Title: Improving Care for Chronic Diseases in Rural Dominican Republic and Guatemala: Development of a Mobile Technology Support System for Community Health Workers

Type: Spectrum Pilot Grants for Community Engagement

Co-Principal Investigators: Shuchi Anand, MD MS  
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Fellow in Pediatric Nephrology  
300 Pasteur Drive, Room G306, Mail Code 5208  
Palo Alto, CA 94305  
wvshih@stanford.edu

Mentors: Paul H. Wise, MD MPH  
Richard E. Behrman Professor of Child Health and Society  
117 Encina Commons  
Stanford, CA 94305-6019  
pwise@stanford.edu

Grant Miller, PhD  
Director, Stanford Center for International Development  
Associate Professor, School of Medicine  
117 Encina Commons  
Stanford, CA 94305-6019  
ngmiller@stanford.edu

Community Partner: Rural Alternative Center of El Limon (CAREL)  
Main Street, Parish of El Limon  
Municipality and Province of San Jose de Ocoa  
Dominican Republic  
Contact: Jon Katz, jon@el-limon.org
ABSTRACT

**Aims:** Chronic diseases such as diabetes, hypertension, and their sequelae—primarily cardiovascular disease—are now the leading cause of death in low- and middle-income countries (LMICs). Addressing chronic diseases requires a comprehensive healthcare delivery system able to operate within significant personnel and financial constraints. Many experts suggest that community health workers (CHWs) are a building-block for such a system. In this pilot project we will equip CHWs with a mobile technology support system to improve health care in rural settings.

**Methods:** This project will be a collaborative effort between Stanford, the Dominican community-based non-governmental organization Rural Alternative Center of El Limon (CAREL), the Provincial Ministry of Public Health, and the Global Telehealth Network. Working in three isolated villages in the Dominican Republic, we will support CHWs with a mobile technology platform, training, and clinical expertise. To perform screening for diabetes and hypertension, and to evaluate this project, we will perform pre- and post-intervention surveys with health-related quality of life as the outcome of interest.

**Innovation:** Though widely touted as a solution, few models exist for CHW-based management for chronic disease in LMICs. This project will address two important limitations identified from current data: lack of integration with health system and inability to participate in clinical decision making. The new, connected, CHW will conduct screening, help maintain medical records, and assist in the management of diabetes and hypertension, with the use of simple protocol-based decision-making tools and online access to national and international specialists.

PROBLEM STATEMENT

The World Health Organization projects that over the next two decades, chronic diseases will lead to five times as many deaths as infectious diseases. Currently half of these deaths in LMICs are labeled “premature.” Nearly a third occur during the productive years of an individual’s lifespan. Coping with these diseases requires a health care system that incorporates screening, reliable follow-up, and medication availability.

However, in most LMICs the skilled personnel and financial resources required to support such a comprehensive delivery system are unavailable. Terrain adds a third challenge in the Dominican Republic, where our proposed project will be piloted, and in Guatemala, where the project will be scaled up. Ill patients must travel for hours over hilly terrain or rivers to reach the nearest city hospital. Visits for preventive care to over-subscribed and under-stocked clinics are understandably rare.

Worldwide, ‘task-shifting’ or ‘task-sharing’ has emerged as an attractive approach for extending the reach of health care systems. Community health workers given a range of training can be deployed for functions that tax most systems: from counseling on safe sex to vaccination campaigns. Often residents of the community they are servicing, CHWs have been shown to be effective in maternal health, and both effective and cost-effective in HIV/AIDS treatment.

Results from studies of CHWs caring for patients with chronic diseases have been mixed. For example, in a cluster randomized trial in rural India, trained CHWs were able to correctly identify individuals at risk for cardiovascular events and make recommendations regarding therapy. Physicians agreed with the recommendations in 87% of re-reviewed cases. However, since the CHWs were not able to prescribe medications or even facilitate appointments with physicians, there were no differences in medication use between the intervention and control groups at two-year follow up. Similar results have been reported from a trial in Cape Town, South Africa (data not yet published).

RESEARCH PLAN

We will work with a recently re-invigorated CHW program in the Dominican Republic to address the challenges of integration and clinical decision making. We will develop an electronic, mobile support system that facilitates task-shifting in community-based chronic disease programs. By combining the strengths of a non-governmental organization with deep roots in three Dominican villages, the regional
public health system, and Stanford faculty experts in implementation of global health initiatives, our proposed intervention will have three components of support for the CHW:

1. Mobile technology platform
2. Training
3. Clinical expertise

**Mobile technology platform**: During the one-year period of this grant, the major objective will be to design and implement a tablet-based electronic decision support system whose inputs come from the CHW and which outputs a follow up and management plan, incorporating consultation from a clinician.

