communication and decision making, and leveraged prior investments in research infrastructure as well as existing partnerships/collaborations. A major focus area for CDU is improving outcomes that are key medical conditions that are strongly influenced by a combination of genetics, social conditions, and access to care, and are disproportionately prevalent among minorities. These include depression, HIV, hypertension, diabetes, chronic kidney disease, and others and are addressed in part through the CTSI community engagement core.

Selected partnership focus area. Key members of the community engagement core from CDU have a longstanding working relationship with many UCLA and RAND faculty, and all have longstanding relationships with common community partners. This has now led to the creation of a "community faculty track," a new and innovative approach to academic-community partnership that reaches into the local community to recruit and develop resident community experts as university faculty members. Born out of a long history of research and education within the context of community engagement, CDU developed the community faculty model of community-academic partnering to create a bidirectional research and education environment that leverages community capital to address many of the sociocultural gaps in traditional health professions research paradigms. It is designed to build community capacity, advance the effective translation of clinical and community research practices, and better prepare traditional academic faculty and health professional students to more effectively engage in community-focused research.

Innovation. New initiatives include community-academic-partnered approaches to address local health concerns, new interinstitutional research collaborations, joint educational initiatives, access to pilot funding and training awards (K awards), and access to core facilities and consultation.

Vanderbilt University/Meharry Medical College in Nashville, Tennessee; VICTR

Leadership. Dr. Gordon Bernard, MD, of Vanderbilt University serves as the Program Director. Russell Poland, PhD, of Meharry Medical College is the Co-Program Director for the VICTR and for the Meharry-Vanderbilt Focused Partnership on Eliminating Health Disparities. At the Vanderbilt-Meharry CTSA, expanding outreach efforts to minority and underserved communities calls for a multipronged approach: 1) an active role cultivating an environment fostering the development of minority clinical and translational researchers at their academic institutions and 2) providing institutional funding and resources to propel translation of scientific knowledge to all underserved populations. Chiefly, the Vanderbilt-Meharry CTSA strives to develop scientists at minority institutions who can establish concordance with the minority and medically underserved populations to accelerate the translation and dissemination of discovery from innovative interventions into poor and underserved communities.²⁷

The Vanderbilt-Meharry CTSA has cultivated minority scientists and translational research programs in underserved minorities in two capacities: 1) Since the inception of the Vanderbilt-Meharry CTSA 79 minority scientists has received infrastructural resources and institutional funding to conduct translational science projects. In the realm of projects specifically targeting underserved minority populations, \$515,735 in institutional funding has been awarded across projects (VICTR, unpublished data, 2013).

Science focus. The range of translational projects supported with these resources represents the spectrum of clinical translational science ranging from investigating genetic biomarkers of preterm labor in African American women, epidemiology of blinding eye conditions in the urban, underserved population; neural correlates of cognitive inhibition in young African American women at risk for alcohol use disorders and community-engaged projects on assessing newcomer refugee families linked with a school-based intervention.

Selected partnership focus areas. To further emphasize the Vanderbilt-Meharry CTSA commitment to appropriately representing members of the minority and medically underserved communities and their unique cultural nuances in clinical translational research projects, the Community-Engaged Research Core (CERC), a shared resource of the Meharry Translational and Clinical Research Center and the VICTR was established to support community research to reduce health disparities and improve the health of communities. A resource the CERC offers is the Community Review Board, a forum that allows Community Experts to provide feedback that enhances a researcher's knowledge of their community of interest. Members of the community are compensated modestly for their time and expertise providing a point of view on all phases of the research study from their community-focused lens. To date, 15 research teams with studies targeting underserved communities have participated in a Community Review Board with several Community Review Boards pending.

Innovation. A novel model for project-specific feedback for biomedical researchers has been developed based on the premise that timely, expert guidance from multiple disciplines would improve the quality and impact of today's clinical and translational research for Vanderbilt and Meharry investigators. This model is premised upon an internal expert review mechanism, called a "Studio." Studios are a series of integrated, dynamic roundtable

discussions bringing together relevant research experts from diverse academic disciplines to focus on a specific stage of research. These sessions are intended to generate new hypotheses, enhance research quality, ensure adequate protocol design and scientific and statistical rigor, improve funding success, foster advances in clinical practice and improvements in patient health, and increase publications in high-profile journals. Over 430 studios have been held over a 6 year period. The studio program received the 2012 AAMC Award for Innovations in Research Training and Education.

