



CHIEF> **PAUL FARMER, M.D., PH.D.** (2003–2005, 2009–PRESENT)

Division of

GLOBAL HEALTH EQUITY

The Division of Global Health Equity is committed to strengthening healthcare delivery, training, and research; to reducing disparities in disease burden; and to improving treatment outcomes for the most needy, both domestically and abroad. Established in 2001, the division works in close collaboration with the nonprofit Partners In Health (PIH) and the Department of Global Health and Social Medicine (DGHSM) at Harvard Medical School (HMS).

Recognizing the complex social determinants of health, division faculty aim to reduce health disparities by undertaking essential research using insights from anthropology, history, sociology, epidemiology, economics, and other social sciences to improve medical care in the world's poorest areas. The division focuses on infectious diseases such as human immunodeficiency virus (HIV), tuberculosis (TB), Ebola Virus Disease (EVD), cholera, and hepatitis, as well as non-infectious diseases such as coronary artery disease, diabetes, and substance

use disorder. Under the leadership of division chief Dr. Paul Farmer, the division works to improve care delivery globally and strengthen health systems. This year the division expanded its advocacy role recognizing that domestic health issues are at a critical moment with safety net programs and affordable insurance at risk and that these issues are deeply interwoven with global equity issues. The division also expanded education efforts into new geographies and new student populations domestically and globally.

STRENGTHENING HEALTH SYSTEMS

Domestic Initiatives

Navajo Nation

Founded in 2009, Community Outreach Patient Empowerment (COPE) is a collaboration among the division, the Navajo Nation Community Health Representative (CHR) Program, the Navajo Area Indian Health Service, and PIH. Led by Dr. Sonya Shin, COPE is based in Gallup, New Mexico. COPE is committed to eliminating health disparities in American Indian and Alaskan Native populations, working at the invitation of tribal leadership. COPE establishes partnerships with healthcare providers and community advocates to address structural barriers to good health, to respond to the burden of disease, and to fill gaps in the healthcare delivery system identified by patients, families, and providers.

COPE provides technical assistance to a diverse group of local stakeholders working to build more-effective healthcare delivery systems and increase food access in Navajo communities. Specific projects include the formation of interprofessional community health teams that meaningfully integrate CHRs in healthcare delivery and case management processes; delivery of robust, community-based outreach; and implementation of multi-level strategies aimed at transforming regional food systems.

This year, under COPE associate director Dr. Sara Selig's leadership and with funding from the Patient Centered Outcomes Research Institute (PCORI) as well as an HMS Eleanor and Miles Shore Fellowship Award, COPE developed a Cancer Patient and Family

Advisory Committee, some of whose members are engaging in qualitative, community-driven research on cancer services on Navajo Nation. This work also engages local, regional, and national stakeholders to increase collaboration and improve cancer outcomes on Navajo Nation. Additionally, this year, Dr. Selig and her team hosted the 2nd Annual COPE-Navajo Cancer Survivorship Conference in partnership with the Navajo Department of Health.

With funding from CDC, COPE has launched a Fruit and Vegetable Prescription Program, partnering with local health clinics and hospital, local stores, and farmers markets. Doctors prescribe fruit and vegetable vouchers to families who face insecurity and increased risk of diet-related disease. Families, in turn, receive health coaching sessions and redeem the vouchers with local stores and growers. Launched in 2015, the program aims to reduce health risk and increase access to healthful foods across Navajo Nation.

Starting in 2015, COPE began working beyond Navajo Nation supporting local partners on the Rosebud Reservation in South Dakota to help strengthen the healthcare system of the Sicangu Lakota Nation. 27,000 Sicangu live in the 2,000-square-mile Nation in southern South Dakota. The expansion is an innovative example of collaboration between two strong Native communities and reflects COPE's unique, culturally attuned approach to improving health. It also will bring much-needed resources and expertise to the Nation's healthcare system.

International Initiatives

Guatemala

Division faculty member Dr. Peter Rohloff co-founded Maya Health Alliance, a nongovernmental health services organization in Guatemala. The organization is one of the largest providers of primary healthcare

and related social services in indigenous Maya communities in central Guatemala. Maya Health Alliance addresses the many cultural, linguistic, and logistical barriers that prevent indigenous patients in Guatemala from receiving the health services they need.

Currently, Dr. Rohloff serves as chief medical officer at Maya Health Alliance. In this role he is responsible for guiding health information technology and quality improvement efforts and building research capacity and promoting research collaborations with other Guatemalan and Central American research institutions.

Current funded research includes the development of smartphone decision support tools to improve the continuum of obstetrical and neonatal care in rural Guatemala and the evaluation of care navigation strategies to improve emergency obstetrical care within regional Guatemalan referral hospitals. In addition, he recently completed a randomized clinical trial of a home-based intervention to improve nutrition and developmental outcomes in infants with chronic malnutrition and, in Boston, he is a member of the Harvard- and PIH-based Early Child Development working group. A final major area of effort is the evaluation of lifestyle and behavior-change interventions for rural populations at high risk of cardiovascular and diabetes morbidity and mortality. As part of this, this year he has collaborated with division faculty member Dr. MaryCatherine Arbour to apply statistical process control tools to the analysis of longitudinal diabetes panel data.

Haiti

The division, working with PIH, has a long history in Haiti. For over 25 years, division faculty have collaborated with Zanmi Lasante (ZL), one of the main healthcare providers in the country. ZL's mission is to increase access to health services for the poorest individuals and to improve the health and the overall

standard of living for residents of the country's rural Central Plateau. Today, ZL ranks as the main provider of healthcare in central Haiti and the only provider of comprehensive primary care, regardless of ability to pay. The number of patient visits to ZL's 12 sites grew to more than 725,000 in 2015. Many division faculty began their international work at ZL and continue to be closely involved in the project.

Another focus of division collaborative efforts in Haiti is the Hôpital Universitaire de Mirebalais (HUM). In partnership with Haiti's Ministry of Health, HMS, and other partners, division faculty work with PIH and ZL to provide care and medical education at the hospital in Mirebalais. HUM serves as a regional referral facility and teaching hospital that grew from the near-destruction of Haiti's main teaching hospital in Port-au-Prince in the devastating 2010 earthquake. The 300-bed hospital offers services never before available at a public hospital in Haiti, including computed tomography (CT) scans, advanced surgical care, and endoscopy. HUM has a 24-hour emergency department, a women's health clinic, general medicine clinic, infectious diseases clinic, and specialty clinics for orthopedic surgery, general surgery, noncommunicable diseases (NCDs), mental health, internal medicine, pediatrics, urology, oncology, and ear, nose, and throat (ENT) care. A neonatal intensive care unit opened in 2013. Clinical services are supplemented by pharmacy, radiographic services, and clinical laboratories, and the hospital is staffed by over 800 people. In addition to providing faculty leaders at HUM, the division is deeply involved in research and education at the hospital and across the Central Plateau region.

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The division provided leadership support for the development of emergency care in Haiti. In 2013, with the opening of HUM, the emergency department (ED) also opened, providing round-the-clock emergency care for patients with acute illness and injury. In the first year, BWH faculty Drs. Regan Marsh and Shada Rouhani led a six-month Certificate in Emergency Medicine for Haitian physicians, which was co-sponsored by ZL and the Haitian Ministry of Health. In 2014, HUM opened the first emergency medicine residency in the history of Haiti. The three-year training program is based on international standards and graduated its first class in October 2017. Both the certificate and residency program students were taught by a combination of local faculty and visiting faculty, with significant participation from BWH emergency physicians who are affiliated with the division. As the residency program grows, these new, fully qualified Haitian emergency physicians will raise the standard of emergency care and training throughout the country.

Liberia

The division began working in Liberia in 2010 through Last Mile Health (LMH), a nongovernmental organization founded by faculty member Dr. Raj Panjabi with other survivors of Liberia's civil war and with American health workers. More than a billion people worldwide lack access to healthcare due to distance. This injustice is particularly acute in Liberia, where 1.2 million people live in remote communities. As a result of remoteness, those living at Liberia's "last mile" often have to travel long hours by canoe, motorbike, or on foot to reach the nearest health facility. The LMH mission is to save lives in the world's most remote communities. In partnership with the government, the organization designs, demonstrates, scales, and advocates for national networks of paid, supervised community health professionals who bridge the gap between remote communities and the public sector health system.