The prototype for this application is a childhood nutrition surveillance Android application developed under Dr. Paul Wise’s guidance and scheduled to be launched in 23 villages in Guatemala (Figure 1). After 12 years of working in Guatemala to address childhood malnutrition, Dr. Wise and his programming team (currently led by Alejandro Chavez) have created an electronic platform to simplify data capture, management recommendations, and research. This platform collects data on height/weight, plots the growth curve, and generates a recommendation based on the child’s clinical status. Data are stored on an encrypted server and interface with a website.

We will work with experienced programmers in Dr. Wise’s team to adapt this application for the detection and management of diabetes and hypertension. We envision it to have: data collection, prompting functions for follow up, and an ability to interface with an electronic medical record.

We will use low-cost Android tablets, connected by wi-fi where available and otherwise by cellular data links.

**Training**: We will develop modules for CHW training that focus on end-organ effects of diabetes and hypertension. These modules will also provide a formulary of generic medications that are often employed as first-line agents and are available in Dominican Republic. We will deliver these modules in-person and will also provide continuing education via telehealth connections.

**Clinical expertise and decision making tools**: Partners In Health, a leading global health organization founded among others by Dr. Paul Farmer and Dr. Jim Yong Kim and working towards health equity worldwide, is creating cost-conscious guidelines for chronic disease management.8 Using their algorithms for Rwanda as a guide, we will develop algorithms for detection and management of hypertension and diabetes (Figure 2). We will incorporate these algorithms as prompting functions in our electronic platform. At the end of each week, the CHW will have a consultation with a local primary care physician who will then use a project formulary list to prescribe or titrate medications.

After the CHW facilitates initiation of medication, he/she will be prompted to return to see the patient in follow-up, with further prompts directed by achievement of targets. If a specialty consultation is needed, a physician volunteer with the Global Telehealth Network will be available online to advise the CHW (and/or local physician) regarding further therapy.
**Preliminary work:** We will pilot our system in the villages of Los Naranjales, Los Martinez, and El Limon, with a total population of 600 and adult population of 350. CAREL, our community partner, has worked in these villages for over 15 years. One of its major accomplishments—a stepping stone for our program—is internet capability in remote regions. Reliable internet capability will enable use of electronic decision support and has supported successful telehealth consultations: in summer 2014, we consulted for a young man on dialysis, and a young woman with complications from type 1 diabetes.

Our group has discussed the proposed project with Dr. Edito Sosa, Provincial Director of the Ministry of Public Health and Social Assistance. Dr. Sosa has pledged to facilitate CHW and physician involvement. In addition, The Ministry of Health has recently committed to upgrade its CHW program, hiring and training one CHW for each 100 residents. Thus, within the period of this pilot, we will be working with 5-6 newly hired CHWs as well as one experienced CHW. Finally the Dominican Republic is implementing an electronic health record system with which we expect to interface our decision support system.

Based on an interview with the current CHW, we estimate that about 15% of the 350 adults (> 18 years of age) have known diabetes and/or hypertension. Taking into account newly detected cases, we would expect to be treating 50-75 people.

**TIMELINE**

<table>
<thead>
<tr>
<th>Months</th>
<th>CHW training and implementation work</th>
<th>Electronic Platform work</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct-Dec 2014</td>
<td>1. Discuss DM &amp; HTN protocols with Partners In Health Rwanda</td>
<td>1. Recruit Stanford students to work on adapting nutrition application</td>
</tr>
<tr>
<td></td>
<td>2. Apply for IRB approval at Stanford &amp; in DR*</td>
<td></td>
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<tr>
<td>Jan-Mar 2015</td>
<td>3. Feedback on protocols and on generic medications from DR Ministry and local physicians</td>
<td>2. Create baseline survey/data collection platform</td>
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<td></td>
<td>4. Start CHW training</td>
<td>3. Incorporate treatment prompts and protocols</td>
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<tr>
<td>Apr-June 2015</td>
<td>5. Perform “case-simulations” with CHWs and clinic physicians</td>
<td>4. Alpha test software with physicians and CHWs in DR</td>
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<tr>
<td></td>
<td>Project Implementation:</td>
<td>5. Beta test software in field</td>
</tr>
<tr>
<td></td>
<td>1. Baseline survey</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Management via mobile technology platform</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Telehealth consultations</td>
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</table>

*Ethics approval in the Dominican Republic requires a detailed protocol that will be reviewed by central Ministry of Public Health officials based in Santo Domingo; to be presented on our behalf by Dr. Sosa.*
Project evaluation: In the seventh month of the grant period, we will implement a community-wide baseline survey which will serve multiple functions including systematic screening for diabetes and hypertension cases, and baseline “pre-intervention” data on blood pressure, medication use, health-related quality of life, and health care expenditures. The survey will be an outreach tool, and encourage broader community involvement in healthcare issues.