Weill Cornell Medical College/Hunter College in New York, New York Weill Cornell-Hunter College Clinical Translational Science Center (CTSC)

Leadership. Julianne Imperato-McGinley, MD, Associate Dean of Translational Research and Education is the PI of the NIH-CTSA grant and the Program Director of the CTSC at Weill Cornell Medical College. Robert Dottin, PhD, is the Director of the Hunter College Gene Center and the PI of the NIH-RCMI Grant. Dr. Jesus Angulo is the Program Director of the Hunter College Gene Center.

Science focus. The Weill Cornell Medical College and Hunter College have promoted an environment of interinstitutional, multidisciplinary research collaboration and resource sharing. The growing connections between the CTSC and Hunter's School of Public Health and School of Nursing have increased opportunities for outreach and education.

The CTSC's innovative seed-funding grant program, which provides initial funding to kick-start novel research ideas, requires all applicants to pair with a researcher outside of their home institution and has been an important mechanism for nurturing interinstitutional team research between medical Scientists at Weill Cornell Medical College and basic researchers at the Hunter College Gene Center. From 2008 to 2012, Gene Center researchers have served as PIs on 17 seed-funding awards, with coinvestigators from across the consortium of CTSC partner organizations. These research projects have exposed complementary interests in investigations of cancer, neurobiology, and posttraumatic stress disorder. For example, collaborations between ophthalmology researchers at CTSC and laser physicists at the Gene Center have enhanced the resolution of imaging of the eye tissue 10-fold by using a focused laser to generate ultrasound for imaging ocular tissue.²⁸ Many papers, presentations, and abstracts have resulted from collaborations with CTSA institutions, and in particular with CTSC or Hunter Gene/RCMI partners.

Another innovative mechanism developed by the CTSC to initiate collaboration among clinical and basic researchers at partner institutions has been Speed Networking Research Bazaars that mimic a "speed-dating" format matching basic and clinical researchers with mutual interests. These bazaars have been successful at spawning multidisciplinary collaborations, and the procedures developed are now widely disseminated and used locally and nationally.²⁹

An historical integration of public and private institutions—creating a compact biomedical complex—is exemplified by the purchase of a floor by CTSC partner and minority institution, Hunter College in WCMC's new Belfer Research Building. The building will become the hub for significantly expanded bench-to-bedside translational research initiatives, and will open in late 2013 or early 2014. Additionally, MSKCC and Hunter will

build a new state-of-the-art science and medical facility that will include the Hunter College's new Science and Health Professions building with its School of Nursing.

Selected partnership focus areas. The CTSC and Hunter College have leveraged their considerable resources to create opportunities for substantial outreach to underserved minority communities to promote healthy lifestyles changes. One of these programs is a bidirectional, real-time, long-distance interactive videoconferencing series that fosters Health and Wellness education by connecting underserved communities at multiple sites to medical experts from Weill Cornell Medical College—mainly broadcasting from the Gene Center Video-collaboration Facility. The diverse topics have ranged from heart disease to obesity to fall prevention and are tailored to the needs and interests of the community. More than 100 events have been held in disparate neighborhoods, with audiences composed mostly of African Americans and Latinos.

A second significant collaboration has been the CTSC Community Outreach Program with the Hunter College School of Nursing, which provides free cardiovascular health screenings and education to the underserved in New York City. To date, the program has screened more than 1,700 participants at 23 events and has won support from the AstraZeneca Foundation. The program benefits not only the communities it reaches, but also students in the health professions who volunteer their time and exercise their clinical skills in a real-world setting.

Innovation. Overall, several biomedical and organizational innovations have developed as a result of the CTSC/Hunter College partnership. These include seed-funding awards that have supported interinstitutional, multidisciplinary collaborations between Gene Center investigators and faculty from CTSC partners; education and training awards to Hunter graduate students and faculty; an ongoing annual research symposium; integration and sharing of buildings, space and core resources that have facilitated interinstitutional collaborative team research; and community outreach to underserved minority populations.

Conclusions

The issues facing underserved minorities are complex. It is not untenable that solutions emerge from institutional partnerships as illustrated in this paper, where organizations that represent underserved minority communities play a preeminent role, tackling the complex interplay of factors ranging from access to affordable and quality healthcare to the environmental, cultural, and socioeconomic influences on determinants of health.