LMH aims to address the global inequity of access to healthcare that afflicts the most remote places in the world by training and deploying cadres of community

health professionals to provide lifesaving care at the last mile. Community health workers are recruited, trained, and equipped to prevent, diagnose, and treat the ten most life-threatening health conditions in Liberia. Over the past year, LMH has trained nearly 500 community health professionals to deliver care in over 460 last-mile communities spread across Rivercess and Grand Gedeh Counties – extending primary care to over 80,000 people.

At the national level, LMH is a key technical partner to the Liberia Ministry of Health to roll out the historic National Community Health Assistant Program, which will deploy over 4,000 health workers to provide the 1.2 million Liberians who live more than five kilometers from the nearest health center with lifesaving healthcare. To date, 2,330 Community Health Assistants (CHAs) have been fully trained and are serving an estimated 680,000 people in 2,500 remote communities.

In 2015, in close collaboration with LMH, division faculty and PIH began working directly in Liberia initially to deliver care during an EVD outbreak. Following the outbreak, the Liberia Ministry of Health requested that the team from the division, PIH, and LMH stay to help build and revitalize the health system. Since June 2016, PIH has renovated J.J. Dossen Hospital and Pleebo Health Center in Maryland County and has set up a comprehensive health system including the deployment of CHAs, and improving the quality of care in the health centers and the referral hospital. In addition to improving the workforce by hiring nurses, pediatricians, obstetricians, and internal medicine physicians, PIH has built a radiology department at J.J. Dossen Hospital with digital x-ray and ultrasound capacity and a comprehensive lab. In addition, PIH is working closely with the Ministry to build the TB and multidrug-resistant TB (MDR-TB) program in Liberia. PIH is co-managing the national MDR-TB hospital in the capital city, Monrovia, and assisting in the development of MDR-TB, pediatric TB, and HIV/TB co-infected expansion plans and guidelines. PIH has also been awarded a USAID TB STRONG grant, which will expand treatment and diagnostic capacity

of MDR-TB across the southeast region of Liberia. PIH also received a UNICEF grant to train over 150 CHAs in Maryland County as part of the national scale-up of the CHA workforce plan to have CHAs provide care for those patients who live in remote areas. PIH is also investing in improving medical education for nursing and medical residency education.

In 2017, Dr. Corrado Cancedda was awarded a five-year grant by the U.S. Health Resources and Services Administration to lead a consortium in the development of the Resilience and Responsive Health System Initiative (RRHS) in Liberia. Partners include Yale University, New York University, and PIH. In the aftermath of the Ebola epidemic, Liberia's health system needed to be strengthened in order to deliver high-quality and comprehensive health services to its population and withstand the next health crisis. The RRHS seeks to strengthen the capacity of Liberia's main academic institutions to train health professionals, physicians, nurses, midwives, health administrators, and community health workers. The project will also complement activities of the Health Workforce Program, a World Bank-funded health professional training initiative that was informed by the Human Resources for Health (HRH) Program. Division faculty member Dr. Jason Beste will lead RRHS at the Liberian College of Physicians and Surgeons and Tubman University Nursing School to train family medicine residents and nurses at PIH-affiliated sites in Maryland County.

Madagascar

Since 2013, the division has been supporting the work of PIVOT, a nongovernmental organization founded by faculty member Dr. Michael Rich. PIVOT's mission is to work in partnership with communities, combining accessible healthcare delivery with rigorous scientific research to save lives and break cycles of poverty and disease. PIVOT collaborates directly with the Madagascar Ministry of Health to provide an evidence-based, research-supported health system model for rural Madagascar and beyond. This model is transforming health conditions in one of the world's poorest countries, with one of the weakest

health systems. When PIVOT began working in Ifanadiana district, under-five mortality was 1 in 6 and lifetime maternal mortality was 1 in 14, with \$14 per capita spending on healthcare.

In the past three years, PIVOT has launched programs to support and strengthen the public health system serving 200,000 people at community, health center, and district hospital levels. Key programs include malnutrition, maternal/child health, TB, removal of user fees for all patients, clinical training and supervision, and an ambulance network. To date, PIVOT has treated over 100,000 patients with Ministry partners.

This year, results from a longitudinal cohort study of a representative sample of 1,520 households in the Ifanadiana district show the impressive impact of PIVOT's first three years. Led in partnership with HMS and the Madagascar Institute of Statistics, this study demonstrates population-level impacts that include some of the most statistically rigorous and independently verified evidence of changes in healthcare access and mortality rates within a government district. Between 2014 and 2016, utilization rates of health facilities quadrupled and delivery rates in facilities doubled. Neonatal and under-five mortality declined by 36% and 19%, respectively. PIVOT is humbled and proud to report these results and looks forward to continued progress with vital support from our partners and community.

Malawi

In January 2007, at the invitation of the Ministry of Health (MOH), division faculty and PIH first began working in the Neno district of Malawi, one of the world's poorest countries with a life expectancy of 62 years of age. A country of 18 million, Malawi has one of the world's highest adult prevalence rates of HIV/AIDS at around 9%. Malawians also have one of the highest ratios of maternal mortality globally – in 2015, an estimated 634 maternal deaths per 100,000 live births. Acute malnutrition affects about 5% of children under five, and the incidence of malaria is one of the highest in the world.

Division faculty are committed to strengthening the health system and improving outcomes in Malawi. The Malawi project, called Abwenzi Pa Za Umoyo (APZU), has made significant progress in Neno since its launch. Within the first few years, both a district hospital and a community hospital and two health centers have been constructed. Today, APZU supports the MOH in delivery of health services at two hospitals and 12 health centers. In 2013, the first-ever surgical suites were opened at both hospitals. In 2014, the hospital began operating the only publicly available oxygen plant in Malawi, and a 70-bed maternity ward opened in early 2015. Additionally, early 2016 saw the opening of the Dambe Health Center, a facility serving one of the most remote areas of Malawi. With the help of division faculty, APZU has supported the MOH in running a decentralized HIV program to all 14 facilities with the best retention and survival outcomes in Malawi, a program that was found to be cost-effective in a research study published in *AIDS* in 2017. The reasons for the program's success include a large cadre of Community Health Workers (CHWs), attention to socioeconomic needs of the patients, and robust support of the public sector. Patients with Kaposi's sarcoma (KS) continue to receive chemotherapy and palliative care at Neno District Hospital, through an innovative program supported by the division and the Dana-Farber Cancer Institute (DFCI), which is one of the only providers of second-line chemotherapy for KS in Malawi.

In 2015, APZU and the MOH used this strong HIV platform to launch the Integrated Chronic Care Clinic (IC3), a program at all 14 facilities aimed at caring for patients with HIV and/or NCDs such as hypertension, asthma, epilepsy, and diabetes. Today, there are almost 8,000 HIV patients and over 2,000 NCD patients in care. Mirroring this model of integration at the clinic, APZU is currently transitioning the CHW program to the "Household Model," a polyvalent program in which the over 1,000 CHWs address malnutrition, TB, HIV, NCDs, and maternal health for the rural population of Neno. This program is being rolled out in a cluster-randomized stepped-wedge design with results anticipated at the end of 2018.

In 2017, in partnership with the MOH, APZU finalized the "District Leadership for Universal Health Coverage and Coordination of Stakeholders" Toolkit, or D-LUCS. This toolkit aims to support district MOH leadership to craft visionary health plans for their district, align implementing partners and funding around these plans, and utilize a structured monitoring and evaluation approach for assessing progress. Currently this project is being piloted in seven districts across the southwest zone.

APZU continues to focus on building the next generation of healthcare providers by developing Neno as a rural primary care training site. This is the third year of Malawian medical students rotating in Neno for their family medicine electives. APZU supports rotating students and fellows from four



academic programs, and leadership is pursuing multiple research initiatives. Current ongoing projects, in partnership with several different institutions worldwide, include development of a CHW Selection Tool, the “Household Model” evaluation, assessment of the impact of CHWs on water sanitation, an evaluation of the Prevention of Mother to Child Transmission (PMTCT) program, and a cost-effectiveness evaluation of the IC3 program.