After completion of year 1 of the intervention (July 2016), we will administer a “post-intervention” survey, with a primary outcome of interest being health-related quality of life scores among adults. Among the patients with hypertension or diabetes, we will examine the proportion on treatment, the proportion meeting targets, and changes in household expenditures on health. We will also incorporate a mixed-methods approach with qualitative focus group discussions and individual interviews to understand successes and failures.

DESCRIPTION OF INTERDISCIPLINARY COLLABORATIONS

The project creates an academic-community partnership within the framework of health services research. Team members will work together to harness Stanford’s expertise in clinical work, technology, and global health research to create an integrated system of care in a community with well-positioned advocates.

Stanford University

Dr. Shuchi Anand will provide expertise in the diagnosis and management of adult hypertension and diabetes, and is a recent recipient of a NIDDK K-23 focused on global health and chronic diseases. With Dr. Shih she will lead the development of protocols, CHW training modules, and the baseline survey. Both physicians will travel to the Dominican Republic to integrate feedback from Dominican Republic physicians, oversee case simulations using the tablet, and implement the baseline survey followed by the intervention.

Dr. Weiwen (Vivian) Shih will additionally serve as the pediatric expert in early detection and mitigation of pediatric kidney disease, as well as potential cross-over for the nutritional surveillance project in Guatemala.

Dr. Paul Wise has led a large-scale, extremely successful intervention to reduce childhood malnutrition in Guatemala. He will provide oversight and guidance at all key steps of this project as well as a pathway to expansion in Guatemala. His programming team will be the key technical resource for the creation of the electronic decision support platform.

Dr. Grant Miller will guide Drs. Anand and Shih as they create a plan for intervention evaluation for the pilot and its expansion. In particular he will help us explore aspects of household economics amenable to study and guide our quantitative research.

CAREL, El Limon de Ocoa, Dominican Republic

This Dominican, community-based non-governmental organization will provide on-site project management, facilitating community engagement, CHW training, and telecommunications access.

Ministry of Public Health and Social Assistance, Province of Ocoa

Dr. Edito Sosa will provide CHW funding, and facilitate primary care provider participation.

Global Telehealth Network

Dr. Jack Higgins will facilitate online physician consultations.
DESCRIPTION OF PLAN FOR COMMUNITY ENGAGEMENT

Our community partner, CAREL, has been an integral part of the El Limon, Los Martinez, and Los Naranjales communities for over 15 years, working with residents to construct the village’s hydroelectric system, internet capability, and a technical training center, and to implement a broad range of educational and cultural activities. CAREL is closely involved with the community’s medical problems, having provided extensive financial and logistical support to individuals with medical needs. In concert with Provincial public health experts and village leaders, CAREL has identified morbidity and mortality from chronic diseases as an increasing concern for most villagers.

Drawing from its extensive experience, linkages, and credibility with the three site communities, and working in close coordination with the PIs, CAREL will implement a community-wide participatory health initiative focused on the CHWs, with the objective of developing a social environment of community and individual responsibility for healthcare needs. This will be achieved through a series of meetings, workshops, and other activities that:

1. Introduce the project to key community actors then continue the outreach to the general population
2. Foster a mutually supportive relationship between CHWs, patients, and Public Health personnel
3. Raise awareness diabetes and hypertension as major causes of death and disability
4. Provide community feedback and accountability for CHW services.

A more detailed community engagement plan description is appended to CAREL’s Letter of Participation.

DESCRIPTION OF POTENTIAL IMPACT AND TRANSITION TO FUNDING

This project will serve as a model for training and integrating CHWs for chronic disease management in medically underserved areas throughout the world. We plan to expand this pilot study to the current sites of nutritional surveillance program in Guatemala (23 villages) and to CAREL’s network of 25 villages in Dominican Republic. Both countries are facing an increasing burden of diabetes and hypertension in their populations, and both are relying on CHW to supplement their primary care services.

The partners in this collaboration intend to seek additional funding for the program through the following sources: the Ministry of Public Health and Social Assistance of the Dominican Republic, Centers for Disease Control’s Division for Diabetes Translation, and the World Bank.

REFERENCES

Budget

Personnel

Program Coordinator (3/5 time)  16500
Stanford Computer Science Student Stipend  10000
Administrative costs (5%)  2367

Equipment

Tablets  6 x $200  1200
Diagnostic Equipment and Supplies  500
Upgrade of communities’ wireless access equipment  1600

Transportation

Limon-Los Martinez-Los Naranjales  3/wk x $20 x 50wk  3750
Ocoa-Santo Domingo  $50 x 40 trips  2000
2 PIs x 2 trips x $1200  4800

Communication

Internet service  2400
Cellphones (including data) (8 accounts x 12 months x $50)  4800

Total requested  49917

Additional funding (From Global Telehealth Network)

Training sessions and meetings  1200

Budget justification:

A large portion of the budget is devoted to personnel costs, including a program coordinator to be hired and supported by CAREL, who will serve as a conduit for all involved CHWs and physicians. He/she will have enough programming experience to trouble shoot the electronic platform, and will also be able to monitor data quality for the baseline survey. We will recruit a Stanford Computer Science student to work under Alejandro Chavez (current programming team leader) for adaption of nutritional surveillance platform to diabetes and hypertension detection and management. Stipend costs are estimated from Dr. Wise’s prior experience.