New Directions:

Improving health quality for all entails CTSA institutions transferring impactful scientific findings, knowledge, and discoveries that allow underserved communities to experience equitable population-based health benefits. We suggest several ways that this transfer could be supported to stimulate a richer national dialogue.

1. Support the development of scientific methods through conference series, which provide incentives for people to develop more collaborative proposals for interventions. For example, on race-specific disparities of birth weight, preterm³⁰ birth and prematurity, or on childhood obesity, or cardiovascular disease all of which disproportionately afflict minority populations.³¹

2. Set aside funds when access to minority populations is feasible and warranted.
3. The NIH already promotes the inclusion of minority population in all studies it supports³² but the social construct of society makes recruitment and/or retention of minorities more challenging (e.g., child/elder care, job insecurity, and distrust). However, pilot or supplemental funding specifically to include minority populations at an appropriately powered sample size could be more routinely provided.
4. Provide minority supplements for K scholars at CTSA committed to supporting HBI/MSI partners to enhance the diversity of a highly trained emerging workforce.
5. Form a “health disparities working group” at the CTSA consortium level, as a part of the Key Function Committees, such as community-engaged research, training and others.
6. Form targeted partnerships in working with NIMHD and disease specific institutes, e.g., around health measurement of disparities in terms of collecting and promoting health quality measures.
7. Evaluate the ways to leverage “rare disease status” for diseases that uniquely affect minorities or affect minorities in different ways recognizing that a single disease may be considered rare in a particular group of people. Similarly, orphan drug status (where there is no reasonable expectation that costs of research and development of the drug for the indication can be recovered by sales) could be sanctioned in such cases.
8. Greater participation of African Americans in clinical research is needed. More effort is needed to ensure recruitment and enrollment of African Americans is supported by general educational efforts to promote the importance of clinical research.
9. Leverage existing national seminar series (such as the NIH Health Disparities Seminar Series) for greater education of scientists and the community.
10. Better integration of activities among the RCMI and the CTSA could be supported, to enhance the synergy of these efforts. Such as a RCMI-CTSA mentoring/faculty development initiative to help retain and advance minorities in academia. The RCMI/CTSA national mentoring model proposal that was outlined under RETCD is one example of such a collaboration.
11. Use state-of-the-art interactive videoconferencing technologies more fully so as to offer seminars, plenary lectures, to promote and maintain collaborations among CTSA institutions and their HBI/MSI partners and vice versa through the RCMI Translational Research Network consortia. Use Internet 2 enabled instruments to facilitate collaboration in real time rather than asynchronously.
12. Establish specific initiatives for CTSA/RCMI partnering on drug discovery/development (phases 1 and 2 clinical trials, phase 3a, and IP development; sharing protocol development, study implementation, and IP/commercialization to enhance sustainability).
13. Create specific initiatives for expanding CTSA/RCMI community partnering initiatives to enhance community research and health education capacity.

Acknowledgments

This project has been funded in whole or in part with Federal funds from the National Center for Research Resources and National Center for Advancing Translational Sciences (NCATS), National Institutes of Health, through the Clinical and Translational Science

Awards Program (CTSA). The manuscript was approved by the CTSA Consortium Publications Committee.

All institutions are supported by the National Center for Advancing Translational Sciences (NCATS), National Institutes of Health (NIH), through the Clinical and Translational Science Awards Program (CTSA), a trademark of DHHS, part of the Roadmap Initiative, "Re-Engineering the Clinical Research Enterprise; Atlanta Clinical & Translational Science Institute