Mexico

In 2011, division faculty helped to launch Partners In Health/Compañeros En Salud (PIH/CES), a sister organization of PIH. Under the leadership of division faculty members including Drs. Daniel Palazuelos, Hugo Flores, and Patrick Elliott, PIH/CES revitalizes rural government clinics in the Sierra Madre de Chiapas – one of the most marginalized regions in the country – to transform health outcomes and clinician education.

While Mexico’s health system has been celebrated for reaching near universal coverage by expanding government health insurance, accessing high-quality care remains elusive for the rural poor. In partnership with the Ministry of Health, PIH/CES currently operates in ten rural public clinics providing over 30,000 patient consults yearly to vulnerable people who previously had no reliable health services. Since August 2017, with support from the federal government in Mexico, PIH/CES also operates the maternity department of a community hospital, where it seeks to set a model of safe and patient-centered care for other parts of the state and the country. PIH/CES designed its service footprint as a learning laboratory for effective and innovative primary care methods. Among the notable results to date, the CES has surpassed national benchmarks in chronic disease detection and outcomes, pioneered rural access to mental healthcare, and achieved outstanding rates of patient satisfaction, particularly in maternal care.

The CES maternal health program, backed by the federal government in Mexico, brings a new cadre

of health professionals into the public system. These professionals, Licenciadas en Enfermería y Obstetricia (LEOs), Enfermeras Perinatales, and Parteras Técnicas, serve as models to be replicated by other sites in the state and the country. This effort is part of a broader movement financed by the MacArthur Foundation with the goal of transferring low-risk deliveries facilities with inpatient capacity.

PIH/CES educates Mexican and international clinical trainees in global health delivery, both in the classroom and in the field. PIH/CES recruits top Mexican social service physicians and obstetric nurses to participate in a career-defining training experiences creating “agents of change” working toward a more equitable health system. They participate in an accredited certificate course in global health equity, monthly onsite supportive supervision, and intensive mentorship from visiting residents and attendings. The majority of graduates have continued working in global health, either pursuing graduate education, joining PIH/CES, or joining another global health group. PIH/CES offers elective rotations and in-depth collaborations for international non-medical graduate students, medical residents, and attending physicians coming from different programs like the HEAL initiative at UCSF, University of Notre Dame, University of Louisville, and the London School of Hygiene and Tropical Medicine.

PIH/CES is also spearheading high-impact implementation research that builds Mexican research capacity and tests clinical innovations with relevance across Mexico. The site has established a research committee that promotes equitable access to research leadership opportunities for staff, and mentorship in all aspects of the research process. As of spring 2017, CES has published articles regarding its educational model and related efforts on treating depression at the community level. It has submitted for peer review major research products related to the management of patients with chronic depression. It has also presented the work on maternal health at the Consortium of Universities for Global Health conference.

Nepal

Division faculty members Drs. Duncan Maru and Ryan Schwarz and division resident Dr. Dan Schwarz work in partnership with Possible, a nonprofit entity in rural Nepal that delivers high-quality, affordable healthcare integrating government hospitals, clinics, CHWs, and referral care. The organization's innovative public-private partnership leverages the Nepali government, external development partners, and philanthropic funds to deliver durable healthcare to one of the poorest regions in South Asia.

Since its founding in 2008, Possible has treated over 500,000 patients and serves a catchment area population of 120,000 in the remote Achham and Dolakha districts.

Russia

From a base in Tomsk Oblast, Siberia, division faculty and PIH have been working since 1998 in collaboration with the Russian Ministry of Health to combat one of the world's most severe epidemics of MDR-TB. The project has focused on improving clinical services for MDR-TB patients in Tomsk, while undertaking training and research to catalyze change in the treatment of MDR-TB across the entire Russian Federation. Key components of the clinical effort include improving diagnostics to detect cases earlier, developing a comprehensive strategy to strengthen the adherence to treatment among patients, and enhancing infection control in hospitals.

DIVISION FACULTY MEMBERS DRs. DUNCAN MARU AND RYAN SCHWARZ AND DIVISION RESIDENT DR. DAN SCHWARZ WORK IN PARTNERSHIP WITH **POSSIBLE**, A NONPROFIT HEALTHCARE ENTITY IN RURAL NEPAL THAT DELIVERS HIGH-QUALITY, AFFORDABLE HEALTHCARE INTEGRATING GOVERNMENT HOSPITALS, CLINICS, CHWS, AND REFERRAL CARE.

Possible has deployed a unique digital continuous surveillance system that combines longitudinal care delivery by CHWs at the household level, a mobile phone application for vital events registration and care coordination, GPS location with unique household identifiers, biometrics integration, and a facility-based electronic medical record. Through this system, Possible measures population health outcomes for impact evaluation and implementation research.

In the coming year, Possible is working with the Nepali government to roll out a new national health insurance pilot program, further expand its catchment area to 200,000 people, and strengthen facility-based services throughout Achham and Dolakha districts, including new MDR-TB, HIV/AIDS, and mental healthcare programs.

In June 2017, Dr. Salmaan Keshavjee led the Russia research team in partnership with Harvard University's Davis Center to launch the conference "Outpatient Care Delivery in the Russian Federation: Creating a Platform for Improved Health Outcomes." As a part of the conference preparation, Davis Center colleagues submitted the paper "Outpatient care in Russia: organization, problems, outcomes." The conference was held at the Higher School of Economics in Moscow. Using a bio-social lens, this conference examined medical, social, and economic impact of investment in extending the reach of hospitals and clinics into the communities where patients live and work. Speakers examined how stronger community-based and ambulatory healthcare delivery systems can complement existing hospital-based care delivery models. Proceedings from this conference will inform the next phase of research funded by the Eli Lilly Foundation.

Rwanda

In 2005, division faculty and PIH launched their first project in Africa through an innovative partnership with the Rwandan Ministry of Health (MOH). Together with PIH's Rwandan sister organization, Inshuti Mu Buzima (IMB), the project has brought high-quality healthcare to three rural districts that previously had some of the country's worst health outcomes. Working closely with the Ministry of Health, the project provides direct services to a population of over one million people at three hospitals and 45 health centers, with the help of approximately 7,200 CHWs. With funding from the Jeff Gordon Children's Foundation and technical assistance from the Dana-Farber/Brigham and Women's Cancer Center (DF/BWCC), the Rwandan MOH and IMB opened the Butaro Cancer Center of Excellence (BCCoE) in 2012.

Building on IMB's previous work in diagnosing and managing chronic conditions such as HIV and TB,

IMB has continued to develop an innovative platform for delivery of services for NCDs, such as hypertension, heart failure, diabetes, chronic respiratory diseases, and cancer. Led by division faculty members Drs. Neil Gupta and Paul Park, IMB is supporting a scale-up of district hospital-based NCD services throughout the country. The BCCoE serves as a national referral facility, offering preventive care, pathology-based diagnosis, chemotherapy, surgery, referral for radiotherapy, and palliative care, as well as social and economic support. IMB supports the Rwanda MOH with national policy and implementation, and seeks to translate policy successes via NCD Synergies, a collaboration of African countries supporting NCD policy and innovation, established by division faculty member Dr. Gene Bukhman. In 2015, the BCCoE's services expanded through the Butaro Ambulatory Cancer Center, a facility newly built through support from the Cummings Family Foundation.



Drs. Paul Farmer and Peter Drobac tour the construction site for the University of Global Health Equity's future campus in Butaro, Rwanda. *Photo by Zacharias Abubeker for UGHE.*

With support from the Doris Duke Charitable Foundation, IMB concluded a seven-year grant focused on health systems implementation, training, and research capacity building, led by division faculty Drs. Peter Drobac, Lisa Hirschhorn, and Neil Gupta. A key aspect of this project included improving the quality of care delivered by nurses, who provide the majority of primary care in rural clinics throughout Rwanda. Initiated in 2010, the Mentorship, Enhanced Supervision, and Quality Improvement (MESH-QI) program aims to improve quality of care through intensive training, mentoring, and supervision of health center nurses across many types of care. The Rwandan government, with the support of IMB clinical nurse mentors, has scaled the program across the country in the areas of HIV/AIDS, maternal, neonatal, and child health (MNCH), and NCDs, and IMB has supported implementation across PIH sites globally. In 2016, Jennifer Goldsmith, division administrator, worked as lead editor of the toolkit guide developed by the research team to expand understanding and implementation of MESH-QI, reflecting a culmination of this mentorship effort. In addition, Ms. Goldsmith served as the lead editor of the Costing Toolkit designed to provide technical skills for effective cost analysis and management using a comprehensive methodology. The toolkit was designed for managers of health organizations and governments in low- and middle-income countries and provides an approach for local adaptation. The overall goal of these documents, which can be disseminated beyond Rwanda, is to provide critical resource utilization data and strengthen accounting and financial reporting practices to meet organizational needs and ultimately strengthen health systems.