Project equipment requirements include tablets to be used by CHWs and diagnostic equipment for screening and follow up of diabetes and hypertension (electronic blood pressure cuffs, glucometers, and glucose strips). Transportation support for project coordinator, CAREL members, and principal investigators is also requested.

Finally, to support communication among CHWs and physicians, we will update, maintain, and extend the current internet connection with new batteries and radio transmission systems. We will assure cell phone connections in areas without internet connection. The Global Telehealth Network will cover costs of hosting and publicizing pre- and post-implementation meetings.
Biosketches of Stanford Personnel
BIOGRAPHICAL SKETCH

NAME OF GRANT APPLICANT
Anand, Shuchi

POSITION TITLE
Instructor, Division of Nephrology
Stanford University School of Medicine

A. Education and Training

<table>
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<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
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<tr>
<td>Carleton College</td>
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<td>Washington University School of Medicine</td>
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<tr>
<td>Stanford University School of Medicine</td>
<td>MS</td>
<td>2011-2013</td>
<td>Epidemiology</td>
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B. Personal Statement

I am extremely excited to propose a project on community health worker support in collaboration with partners in the Dominican Republic and mentors at Stanford. Not only does this project attempt to address gaps in current community health worker models, it also has a tremendous scope for scalability, with both groups from Dominican Republic and Guatemala expressing interest in doing so.

This proposal builds on my interest in working at intersection of the global health and chronic diseases. Directly relevant to this proposal, I have also completed a Fogarty Global Health Equity Scholarship, having spent the past year at the Center for Chronic Disease Control in New Delhi and am currently evaluating data from a surveillance study, looking at prevalence and risk factors of chronic kidney disease. In addition, I have recently completed a Masters in Health Research and Policy (Epidemiology). This project will be a milestone in my development as an investigator, allowing me to extend my reach beyond epidemiology into programmatic, health services research—a major goal of my K23 award. A superb group of mentors will guide this process. In addition to getting ongoing content guidance from Drs. Chertow and Barry (senior mentors on my K-23 project), I will get guidance relevant to implementation (Dr. Wise) and impact evaluation (Dr. Miller).

C. Research/and or Professional Experience

Employment/Positions

2001    Fogarty Intern, Bamako, Mali
2005    OC Hubert Fellow (Center for Disease Control), Nakhon Phanom, Thailand
2006    Research intern, Hopkins-Sassoon Hospital Maternal Infant HIV Transmission Trial
2006-2009 Resident, Internal Medicine, Brigham and Women's Hospital, Boston, MA
2009-2013 Fellow, Nephrology, Stanford University School of Medicine, Palo Alto, CA
2012-2013 Fogarty Global Health Equity Scholar, Stanford University School of Medicine and Center for Chronic Disease Control, India
2013-present Instructor, Division of Nephrology, Stanford University School of Medicine, Palo Alto, CA

Professional Memberships & Board Certifications

2009-present Member, American Society of Nephrology
2011-present Member, Stanford University Physician Scholars
2014-present Member, International Society of Nephrology
2014-present Coordinator, Global Health Nephrology Interest Group
2010 American Board of Internal Medicine Certification
2012 American Board of Internal Medicine Certification in Nephrology

Honors

1998 Knight Ridder National Scholar
2000 Phi Beta Kappa—Inductee during Junior year of College
2002 Minnesota Economic Association second place for Undergraduate thesis
2005 Washington University Alumni Award for outstanding scholarship
2006 Alpha omega alpha inductee during medical school

Publications

Most relevant to current award (in chronological order)


**Other publications (in chronological order)**


Research support

Current
K23DK101826-01 Anand (PI) 9/01/14-8/31/19
Chronic kidney disease epidemiology and management in South Asians.

Completed
R25TW009338 Barry (PI) 9/28/12 – 8/27/13
Fogarty Global Health Equity Scholar, placed a Center for Disease Control, New Delhi, India
Role: Post-doctoral fellow

F32 DK084697 Anand (PI) 9/28/09-09/27/10; 09/28/11-09/27/12
Ruth L. Kirschstein National Research Service Awards (NRSA) for Individual Postdoctoral Fellows; 2 years of funding (interrupted by clinical nephrology year) for “Self-reported physical activity in the dialysis population.”
A. Personal Statement