(ACTSI; Grant # UL1RR025008); Morehouse School of Medicine is also supported by the National Institute for Minority Health and Health Disparities (NIMHD) Research Centers at Minority Institutions (RCMI) RCMI grant # 8 G12 MD00760227 Centers of Excellence for Clinical and Translational Research (R-CENTER), Grant Number 8 U54 MD007588; Georgetown-Howard Universities Center for Clinical and Translational Science (GHUCCTS; Grant # UL1TR000101 previously UL1RR03197) Howard University is supported by the National Institute for Minority Health and Health Disparities (NIHMD) Research Centers at Minority Institutions (RCMI) RCMI grant # 8 G12 MD007597; Weill Cornell Medical College Clinical and Translational Science Center, including Hunter College (CTSC, grant # 2UL1 TR000457) Hunter College Center for Study of Gene Structure and Function is also supported by RCMI grant # 8 G12 MD007599; Vanderbilt Institute for Clinical Translational Research (VICTR; Grant #2 UL1 TR000445-06; previously UL1RR024975-01) Meharry Medical College is supported by the National Institute for Minority Health and Health Disparities (NIMHD) RCMI grant # 8 G12MD007586; UCLA CTSI Grant # 8UL1TR000124-02 previously 1U54RR31268-1A1); Charles Drew University is also supported by the National Institute for Minority Health and Health Disparities (U54MD007598 and U54MD008149); and UCLA is also supported by the Clinical and Translational Science Institute (UL1TR000124). We acknowledge helpful review of the manuscript by Valerie Montgomery Rice, MD; Sandra Harris-Hooker, PhD, and Vincent Bond, PhD; Daniel Blumenthal, MD; and James Lillard PhD from the RCMI programs at Morehouse School of Medicine.