In the area of MNCH, the Ministry and IMB have prioritized innovations in improving neonatal survival. Division faculty member Dr. Hema Magge has led a team at IMB to develop innovative neonatal care units, including the introduction of bubble continuous positive airway pressure, at several rural district hospitals, and to design National Neonatal Care Protocols to guide the care of newborns across the country. Furthermore, IMB successfully

concluded the intensive phase of the All Babies Count Initiative, a combined clinical mentorship and quality-improvement approach at all health system levels, which resulted in a 33% reduction in neonatal mortality. With support from the USAID "Saving Lives at Birth" program, this model will be scaled to eight additional catchment areas in the near future.

The Human Resources for Health (HRH) Program, a seven-year, \$150 million initiative launched by the Government of Rwanda in 2012 with support from division faculty, entered its fifth year of successfully training future specialists in the country. BWH and HMS are partners in a consortium of 22 U.S. universities and academic medical centers participating in the program, which aims to support Rwanda's growing medical and educational capacity and help establish a world-class, self-sustaining national healthcare system. Division faculty, led by Dr. Corrado Cancedda with support from Drs. Marla McKnight and Gene Bukhman, helped to conceptualize and implement the HRH Program. Division and other U.S. faculty members are working with local institutions, colleagues, and trainees to train the next generation of doctors, clinicians, medical educators, nurses, and midwives across the main specialty and subspecialty areas over the course of seven years. Since 2012, seven Harvard-affiliated institutions (led by BWH and HMS) have deployed over 70 faculty to Rwanda and supported 22 training programs (11 of which did not exist before), which are on track to train over 4,600 health professionals by 2019.

Dr. Marla McKnight currently works with internal medicine trainees and early career faculty members at the University of Rwanda to establish clinical research projects. They are currently working on finishing two papers for submission for publication.

Sierra Leone

Division faculty members Drs. Corrado Cancedda and Kerry Dierberg began working in Sierra Leone in the fall of 2014 focusing on responding to the EVD outbreak. At the request of the Ministry of Health and Sanitation (MOHS), in partnership with PIH teams, division faculty set up services to address the

EVD outbreak in Port Loko District, Kono District, and in the nation's capital, Freetown. Division faculty also assisted with the set-up of the National Survivor Eye Care Program, recognizing that approximately 15 percent of survivors seem to contract uveitis, an inflammation of the eye that can lead to blindness.

By 2015, the focus had shifted to the transition from EVD emergency response to health systems strengthening initiatives in Kono and Port Loko Districts. These efforts have primarily focused around Koidu Government Hospital and nearby WellBody Clinic in Kono, and to a lesser degree at Port Loko Government Hospital. Faculty have assisted with improving hospital infrastructure, diagnostic capacity, patient-care systems, and training of clinical staff. In addition, division faculty, including Drs. Kerry Dierberg and Alishya Mayfield, conduct teaching rounds with national staff in these facilities to build local capacity and increase the quality of care for patients suffering from TB, HIV, hepatitis B, malaria, malnutrition, and NCDs. Similar to models developed at other PIH-supported sites, our faculty in Sierra Leone are involved with creating systems to support healthcare delivery from the community level to the primary care level and on through the secondary and tertiary care level.

Vietnam

Dr. Lisa Cosimi studies ways to strengthen health systems and the quality of healthcare in resource-limited settings. She designed a model that trained public healthcare workers to provide mentoring in both clinical care and quality-improvement methodology to improve the quality of HIV care in clinics throughout a rural province of Vietnam. Lessons learned from this model are being used to help the Ministry of Health expand its national quality-improvement initiative. Ongoing work includes examining the acceptability and feasibility of novel modes of education such as e-mentoring to improve HIV clinical education and healthcare quality, and studying methods to reform undergraduate and postgraduate medical education in Vietnam. In addition, Dr. Andrew Ellner was

funded by FHI 360 to provide technical assistance to establish a learning collaborative of community health centers in Ho Chi Minh City, focused on building capacity to prevent and treat NCDs using a team-based model of care.

The Global Health Delivery Project

The Global Health Delivery Project (GHD), under the leadership of Dr. Rebecca Weintraub, is based at BWH and HMS. GHD is supporting implementers by generating new knowledge and professional networks in healthcare delivery through research, education, dissemination of evidence-based clinical research, and virtual collaborations.

GHD's library of nearly 40 teaching cases and companion teaching notes explores how leaders implement value-based principles. In 2016-2017, GHD developed its first case looking at healthcare in the U.S.—Project ECHO: Expanding the Capacity of Primary Care Providers to Address Complex Conditions—as well as a new concept note to support the collection. Institutions in more than 125 countries have used the cases, which have been downloaded over 7,000 times. The GHD team presented two oral abstracts at the Consortium of Universities for Global Health 2017 annual conference. The abstracts were also published in *The Lancet Global Health*.

GHD's web-based platform, GHDonline, comprises professional virtual communities designed specifically for global health professionals worldwide. GHDonline now hosts more than 23,000 members representing over 7,000 organizations from 188 countries. Members engage across seven public and dozens of private communities of practice, each of which is focused on a common challenge in healthcare delivery and guided by an expert moderator.

The GHD team worked with The Rx Foundation to host a series of online virtual Expert Panels to engage new and existing members in professional collaboration and knowledge exchange on topics including the opioid epidemic and the community health workforce. GHD received support to launch a virtual community on global diagnostics after an online Expert Panel on the topic generated significant interest and engagement.

Social Medicine Consortium

In 2015, Dr. Michelle Morse worked with several former division residents who are now leaders at other academic medical centers to co-found the Social Medicine Consortium (SMC). Dr. Morse describes the SMC as a platform for reimagining education of health professionals and advocating for systems-level change towards achieving global health equity. This global coalition seeks to use advocacy, education, and research to rectify the miseducation of health professionals on the root causes of illness using the practice and teaching of social medicine. The SMC is a coalition of more than 400 health professionals representing over 20 organizations and universities from numerous countries including the U.S. The SMC has convened dynamic conferences hosting more than 400 global attendees each year. The work is supported by the Macy Foundation and the Physicians Foundation, both of which are committed to furthering advocacy for the teaching of Social Determinants of Health. The SMC structure helped launch fourteen social medicine teaching cases with support from the Radcliffe Institute. In the spring of 2018, the SMC will host its third annual global conference in Navajo Nation in partnership with COPE.

Advocacy for Healthcare Access and Addressing Inequities in Care Delivery

Division faculty and the SCM have responded to threats to U.S. healthcare coverage through publications and public presence. They have advocated for healthcare coverage for all Americans, in collaboration with Harvard Medicine Indivisible and other grassroots groups. Drs. Morse and Mukherjee spoke at several city-wide events both at HMS and the Massachusetts State House, fighting policy proposals that would strip healthcare from at least 23 million Americans.

Dr. Morse has also taken on a leadership role in the Department of Medicine (DOM) Health Equity Committee which includes faculty, staff, and trainees from across the department, reflects a commitment to understanding inequities that are documented in patient care and to build on existing infrastructure to achieve institutional health equity goals. As a component of this work, Dr. Morse and division administrator Jennifer Goldsmith are participating on a national Institute for Healthcare Improvement initiative to address racial inequity in healthcare. This two-year commitment involves both the DOM and Southern Jamaica Plain Health Center.

EDUCATION

The division is committed to the education and training of future leaders in global healthcare delivery through the Doris and Howard Hiatt Residency in Global Health Equity at BWH, residencies and an administrative fellowship at HUM in Haiti, and through courses, curriculum development, and online communities, each of which focuses on a deepening understanding of how to fundamentally reduce inequities in global health.