As a young pediatric nephrologist interested in global health, I am focused on improving outcomes, quality of care, and quality of life in patients in medically underserved countries. The proposed project fits well within these goals, as we work to develop a model for further community health worker programs in medically underserved countries worldwide. By working with the Stanford Center for Innovation in Global Health, I hope to further hone my skills in developing sustainable health care programs globally. This project will serve as an excellent springboard for me to expand my skills and further my understanding in implementation of global health research. I am fortunate to have the guidance of two mentors, Dr. Paul Wise and Dr. Grant Miller who provide excellent leadership and experience in the development of technology to facilitate medical global health and international medical research intervention evaluation, respectively. Following completion of residency, I chose to take an additional year working in General Pediatrics to gain more experience and knowledge as a General Pediatrician. During that time, I worked with residents and medical students to hone my teaching skills and further my understanding of working in an academic center. My confidence and capabilities expanded immensely, and the time only reinforced my desire to become an academic pediatric nephrologist. Since the start of my fellowship, I have been increasingly enthusiastic to broaden my experience from direct patient care to improving patient care through clinical research. In summary, my experience and enthusiasm as a new researcher combined with knowledgeable mentorship creates an ideal research environment and gives me the tools to lead the proposed project.

B. Positions and Honors

Positions and Employment

<table>
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<tr>
<th>Year</th>
<th>Position</th>
<th>Institution and Location</th>
<th>Degree/Field of Study</th>
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<td>2011-2012</td>
<td>Clinical Instructor</td>
<td>Division of General Pediatrics, Stanford University, Palo Alto, CA</td>
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<tr>
<td>2012-current</td>
<td>Fellow, Division of Pediatric Nephrology</td>
<td>Division of Pediatric Nephrology, Stanford University, Palo Alto, CA</td>
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</tbody>
</table>
2011-2012 Pediatrician, Division of General Pediatrics, Santa Clara Valley Medical Center, San Jose, CA
2009-2011 Resident, Division of Pediatrics, Stanford University, Palo Alto, CA
2008-2009 Intern, Division of Pediatrics, Stanford University, Palo Alto, CA

Other Experiences and Professional Memberships
2013-present Member, American Society of Nephrology
2012-present Member, American Society of Pediatric Nephrology
2010-present Member, Pediatric Academic Society
2008-present Member, American Academy of Pediatrics
2007-2008 Clinic Liaison, Texas Medical Association
2004-2008 Member, American Medical Association
2004-2008 Member, Texas Medical Association

Honors
2011-2012 Outstanding teacher in General Pediatrics
2008 John A. Mangos, MD Award for Excellence in Pediatrics
2013 Poster presentation for case presentation at Annual Dialysis Conference
2014 Poster presentation at Annual Dialysis Conference submitted
2014 Abstract for Pediatrics Academic Society submitted
2014 Poster presentation for case presentation at Annual Dialysis Conference submitted

C. Research Support

Ongoing Research

UL1 TR000093 and UL1 TR001085 Child Health Research Institute (CHRI) 7/1/2013-6/30/2015

To demonstrate an association between high chloride exposure and acute kidney injury, allowing for identification of modifiable risk factors to prevent the development of AKI in critically ill patients

Role: Post doctoral fellow
BIOGRAPHICAL SKETCH

NAME
Paul H. Wise, MD, MPH

POSITION TITLE
Professor of Pediatrics
Co-Director, March of Dimes Center for Prematurity Research, Stanford University

eRA COMMONS USER NAME
wisep

EDUCATION/TRAINING

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
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<td>Cornell University</td>
<td>AB</td>
<td>1969-74</td>
<td>Latin American Studies</td>
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<tr>
<td>Cornell University College of Medicine</td>
<td>MD</td>
<td>1974-78</td>
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<tr>
<td>Harvard School of Public Health</td>
<td>MPH</td>
<td>1977-8</td>
<td>General Studies</td>
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A. Personal Statement
My research activities have long been focused on disparities in birth and child health outcomes. Of special concern have been the life-course implications of early life exposures and the development of effective community-based and policy-based responses. I have a broad background in pediatric outcomes, health services, and policy research, and have led research teams focused on a variety of subspecialty disciplines, including neonatology, pulmonology, hematology/oncology, rheumatology, emergency medicine, and others. My current positions include Co-Director of the March of Dimes Center for Prematurity Research at Stanford University which is dedicated to addressing social disparities in prematurity and its sequelae. I have considerable experience in developing and supporting highly collaborative research initiatives that integrate clinical, basic and social science expertise. Prior to my current position, I served in highly interdisciplinary leadership roles, including Director of the Harvard Institute of Reproductive and Child Health and Vice-Chief of the Division of Social Medicine and Health Inequalities at Harvard Medical School. In addition, I have served in a variety of cross-disciplinary consultative roles, as Special Assistant to the US Surgeon General, Chair of the Steering Committee of the NIH Global Network for Women’s and Children’s Health Research, and currently, as Chair of the Task Force on Strategic Priorities of the Secretary of the Department of Health and Human Service’s Advisory Committee on Genetics, Health and Society. I am currently a member of the NICHD, NIH Advisory Council. Specific to this submission I have considerable experience working with community-based research and intervention programs in the developing world with particular interest in technology-based enhancements to community health worker capacity.