References

- Agency for Healthcare Research and Quality. National Healthcare Disparities Report, December 4, 2004. (AHRQ Publication No 05-0014) Rockville, MD.
- Gornick ME, Eggers PW, Reilly TW, Mentnech RM, Fitterman LK, Kuken LE, Vladeck BC. Effects of race and income on mortality and use of services among Medicare beneficiaries. *N Engl J Med*. 1996; 335: 791-799.
- Wong MD, Shapiro MF, Boscardin WJ, Ettner SL. Contribution of major diseases to disparities in mortality. *N Engl J Med*. 2002; 347: 1585-1592.
- Hajat A, Lucas JB, Kington R. Health outcomes among Hispanic subgroups: data from the National Health Interview Survey, 1992-95. *Adv Data*. 2000; 310: 1-14.
- Buescher PA. A review of available data on the health of the Latino population in North Carolina. *N C Med J*. 2003; 64: 97-105.
- Flores C, Ma SF, Pino-Yanes M, Wade MS, Pérez-Méndez L, Kittles RA, Wang D, Papaiahgari S, Ford JG, Kumar R, et al. African ancestry is associated with asthma risk in African Americans. *PLoS One*. 2012; 7(1): e26807.
- Satcher D, Fryer, GE, Jr, McCann J, Troutman A, Woolf SH, Rust G. What if we were equal? A comparison of the black-white mortality gap in 1960 and 2000. *Health Aff (Millwood)*. 2005; 24(2): 459-464.
- LaVeist TA, Gaskin DJ, Richard P. *The Economic Burden of Health Inequalities in the United States*. The Joint Center Health Policy Institute. September 2009. Available at: <http://www.jointcenter.org/research/the-economic-burden-of-health-inequalities-in-the-united-states>. Accessed December 21, 2012.
- Treadwell H, Braithwaite RL, Braithwaite K, Oliver D, Holliday R. Leadership development for health researchers at historically black colleges and universities. *Am J Public Health*. 2009; 99 s1: S53-S57.
- Doumatey AP, Chen G, Ayele FT, Zhou J, Erdos M, Shriner D, Huang H, Adeleye J, Balogun W, Fasanmade O, et al. C-reactive protein (CRP) promoter polymorphisms influence circulating CRP levels in a genome-wide association study of African Americans. *Hum Mol Genet*. Jul 1 2012; 21(13): 3063-3072.
- Rasmussen-Torvik LJ, Guo X, Bowden DW, Bertoni AG, Sale MM, Yao J, Bluemke DA, Goodarzi MO, Chen YI, Vaidya D, et al. Fasting glucose GWAS candidate region analysis across ethnic groups in the Multiethnic Study of Atherosclerosis (MESA). *Genet Epidemiol*. May 2012; 36(4): 384-391.
- Schuh-Huerta SM, Johnson NA, Rosen MP, Sternfeld B, Cedars MI, Reijo Pera RA. Genetic variants and environmental factors associated with hormonal markers of ovarian reserve in Caucasian and African American women. *Hum Reprod*. Feb 2012; 27(2): 594-608.
- Spencer KL, Glenn K, Brown-Gentry K, Haines JL, Crawford DC. Population differences in genetic risk for age-related macular degeneration and implications for genetic testing. *Arch Ophthalmol*. Jan 2012; 130(1): 116-117.
- Ramirez AH, Shi Y, Schildcrout JS, Delaney JT, Xu H, Oetjens MT, Zuvich RL, Basford MA, Bowton E, Jiang M, et al. Predicting warfarin dosage in European-Americans and African-Americans using DNA samples linked to an electronic health record. *Pharmacogenomics*. Mar 2012; 13(4): 407-418.
- International Consortium for Blood Pressure Genome-Wide Association Studies, Ehret GB, Munroe PB, Rice KM, Bochud M, Johnson AD, Chasman DI, Smith AV, Tobin MD, Verwoert GC, et al. Genetic variants in novel pathways influence blood pressure and cardiovascular disease risk. *Nature*. Sep 11 2011; 478(7367): 103-109.
- Edwards TL, Edwards DRV, Villegas R, Cohen SS, Buchowski MS, Fowke JH, Schlundt D, Long J, Cai Q, Zheng W, et al. HTR1B, ADIPOR1, PPARGC1A, and CYP19A1 and obesity in a cohort of Caucasians and African Americans: an evaluation of gene-environment interactions and candidate genes. *Am J Epidemiol*. Jan 1 2012; 175(1): 11-21.
- Cole RT, Kalogeropoulos AP, Georgiopoulou VV, Gheorghiadu M, Quyyumi A, Yancy C, Butler J. Hydralazine and isosorbide dinitrate in heart failure: historical perspective, mechanisms, and future directions. *Circulation*. May 31 2011; 123(21): 2414-2422.
- Lenfant C. Clinical research to clinical practice: lost in translation? *N Engl J Med*. 2003; 349: 868-8674.
- U.S. Department of Education. Higher Education Act of 1965: Part B. Strengthening historically Black graduate institutions. 1999. Available at: <http://www2.ed.gov/programs/idea/idea3b/index.html>. Accessed December 21, 2012.
- Carey T, Howard D, Goldmon M, Roberson JT, Godley PA, Ammerman A. Developing effective interuniversity partnerships and community-based research to address health disparities. *Acad Med*. Nov 2005; 80(11): 1039-1045.
- "Profile of General Demographic: 2000 Census Summary File 1 (SF 1) 100-Percent Data. Howard County, Washington DC." *American FactFinder*. 2010. Bureau of the Census. Web. 11 July 2012.
- "Profile of General Demographic: 2000 Census Summary File 1 (SF 1) 100-Percent Data. Nashville, TN." *American FactFinder*. 2010. Bureau of the Census. Web. 11 July 2012.
- Profile of General Population and Housing Characteristics: 2010 Census Summary File 1 (SF1) 100-Percent Data. Atlanta, GA." *American FactFinder*. 2010. Bureau of the Census. Web. 11 July 2012.
- "General Housing Characteristics: 2010 Census Summary File 1 (SF1) 100-Percent Data. United States" *American FactFinder*. 2010. Bureau of the Census. Web. 11 July 2012.
- "Profile of General Population and Housing Characteristics: 2010. Demographic Profile Data (DP 1)." *American FactFinder*. 2010. Bureau of the Census. Web. 3 October 2012.
- Stephens DS, West AC, Ofili EO, Boyan BD, Blumberg HM. The Atlanta Clinical and Translational Science Institute: clinical and translational science education and training partnership. *Clin Transl Sci*. Jun 2011; 4(3): 143-145.
- Ruffin J. The science of eliminating health disparities: embracing a new paradigm. *AJPH*. 2010; 100(Suppl 1): S8-S9.
- Kong F, Chen YC, Lloyd HO, Silverman RH, Kim HH, Cannata JM, Shung KK. High-resolution photoacoustic imaging with focused laser and ultrasonic beams. *Appl Phys Lett*. 2009; 94(3): 033902-033902.
- Holmes LM. Perspective: speed networking for scientists. http://sciencecareers.sciencemag.org/career_magazine/previous_issues/articles/2009_06_12/caredita0900075. Accessed May 23, 2013.
- Soskolne G, Bennett A, Rankin KM, Collins JW. The infant mortality rate (365d, IMR) of term (37-42 wks) Non-Latino Whites, African-Americans, and Mexican-Americans: what's maternal nativity got to do with it? Presented at APHA 139th Annual Meeting and Exposition, Washington (DC), Nov 2011.
- Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. *Lancet*. 2002; 360: 473-478.
- NIH Revitalization Act of 1993, Pub. L. no. 103-43.(1993). Print.