The Doris and Howard Hiatt Residency in Global Health Equity

With a commitment to increasing the number of young physicians who aim to dedicate their careers

to improving health of impoverished people in the U.S. and abroad, the division, the Department of Medicine (DOM), and BWH created a unique residency program to address this growing interest. In 2004, the Doris and Howard Hiatt Residency in Global Health Equity and Internal Medicine was established as a comprehensive program that includes training in internal medicine; coursework in research methods, public policy, global health advocacy; and research and patient-care experiences in impoverished settings at PIH sites around the world. The program adds an additional training year to Internal Medicine and Internal Medicine and Pediatrics residencies. The residency program honors division co-founder Dr. Howard Hiatt and his late wife, Doris.

Residents in the program maintain a rigorous training schedule in Boston and are engaged in lifesaving efforts around the world. Response to the residency has been enthusiastic, attracting attention from universities and teaching hospitals throughout the world. Interest among young physicians is strong. To date, of the 51 graduates of the residency, 85 percent have built careers in global health, while others have focused on primary care, health policy, research, and innovation in care delivery.

Recent accomplishments of residents include:

- Designing a national postgraduate medical education curriculum in Botswana
- Developing protocols for Ebola-treatment units in Liberia and Sierra Leone
- Improving NCD services in a rural district of Malawi
- Training community health workers and medical officers in Chiapas, Mexico
- Strengthening a community health worker program in the Navajo Nation, and developing an innovative nutritional support program throughout the reservation
- Developing a public-private partnership in Nepal to improve community- and facility-based care throughout remote areas of the country
- Coordinating a hepatitis C treatment trial, and developing and implementing oncology treatment protocols in rural Rwanda
- Documenting successful efforts in Haiti and Rwanda to prevent the transmission of HIV from mother to child
- Building a graduate medical education program in Haiti, in collaboration with the Haiti Ministry of Health
- Assessing health-service coverage in Liberia
- Developing a clinical ultrasound elective with faculty from BWH for the GHE residents to learn, and then translate their own learning to colleagues in multiple PIH country sites
- Developing a nonprofit management elective for GHE residents, in conjunction with the leadership of PIH

Continuing Medical Education Courses

In 2017, the division offered a Continuing Medical Education (CME) course that was attended by more than 60 clinicians from the U.S. and globally. Fifteen division faculty taught the course, “Understanding Global Healthcare Delivery.” The syllabus addressed the biosocial determinants of health and disease and explored how programs to deliver healthcare in low-resource settings address these factors to improve the health of the communities they serve. Course evaluations were extremely favorable, and the division will offer the course again in 2018. Also in Boston in 2016-2017, Dr. Ed Nardell taught a unique “Building Design and Airborne Infection Control” course to 40 students from around the world. He has taught similar courses in Lima, Peru, and Pretoria, South Africa. This year, the course was offered under the auspices of BWH, rather than partner entities, and drew its largest student population to date.

Monthly Grand Rounds

The division began offering monthly grand rounds in 2014 as an interactive forum for both speakers and attendees to keep abreast of their colleagues’ work, share best practices, and receive constructive feedback from peers in the global health community. This year’s lectures include:

- Reframing NCDs and Injuries for the Poorest Billion, Gene Bukhman, M.D., Ph.D.
- Rethinking Global Health Education: University of Global Health Equity, Rwanda, Peter Drobac, M.D.
- Universal Health Coverage, Joia Mukherjee, M.D.
- Biosocial Approaches to Ebola Virus Disease, Eugene Richardson, M.D., Ph.D.
- Improving Quality of Care for Mothers and Newborns with the BetterBirth Program and the WHO Safe Childbirth Checklist, Katherine Semrau, Ph.D.

Annual Victor Dzau Lecture in Global Health Equity

The endowed Victor Dzau Lecture annually invites a leader in global health to discuss research, clinical work, or an innovative and replicable approach to improving healthcare delivery. In 2017, Dr. Wafaa El-Sadr, the Dr. Mathilde Krim-amfAR Chair of Global Health at Columbia University and Director, International Center for AIDS Care and Treatment Programs (ICAP), spoke on "Implementation Science: Taking Knowledge to Action."

BWH Global Health Hub

The division is responsible for maintaining the hospital's Global Health Hub website. This site offers stories of work in global health beyond the division. Posts include articles, Q&A format interviews, and personal narratives. Working in collaboration with BWH Communications, division administrator Jennifer Goldsmith has written or curated stories on:

- Anesthesia in Rwanda
- An emergency medicine physician working with refugees in Greece
- Community healthcare at Department of Medicine (DOM) with a global reach
- Women's Health fellows focusing on reproductive rights in Nepal

This partnership presents important work at BWH that crosses divisional and departmental lines and recognizes collective global and humanitarian health efforts.

UpToDate African Donation Program

The Global Health Delivery Project of the division has partnered with UpToDate, a leading, evidence-based, clinical-information resource to expand access to medical resources globally. Through this partnership, GHD manages the UpToDate subscription donation program and has helped to coordinate nearly 3,000 free UpToDate subscriptions to individuals and institutions in resource-limited settings in 120 countries. With Ariadne Labs, GHD is studying the

barriers and facilitators to use UpToDate to work toward maximizing the program's impact. In addition, GHD is evaluating the use of UpToDate in two sub-Saharan medical schools to gauge its impact on medical education.

Education Initiatives at Hôpital Universitaire de Mirebalais

Dr. Michelle Morse served as deputy chief medical officer for PIH from 2013 to 2016, and established the first three residency programs offered at HUM in 2013: general surgery, internal medicine, and pediatrics. In 2014, the country's first emergency medicine residency program was launched with collaboration from the division and BWH faculty members Drs. Shada Rouhani and Regan Marsh. Emergency medicine is a new specialty in Haiti, and the residency will save lives and impact patient care in dramatic ways, ideally expanding these critical skills across the country. Since then, the hospital has expanded to serve a catchment area of three million people with an annual budget of \$12 million, while now hosting six residency programs with over 100 residents in training annually and working towards being the first resource-poor country to achieve international accreditation through ACGME International. The division also hosts Dr. Aaron Berkowitz, the director of BWH's Global Neurology program. He works collaboratively with expertise built in the division to offer partnership, training, and consultation with physicians in Haiti.

Dr. Morse led the HUM Department of Medical Education and Research from 2012 to 2013 to standardize academic training across HUM, as a leading facility for training and research for the country. The department seeks to train an adequate number of Haitian health providers dedicated to vulnerable rural populations and to establish a locally relevant research strategy that promotes Haitian-led research in health-systems strengthening, implementation science, and clinical care. As co-principal investigator for a \$1 million grant from the Kellogg Foundation, Dr. Morse has led a two-year project to expand and improve these training programs in Haiti and complete a country-wide human resources for health policy analysis.

In 2015, the division launched the David Walton Administrative Fellowship to develop the managerial and leadership skills of healthcare administrators working at PIH Haiti. To date, eight Haitian colleagues have participated in the initiative. In its first year, two members of ZL's finance team spent six weeks in Boston rotating through BWH and Partners HealthCare departments to gain a rich understanding of the functional areas and operations that might be transferable to their own. The second cohort, three administrators from ZL, spent six weeks in 2016 rotating through meetings with BWH and PHS leaders to better understand program operations. In 2016, two administrators, one from Human Resources and another from central management, and a pharmacist from Haiti were Walton Fellows with projects customized to their needs and interests and those of ZL. Each fellowship culminates with a month spent in Boston to develop a capstone project that is authentic and practical, while building internal administrative leadership capacity at ZL. Under the guidance of fellowship director Jennifer Goldsmith, fellows have undertaken projects that include monthly accounting and variance analysis improvement, unit-dose control pharmacy implementation and employee engagement in ancillary areas.

EqualHealth

In the aftermath of the devastating 2010 earthquake in Haiti, then-GHE-resident Michelle Morse and BWH medicine-pediatrics resident Zadok Sacks saw a decimated clinical education system that they hoped they could help strengthen. They established the nonprofit EqualHealth, which works with clinicians across the career continuum including medical and nursing students, practitioners, master educators, and the population of providers and leaders in healthcare in Haiti. In 2017, under the continued leadership of Drs. Morse and Sacks, EqualHealth offered its fifth annual three-week intensive Social Medicine course for North American and Haitian trainees, which now boasts over 100 graduates and has resulted in the founding of a student-led organization that aims to transform health professional education through social medicine, a Haiti-wide Medical Education conference, and Visiting Professor and Teach the Teacher programs. In addition, in 2015, EqualHealth launched the Marshall Wolf Medical Education Fellowship, which enabled two Haitian clinicians to spend time in residence at BWH to gain increased mastery as teachers, and which continues to host fellows annually with two new fellows beginning their training in October 2017.