B. Positions and Honors.

1978-81 Residency in Pediatrics, Children’s Hospital Medical Center, Boston
1981-1984 Director, Emergency and Primary Care Services, Children’s Hospital, Boston, MA
1984-1987 Director of Perinatal Epidemiology, Joint Program in Neonatology, Brigham and Women’s Hospital, Boston, MA
1988 Young Professional Award, American Public Health Association
1990-91 Special Expert, NICHD, NIH and Office of the Surgeon General, USPHS
1992-1996 Director, Harvard Institute for Reproductive and Child Health, Harvard Medical School, Boston, MA
1995 Franklin Delano Roosevelt Award, The March of Dimes, Massachusetts Chapter
1996-2004 Director, Social and Health Policy Research Department of Pediatrics, Boston Medical Center
2000-2006 Chair, NIH Global Network for Women’s and Children’s Health Research, NICHD, NIH
2001  Richard and Millie Brock Award for Contributions to Pediatrics, New York
       Academy of Medicine
2002  Anne E. Dyson Memorial Award Visiting Professor, Department of Pediatrics,
       University Rochester School of Medicine
2003-4  Vice-Chief, Division of Social Medicine and Health Inequalities
        Department of Medicine
        Brigham and Women’s Hospital
2004-14  Director, Center for Policy, Outcomes and Prevention, Dept. of Pediatrics;
         and Core Faculty, Centers for Health Policy and Primary Care and Outcomes
         Research, Stanford University
2005-   Richard E. Behrman Professor of Child Health and Society, Professor of
       Pediatrics, Stanford University School of Medicine
2007-11  Member, Secretary’s Advisory Committee on Genetics, Health and Society,
         DHHS. Chair, Task Force on Strategic Planning
2010-   Senior Fellow, Freeman-Spogli Institute for International Studies, Stanford
         University
2011-   Co-Director, March of Dimes Center for Prematurity Research
2012-   National Advisory Child Health and Human Development Council, NICHD, NIH

C.  Selected peer-reviewed publications (Selected from 156 publications).

Most relevant to the current application

2.  Kempe A, Wise PH, Barkan SE, et. al. Clinical determinants of the racial disparity in very low birth
      hospitalization for children with chronic conditions in California: A total-population study. Pediatrics
5.  Wise MD, Little AA, Wise PH, Wang CJ. Can state early intervention programs meet the increased
      demand of children suspected of having autism spectrum disorders? J Devel Behav Peds 2010;
      31(6):469-76.
      Xu X. Maternal cigarette smoking, metabolic gene polymorphism, and infant birth weight. JAMA.
      population study of pediatric rheumatology inpatients in California. Arthritis Care Res (Hoboken).
      2011;63(7):998-1005.
      pediatric subspecialty care: a population study of pediatric oncology inpatients in California. J Ped
      Hem Onc. (In Press).
9.  Lakkam M, Wager S, Wise PH, Wein LM. Quantifying and exploiting the age dependence in the
        Population-level correlates of preterm delivery among black and white women in the U.S. PLoS
11. Shaw GM, Wise PH, Mayo J, Carmichael SL, Ley C, Lyell DJ, Shachar BZ, Melsop K, Phibbs CS,
      Stevenson DK, Parsonnet J, Gould JB. Maternal prepregnancy body mass index and risk of
**Additional publications of importance to the field**


**D. Research Support**

**Ongoing Research Support**

<table>
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<td><strong>Center for Integrating Ethics and Genetic Research</strong></td>
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<tr>
<td>The major goals of this project are to identify the implications of new genetic discoveries on health policy and ethics.</td>
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<td>Role: Investigator</td>
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<td>March of Dimes Birth Defects Foundation (Stevenson, PI)</td>
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<td>SPO #50185</td>
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<td><strong>March of Dimes Prematurity Research Center at Stanford University</strong></td>
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<td>The major goals of the project are to disentangle what appear to be the evasive host (genetic) environments that underlie preterm birth.</td>
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<tr>
<td>Role: Co-PI</td>
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<tr>
<td>1R25TW00951001</td>
<td>Wang, PI</td>
<td>07/01/13 – 01/31/18</td>
<td>NIH</td>
</tr>
<tr>
<td>(SPO#107566)</td>
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<td><strong>Integrating Technology and Context into Research Ethics Education in ACME</strong></td>
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<td>The major goal of this project is to train scholars and emerging healthcare leaders from developing countries in Asia on research ethics via the Asia Collaborative for Medical Education (ACME) Collaborative.</td>
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<tr>
<td>Role: Investigator</td>
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<tr>
<td>U01 HL103629</td>
<td>Robinson, PI</td>
<td>09/01/10-04/30/17</td>
<td>NIH</td>
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</tbody>
</table>
Clinic, Family & Community Collaboration to Treat Overweight and Obese Children
The purpose of this study is to study the effectiveness of behavioral, social and environmental interventions to prevent and treat overweight and obese children.
Role: Investigator

Freeman-Spogli Institute for International Studies (Wise, PI) 01/01/12-8/31/14
Improving Child Health in Areas of Unstable Governance
This project is directed at identifying child health needs and service provision failures in areas of the world affected by political instability and civil conflict. It is focused on generating new technical and political strategies designed to ensure more effective service provision in complex political settings.