IN THE AFTERMATH OF THE DEVASTATING 2010 EARTHQUAKE IN HAITI, THEN-GHE-RESIDENT MICHELLE MORSE AND BWH MEDICINE-PEDIATRICS RESIDENT ZADOK SACKS SAW A DECIMATED CLINICAL EDUCATION SYSTEM THAT THEY HOPED THEY COULD HELP STRENGTHEN. THEY ESTABLISHED THE NONPROFIT *EQUALHEALTH*, WHICH WORKS WITH CLINICIANS ACROSS THE CAREER CONTINUUM INCLUDING MEDICAL AND NURSING STUDENTS, PRACTITIONERS, MASTER EDUCATORS, AND THE POPULATION OF PROVIDERS AND LEADERS IN HEALTHCARE IN HAITI.

University of Global Health Equity – Rwanda

Dr. Peter Drobac leads efforts to establish the University of Global Health Equity (UGHE) in Rwanda. UGHE is a private institution designed to leverage expertise and resources from the government of Rwanda, BWH leadership, HMS, and key partners to create a forum for delivery-focused teaching, research, clinical care, and implementation. UGHE's academic programs aim to harness the best ideas in higher education and integrate cutting-edge technology platforms with immersion in complex healthcare delivery systems. Programs will be fundamentally rooted in innovative pedagogy, with a focus on team-based and problem-based techniques, and will train the next generation of African and international leaders. UGHE enrolled students in its first academic degree program in September 2015 and graduated its first class of Master's students in June 2017. International and local experts in global health delivery, including DGHE faculty Drs. Peter Drobac, Joseph Rhatigan, Joia Mukherjee, Michelle Morse, and Paul Farmer, all taught at UGHE last year.

Center for Global Health Delivery – Dubai

Dr. Keshavjee has been leading the HMS Center for Global Health Delivery—Dubai since 2014. Under his direction, the Center addresses some of the most pressing health challenges in the region by focusing on research, medical education, and training that promise to improve healthcare delivery systems and patient outcomes for diseases prevalent in the United Arab Emirates, Middle East, North Africa, and neighboring regions. The Center also provides opportunities for faculty and students to pursue research related to the delivery of existing or new interventions that can cure or prevent disease, specifically in the following priority areas: diabetes and obesity, infectious disease, mental health, and surgery. This year the Center sponsored eleven students to attend the division's Global Health Delivery Intensive Course this summer, creating a valuable synergy among division faculty and efforts in many countries.



Members of the University of Global Health Equity's Master of Science in Global Health Delivery Class of 2017 pose for a class photo with His Excellency, Paul Kagame; the First Lady; Honorable Minister of Health, Dr. Diane Gashumba; Dr. Peter Drobac; Honorable Minister of Education, Dr. Papias Musafiri Malimba; Dr. Paul Farmer; Dr. Gary Gottlieb; and Dr. Agnes Binagwaho. *Photo courtesy of Urugwiro Village.*

Global Health Delivery Intensive Course

The Global Health Delivery Intensive Summer Program is a concentrated three-week session with classes in epidemiology, management science, and healthcare delivery. Now in its ninth year, the program has trained over 300 practitioners from around the world and serves as the foundational course to a two-year Master's of Medical Science in Global Health Delivery at HMS. The 2017 cohort included 56 students representing 27 countries, including Argentina, Bulgaria, Burundi, Canada, Chile, Colombia, Costa Rica, Egypt, Eritrea, Ghana, Haiti, India, Jordan, Lebanon, Liberia, Nepal, Nigeria, Papua New Guinea, Rwanda, Saudi Arabia, Sierra Leone, Sudan, Tanzania, Turkey, UAE, United Kingdom, and USA. Their professional roles were diverse, including clinicians and providers, managers, community health workers, researchers, medical students, and educators, all emerging leaders in healthcare delivery.

Global Health Delivery Course – Malawi

In October, Dr. Emily Wroe led the second annual Global Health Delivery Course - Malawi with participants from Ministry of Health (MOH) leadership in seven districts in the southwest zone and national MOH leadership. The group used case-based learning and workshopped to produce the final version of PIH Malawi's "District Leadership for Universal Health Coverage and Coordination of Stakeholders" Toolkit. This toolkit, being piloted in seven districts, supports the MOH to produce visionary health plans for their district, align implementing partners, and utilize a structured Monitoring and Evaluation approach to assess progress in achieving program goals.

Doris Duke International Research Fellowship

This prestigious fellowship provides a funded year for U.S.-based medical students to conduct mentored research in global health while developing medical proficiency. Dr. Bisola Ojikutu serves as the co-principal investigator, and Dr. Louise Ivers serves as a mentor in this program, which is designed to develop the next generation of clinical investigators in global health.

Global Health and Security

Dr. Margaret Bourdeaux continues her work as a leader in understanding the fragile state of health system post-conflict. This year, she designed and led the Harvard Global Health Institute's Summit on Threatened Health Systems. Among the 45 Summit participants were representatives from six conflict-affected state health systems: Haiti, Liberia, Kosovo, Afghanistan, Syria, and Northern Iraq. Conceptually, the program focused on research showing that health systems and institutions often struggle to maintain function during periods of acute stress and suffer inadequate support for years to decades after the conclusion of a crisis. The program considered new approaches to support health systems in these contexts.

Undergraduate Curriculum and Textbook

Dr. Joia Mukherjee recognized the need for a comprehensive undergraduate global health textbook given that global health is the number one undergraduate minor in the U.S.. She has written her forthcoming textbook from a social justice perspective, exploring social movements and implementation strategies that are needed to deliver care as a human right to all. The book will be published by Oxford University Press in November 2017. Dr. Mukherjee identified a gap in education, so she developed a practical guide and introduction to the history and delivery of healthcare globally. She included cases and exercises that highlight challenges and opportunities in global health delivery. Dr. Mukherjee linked her textbook with the division's open-source Global Health Delivery cases developed under the leadership of Dr. Rebecca Weintraub. She also included highly relevant details on the United Nations' 2015 Sustainable Development Goals and their implications for global health. The textbook codifies many of the key themes and learning that have been established by division faculty over decades.

RESEARCH

Among the tenets of the division's mission is to address inequalities in disease burden and treatment outcomes through research. Research activities range broadly, including HIV/AIDS, MDR-TB, cholera vaccines, surgery, cardiology, hepatitis, health system benefits of community health workers, school-based community trials, and high-tech innovations in remote rural settings, all as they relate to poverty and health. The division has seen growth in cross-disciplinary, biosocial research on diseases of the poor; in FY17, total research expenditures were \$10 million.

Tuberculosis

The division has an active TB research program focused on optimizing treatment outcomes in patients with multidrug-resistant tuberculosis. This ongoing work is a collaboration with PIH and the Department of Global Health and Social Medicine at HMS. Division faculty Drs. Salmaan Keshavjee, Mercedes Becerra, Carole Mitnick, Michael Rich, KJ Seung, Joia Mukherjee, Serena Koenig, Sonya Shin, Dylan Tierney, and Ed Nardell are conducting retrospective studies that apply novel analytic methods to clinical data from Peru, Russia, and Haiti. This group has produced multiple peer-reviewed publications that provide evidence that patients with MDR-TB who receive at least five likely effective drugs have significantly lower risks of death and recurrence, and significantly speedier response to therapy, compared to patients who receive less than five likely effective drugs. This group of investigators is also engaged in translating these results into practice through active participation in numerous global technical, policy, and program advisory boards.

Dr. Murray is the co-principal investigator on two major NIH grants totaling more than \$45 million for work in Lima. Dr. Murray is the sole principal investigator on a five-year grant based at the CETR at HMS, focused on developing TB diagnostic tools for MDR and childhood TB. A seven-year grant based in the Division of Rheumatology, Immunology, and Allergy with co-principal investigator Dr. Branch Moody is

focused on lipidomic, immune, metabolic, and allelic determinants of TB risk.

In Russia, studies led by Dr. Keshavjee focus on treatment outcomes, risk factors for treatment failures, and community-based care-delivery models. Recent publications describe the role of alcohol use in patients with MDR-TB and hepatotoxicity related to treatment.

In South Africa, Dr. Nardell continues his work at the Airborne Infection Research (AIR) facility in Witbank studying innovative interdisciplinary approaches to sustainable airborne infection control, based upon a human-to-guinea pig transmission model. Dr. Nardell's current projects, supported by the National Institute for Occupational Safety and the NIH/Fogarty Center, focus heavily on germicidal ultraviolet air disinfection (GUV). Based upon earlier research, Dr. Nardell and colleagues will be pilot-testing an egg-crate ceiling with GUV in an actual clinical setting; they also have plans to test the first LED UV prototype GUV fixtures. This is the first significant advance in GUV in almost 50 years. LED UV is capable of running off solar or alternative power sources, thus holding great potential for use in low-resource, high-TB-burden settings. The fixtures will undergo testing in the HSPH exposure chamber in Boston before being sent to partners at the AIR facility and elsewhere for pilot implementation. Dr. Nardell recently purchased a real-time viable particle counter for use as a promising innovative method to measure the impact of various interventions on airborne particles and infection risk. This device is being tested in laboratories and a hospital ward in Boston and will be sent to South Africa for use in the AIR facility, once its potential is better understood. Concurrent with these efforts, Dr. Nardell is spearheading the development of a sustainable model for GUV design, manufacture, implementation, and maintenance in low-resource settings. Current efforts focus on South Africa, India, Pakistan, Myanmar, and Ethiopia but will ideally be scalable and transferable to other settings.

In Peru, Dr. Nardell leads a study on an intensified, refocused administrative approach to TB infection control, called FAST (Find cases Actively, Separate temporarily, begin effective Treatment). By identifying unsuspected TB and unsuspected drug-resistant TB cases and initiating effective treatment for inpatients at a large general hospital in Lima, Dr. Nardell's team, along with Peruvian partners Socios en Salud (SES), will be evaluating the impact of FAST on TB transmission to healthcare workers.

The question of how to measure the actual impact of building design and use on airborne infection control continues to be a challenging one. Dr. Nardell oversees a pilot study in two South African hospitals using both personal and static CO₂ monitoring to measure "re-breathed" air as a proxy for airborne infection risk. The static monitors provided point-in-time and location CO₂ levels, while the personal monitors, together with healthcare worker diaries, provided critical information about CO₂ levels at different locations within the hospital, based on building design and healthcare worker use of space. This approach was further refined and tested at a third hospital site in South Africa in early 2017.

Human Immunodeficiency Virus

The division's HIV research agenda spans multiple countries and sites with a common theme of improving care to those with the least access and greatest need.

In Haiti, Dr. Louise Ivers is completing an NIH-funded study that assessed the impact of a pilot nutritional intervention on HIV-positive individuals, and Dr. Serena Koenig is the primary investigator for an NIH-funded randomized trial evaluating the effectiveness of same-day HIV testing and treatment, compared to standard care. Dr. Koenig is co-investigator for a proposal to improve the management of depression among HIV-infected patients. Dr. Koenig, along with division colleagues, has also demonstrated that HIV outcomes have improved over time, while treatment costs have significantly decreased. In addition, she has evaluated the impact of gender on HIV treatment outcomes, and evaluated the rates and risk factors of attrition at every step from HIV testing to antiretroviral therapy (ART) initiation. Dr. Koenig's

study on same-day ART initiation was one of the main studies which resulted in the change in World Health Organization (WHO) guidelines in July 2017, to recommend rapid or same-day ART initiation for all HIV-infected patients.

Dr. Shin and SES completed the Community-based Accompaniment with Supervised Antiretrovirals (CASA) project, which explored the use of the directly observed treatment short-course (DOTS) framework for HIV patients living in extreme poverty in the outlying communities of Lima. This NIH-funded study followed 356 patients receiving directly observed therapy (DOT-HAART) through community-based accompaniment and support to gain independence of the management of their disease and improve their long-term antiretroviral drug adherence and well-being. Findings related to HIV outcomes are mixed, and the paper is currently under review. Qualitative findings regarding social support and stability as well as the validation of the HIV stigma scales for health professionals have recently been published. Domestically, Dr. Bisola Ojikutu's research focuses on the challenges faced by at-risk women and immigrant populations. She recently completed a large cross-sectional study to determine barriers to HIV testing among black U.S.-born and non-U.S.-born individuals in Massachusetts. Internationally, she has worked extensively throughout sub-Saharan Africa developing programs to improve health systems and is the founder of the Umndeni "Family" Care Program, which promotes HIV testing and linkage to care in rural South Africa.

Cholera

Cholera has presented a persistent humanitarian crisis in Haiti since October 2010, having infected more than 700,000 people and claiming the lives of nearly 10,000. PIH continues to provide urgent care, treatment, and prevention activities in response to the widespread cholera outbreak. Dr. Louise Ivers currently leads a team from PHS and HMS on several NIH-funded studies related to the epidemiology of cholera in Haiti and the use of oral cholera vaccine. These include a case-control study to evaluate the field effectiveness of oral cholera vaccine piloted in the Artibonite and expanded in the Central Plateau.

Dr. Ivers is also engaged in several studies on immune responses in vaccinated Haitians. Using results of her research work, she is involved in national and international advocacy efforts to draw continued attention to the cholera epidemic. She is part of the WHO global task force for cholera control that works on updating WHO policy on cholera, and a member of the WHO Strategic Advisory Group on Vaccines working group on oral cholera vaccines. In 2016, she was awarded a \$3 million grant from the Bill and Melinda Gates Foundation to eliminate cholera in two communities in Haiti through a combined integrated approach using oral cholera vaccination and household water chlorination.

Hepatitis

In 2016, Dr. Neil Gupta established the “Simplifying Hepatitis C Antiviral Treatment in Rwanda for Elsewhere in the Developing World” (SHARED) study to bring new hepatitis treatments to Rwanda and demonstrate the efficacy and safety of these medications in a sub-Saharan African context. Hepatitis C is a chronic infectious disease that infects more people globally than HIV, and can result in severe liver failure, cancer of the liver, and premature death. Treatment for chronic hepatitis C infection has traditionally been of limited efficacy, highly toxic, and difficult to administer. Recently developed and marketed medications have provided a safe, easy, and highly effective cure; however, use of these medications has been limited due to their high cost and regulations, resulting in less than 2% of patients accessing treatment worldwide, and even lower in sub-Saharan Africa and other poor countries. Dr. Gupta’s team will use the findings of this study to support the development of hepatitis C care and treatment programs in low-income countries and advocate for expansion of availability and access to these medications for poor populations worldwide.

Zika Virus

The Zika virus is transmitted by the bite of the *Aedes* mosquito, which is the same mosquito that transmits chikungunya and dengue fever. That mosquito is

everywhere in the Western Hemisphere, including the southern United States. Eighty percent of people who have Zika appear not to have symptoms. Yet when a mosquito bites them, the Zika virus lives in the mosquito until it bites another person, thus transmitting the virus to another person. Most troubling is that it appears Zika can be transmitted from a pregnant woman to her unborn fetus. Dr. Louise Ivers was awarded a CDC grant to determine the prevalence of Zika virus infection in pregnant women receiving antenatal care in rural health. Dr. Joia Mukherjee has driven PIH’s global efforts to combat Zika by mobilizing community health workers.

Health-System Strengthening

Division faculty are implementing and evaluating health-system-strengthening programs in rural southeastern Rwanda. Co-led by Drs. Peter Drobac and Lisa Hirschhorn, this multi-year project, the Rwanda Population Health Implementation and Training Partnership, was established in 2009 with support from the Doris Duke Charitable Foundation’s African Health Initiative. The partnership endeavors to improve the capacity and performance of the health system in two rural districts with targeted financial and technical investments focused on health centers, coupled with quality-improvement initiatives designed to improve service delivery and to strengthen monitoring and evaluation systems. Aspiring to create a replicable, evidence-based roadmap for district-level primary healthcare delivery, the partnership has developed an integrated model of implementation, operational research, and impact evaluation to facilitate refinement and rigorous evaluation of the intervention.