### Completed Research Support

California Health Care Foundation 17591 (Wise, PI) 04/01/13 –09/30/14
**Improving California Children’s Services CCS Through User-Driven Data Analysis**
The major goals of this program are to provide the California Department of Health Care Services (DHCS) and stakeholders of the California Children’s Services program (CCS) with data-driven guidance necessary to make policy and programmatic changes to improve the care of children with special health care needs. (CSHCN).

California Health Care Foundation (Wise, PI) 08/01/10-06/30/11
**Utilization and Expenditure Analysis of the California Children’s Services Database**
This project examines the epidemiology of health care utilization and expenditures among children in the California Children’s Services program, primarily all children enrolled in Medicaid with a serious chronic illness in California.
BIOGRAPHICAL SKETCH

NAME
Miller, Norman Grantham

POSITION TITLE
Associate Professor of Medicine

eRA COMMONS USER NAME
Miller.Norman

EDUCATION/TRAINING

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE (if applicable)</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yale University</td>
<td>B.A.</td>
<td>1995</td>
<td>Psychology</td>
</tr>
<tr>
<td>Harvard University</td>
<td>M.P.P.</td>
<td>2000</td>
<td>Public Policy</td>
</tr>
<tr>
<td>Harvard University</td>
<td>Ph.D.</td>
<td>2005</td>
<td>Health Policy/Economics</td>
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</table>

A. Personal Statement
My research focuses on (1) evaluating health policies and programs for improving population health and (2) developing and testing new strategies for addressing the behavioral obstacles that can limit their impact. On the former, I have conducted evaluations of programs and policies including the family planning and reproductive services of Profamilia in Colombia, the New Rural Cooperative Medical Scheme in China (China’s major health insurance program for the rural poor), the Chiranjeevi Yojana Program in India (covering the expense of institutional deliveries among poor women in Gujarat, India) and Colombia’s Regimen Subsidiado (the predominant publicly-financed health insurance program in Colombia). On the latter, I have conducted large-scale intervention-based experimental studies of demand- and supply-side barriers to the appropriate adoption and use of public health and basic medical technologies. I have led my work on behavioral obstacles to health improvement with teams in India, Bangladesh, and China. Finally, I am currently developing a new initiative to join Stanford with Indian health policymakers and professionals to investigate the social, behavioral, and institutional obstacles to health policy success. The initiative will develop an agenda led by the experience of these Indian health policymakers and professionals, and it will develop and conduct graduate level student team projects spanning three quarters (including one in India in collaboration with India peer students). Given these experiences, I am well-qualified to support Dr. Anand and Shih in their proposed research in the Dominican Republic. I will work with them in particular on the areas of impact evaluation and scalability.

B. Positions and Honors

Positions and Employment
2014 - Director, Stanford Center for International Development, Stanford University
2012 - Associate Professor of Medicine (with tenure), Stanford University
2005 - Assistant Professor of Medicine, Department of Medicine, Stanford University
2006 - Assistant Professor of Economics (by courtesy) and Assistant Professor of Health Research and Policy (by courtesy), Stanford University
2008 - 2010 Academic Visitor, Department of Economics, Universidad de los Andes
2012 - Associate Professor of Medicine, Department of Medicine, Stanford University; Senior Fellow, Freeman Spogli Institute for International Studies, Stanford University; Associate Professor of Economics (by courtesy) and Associate Professor of Health Research and Policy (by courtesy), Stanford University

Other Experience and Professional Memberships

2002 - present  Member: International Health Economics Association

2002 - present  Member: AcademyHealth

2003 - present  Member: Population Association of America

2004 - present  Member: American Economic Association

2009 - present  Grant Reviewer: National Institute of Child Health and Human Development (NIH/NICHD) Special Emphasis Panel; National Science Foundation

2009  External Ph.D. Examiner: Department of Economics, University College London

**Honors and Awards**

2000 - 2002  Graduate Award - the Harvard Health Policy Program for research on health and health care in Iran

2000 - 2002  Agency for Healthcare Research and Quality Trainee

2002 - 2004  Harvard Center for International Development Graduate Student Fellow

2002 - 2005  NBER Pre-Doctoral Fellow in Aging and Health Economics

2005  Graduate Award - the Warburg Fund through the Harvard Economics Department for research on the social consequences of civil conflict in Colombia

2005 - 2012  Faculty Research Fellow, National Bureau of Economic Research (NBER)

2005 - 2006  Faculty Fellow, Stanford Center for International Development

2005 - 2006  Faculty Affiliate, Stanford Center for Latin American Studies

2006  Best Student Paper Prize, American Society of Economists (Inaugural Award)

2006  Biennial Prize for Distinguished Contribution to Scholarship in Population, American Sociological Association Section on Population (Inaugural Award)

2009 - 2012  Faculty Affiliate, Woods Institute for the Environment, Stanford University

2009  Divisional Teaching Award, Department of Medicine, Stanford University

2010  Inter-American Prize for Research on Social Security, Conferencia Interamericana de Seguridad Social (CISS)

2011  Divisional Teaching Award, Department of Medicine, Stanford University

2012  Member, Urban Services Initiative, Abdul Latif Jameel Poverty Action Lab (J-PAL)

2012  Research Associate, National Bureau of Economic Research (NBER)

2013  Excellence in Refereeing, American Economic Review

2013  Research Associate, ESRC Research Centre for Micro-Social Change (MISOC), Institute for Social and Economic Research, University of Essex

2014  Affiliate, Abdul Latif Jameel Poverty Action Lab (J-PAL)

**C. PUBLICATIONS**

**Articles most relevant to the current application**


**D. RESEARCH SUPPORT**

**Ongoing Research Support**

Freeman Spogli Institute, Stanford University  Miller (PI)  08/01/14-07/31/19

*The Stanford-India Health Policy Initiative (SIHPI) and Micronutrient Deficiencies in Tamil Nadu, India*

This project aims to design and test interventions to improve the performance of childhood nutrition programs using a rigorous randomized controlled trial (RCT) methodology. SIHPI’s network and field-based investigation will provide on-the-ground intelligence to guide their structure.

Role: Principal Investigator

NIH (SPO# 48696) 5R01 HL10602304  Miller (PI)  06/15/11-03/31/16

*Paying for Performance and CE of Strategies to Combat Anemia in China*

This project studies how direct rewards for better health (lower anemia rates) to primary school principals in rural China alter the use of educational and nutritional inputs. It also analyzes how these incentives substitute or complement similar incentives provided to students’ parents.

Gates Foundation  Mohanan (PI)  06/06/11-03/31/15

*BEST- Bihar Evolution of Social Franchising and Telemedicine*

The major goal of this project is to carry out an evaluation of the impact of a large-scale social franchising and telemedicine program financed by the Gates Foundation in rural Bihar as well as related additional studies on how to improve the effectiveness of health care delivery in rural India.

Role: PI: Sub Award

NIH 1RC4 TW00878101  Barry (PI)  09/01/10-08/31/14

*Stanford Global Health Consortium: Innovation, Design, Evaluation and Action*
The major goals of this project are to develop infrastructure at Stanford for innovation in the design and modeling of new diagnostics, drugs, and devices for global health which are scalable, have high impact, and are able to be implemented and commercialized.

Role: Investigator

**Completed Research Support**

NIH - Center for Innovation in Global Health
8-RTW008781Z Barry (PI) 08/1/13-07/31/14
*The Stanford-India Emergency Management and Research Institute (EMRI) Study*
This study aims to provide the first quantitative evidence of GVK EMRI's early impact on population-level infant and maternal health outcomes.
Role: Sub Award

K01 HD053504 Miller (PI) 06/01/07 –05/31/11
NIH/NICHD
The Causes and Behavioral Foundations of Mortality Decline in Developing Countries Career Development Award to synthesize applied econometrics and demography into a new program of empirical mortality research.

Gates Foundation Mohanan (PI) 11/15/10-07/31/11
Evaluation of Private Provider Project in Bihar
This project is to plan an evaluation of the impact of a large-scale social franchising and telemedicine program financed by the Gates Foundation in rural Bihar. It will also plan additional studies on how to improve the effectiveness of health care delivery in rural India as well.
Role: PI, subcontract

International Initiative for Impact Evaluation (3IE) (Mohanan, PI) 05/01/10-05/31/12
*Improving Maternal and Child Health in India: Evaluating Demand and Supply Side Strategies*
This project's objectives are to evaluate voucher programs to increase rates of institutional deliveries among poor women in two India states (Gujarat and Karnataka) and to conduct experimental studies of how performance-based incentive payments to medical care providers improve their effectiveness.
Role: PI, subcontract

Presidential Fund for Innovation Miller (Co-PI) 01/01/12 –08/31/13
International Studies Freeman Spogli Institute for International Studies
*Paying for Performance to Improve Health in Rural China: Does Resource Scarcity Breed Innovation in Service Delivery?*
The major goals of this project are to analyze how the degree of innovation in service delivery under such incentives responds to the amount of resources available.