Dr. Sonya Shin was awarded support from PCORI to evaluate the impact of the COPE Program in Navajo Nation. COPE is engaged in ongoing qualitative interviews and compilation of content for data analysis as well as pilot-testing of online training tool for CHRs. The goal of this work is to understand the impact of COPE’s standardized trainings on CHRs’ self-reported efficacy, clinical teams’ coordination and cooperation, and patients’ ability to make informed healthcare decisions and take better control of their diabetes.

Dr. Duncan Maru was awarded a five-year “high-risk, high-reward” grant by the NIH to further develop Possible’s implementation research program, the Healthcare Systems Design Group. Recently, the team published studies on the determinants of institutional birth, provider training in mental health, a community health worker mobile surveillance project, and implementation of a patient-navigation system.

Dr. Gene Bukhman is leading The Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion with the goal of shifting the global framework of NCDs for those living in extreme poverty. Between 2015 and 2017, the commissioners are developing a critical report for publication in 2018. Currently, country leaders and disease experts are collaborating on this work and commentaries are anticipated in advance of the release of the report. Dr. Bukhman and his NCD team organized a series of conferences on topics of interest to National NCDI Poverty Commissions. These conferences were developed in cooperation with the World Bank, using World Bank facilities in 11 countries to convene National Commission Co-Chairs in person with World Bank staff locally. They then connected these local groups through global video connections. To date, there have been five of these Knowledge Exchanges, involving more than 60 participants at each event. The NCD team has also convened a group of almost 200 collaborators who have supported the organization of National NCDI Poverty Commissions in 11 countries: Haiti, Rwanda, Liberia, Kenya, Tanzania, Ethiopia, Malawi, Mozambique, Nepal, Afghanistan, and India. These National Commissions are reviewing local disease burden and assessing intervention priorities based on local contexts. Commission results will be publishing in 2018.

School-Based Interventions for Child Health

Dr. MaryCatherine Arbour is committed to reducing disparities and interrupting intergenerational poverty transmission by designing, evaluating, and disseminating interventions that optimize the healthy development of young children in disadvantaged families. Dr. Arbour implements and evaluates interventions to reduce inequities

in the U.S. and abroad, using a combination of experimental, ethnographic and quality-improvement methodologies. She has particular interests in methods for adapting evidence-based practices across diverse contexts and populations, and in scale.

She directs the health component of a randomized controlled trial of a preschool-based child-development intervention in Chile, leading the integration of continuous quality improvement (CQI) methods in an expansion phase of the project to schools serving 10,000 children in two regions of the country. Investigators are examining the impact of intensified case management within schools on outcomes including asthma frequency and school absenteeism. In addition, Dr. Arbour was funded to evaluate the benefits of home visits on early childhood development in Santiago, Chile.

Dr. Arbour’s research methodology is to integrate CQI and traditional research methods to improve the impact of interventions that, despite a strong evidence base in small-scale experiments, often obtain only partial positive outcomes in children’s health and development when applied at scale. In the U.S., Dr. Arbour leads the adaptation of quality-improvement methods for the first national quality-improvement collaborative in-home visiting (HV CoIIN).

Dr. Shin and SES researchers finished piloting a community-based strategy to screen children 6-24 months of age for developmental delay, and deliver early interventions to at-risk children and their parents.

Funded by Grand Challenges Canada, this study has involved collaboration with Boston Children’s Hospital, Boston University’s BU Spark! initiative, HMS, and UCSF. This cross-disciplinary team has worked closely with Peruvian colleagues to develop an intervention that is tailored to the local context. Preliminary findings suggest that the community-based intervention (termed “CASITA”) improves child development and positive parenting behavior, compared with control families. They have also begun exploratory qualitative research to understand how community-based early interventions could be potentially adapted and deployed in other PIH sites, including Mexico and Rwanda.

Dr. Arbour also conducts quality improvement capacity-building efforts, including formal curriculum development and delivery in Spanish and English with health, public health, and education professionals and paraprofessionals. Her materials, measures, and methods have been used in Chile to train more than 750 health and education professionals in 30 public health clinics and 160 public preschools, and in the U.S. to train hundreds of home visitors serving 4,000 low-income families through 35 participating home visiting agencies in 12 states and two tribal entities. She co-leads one professional development course in continuous quality improvement in Lima, Peru, as faculty of the Health Improvement Institute (IHI), and co-directs a CQI Practicum for public health practitioners for the Design Options for Home Visiting Evaluation (DOHVE) project of the U.S. Administration for Children and Families.

Better Birth Program

Over the past three years, Dr. Katherine Semrau led a research team at Atul Gawande's Ariadne Labs implementing the BetterBirth trial in Uttar Pradesh, India. This matched-pair, cluster-randomized-controlled trial tested a coaching-based implementation of the WHO Safe Childbirth Checklist for impact on birth attendant adherence to evidence-based practices, and maternal mortality, morbidity, and perinatal mortality. Across 120 health facilities in 24 districts of Uttar Pradesh, the trial enrolled more than 160,000 laboring women and followed 99.7% of enrollees and their newborns to obtain health outcomes at seven days postpartum.

HMS Global Mental Health faculty member Dr. Stephanie Smith, an affiliate of the division who collaborates with PIH, focuses on helping local implementers to build effective mental health programming into community and healthcare infrastructures across all PIH country sites. Settings of her work include Rwanda, Liberia, Lesotho, Malawi, Haiti, Peru, and Mexico. This year, Dr. Smith published results on Patient Outcomes and Experiences of a Primary Care Integration Program in rural Rwanda in *BMJ Open*.

Global Health Economics

During the past year, research in global health economics in the division mainly focused on (1) tracking

and analyzing the level and trend of investments in global healthcare from various funding sources on child and adolescent health and assessing financial sustainability of public health programs (such as HIV, TB, child and maternal health) in developing countries; (2) understanding the positive synergy between health aid and health systems; (3) evaluating the impact of healthcare financing mechanisms (such as community-based health insurance or cash aid) on the coverage of medical interventions and population health outcomes; and (4) conducting cost-effectiveness analyses on various interventions.

Dr. Chunling Lu served on the writing group for *The Lancet Series on Early Childhood Development*. She made major contributions towards quantifying the prevalence of under-five children exposed to risk factors during early development, such as poverty and stunting at the global, regional, and country levels. Dr. Lu and collaborators found that the global prevalence of children exposed to two risk factors has reduced from 51% in 2004 to 43% in 2010, but that important gaps remain, with sub-Saharan Africa having the highest prevalence of such factors. The study set up a new landmark measure for monitoring the progress in reducing children at risk of poor development. The results of the study have been cited by the institutions such as WHO, UNICEF, World Bank, and covered by the media such *The Guardian*, *People's Daily* (China), and *Livemint* (India). In the same series, Dr. Lu led an estimation of adulthood income loss due to the deficit in schooling associated with exposure during childhood. These studies provided evidence that such exposure to stunting and extreme poverty in children aged under-five can exert a strong downward economic pull in adulthood, therefore trapping families in poverty. The results serve as important scientific evidence in a publication that supports improving early child development as the first step towards enabling all people to fulfill their potential in dignity and equality.

Dr. Lu and a team of researchers undertook a multi-sectoral approach to evaluate the success of the Millennium Development Goal focused on reducing child mortality (MGD4). They published a group of estimates on aid disbursed to support this goal in the 134 countries between 2000 and 2014. This failure

occurred despite dramatic increases in donor funding to the health sector. Existing evidence from developing countries has demonstrated that addressing the complexity of child mortality required joint and integrated efforts from multiple sectors: education, health, water and sanitation, and food and nutrition, as well as humanitarian assistance recommending better coordination among donors and recipients to improve the aid targeting.

Dr. Lu also engaged in research on rural healthcare facilities in low-income countries that play a major role in providing primary care to rural populations. She examined the synergy between foreign aid and government investments and medical service provision in rural health centers in Rwanda, discovering that foreign aid did not replace government investments in such centers. Foreign aid programs, conducted in addition to government investments, were positively associated with the provision of child and maternal care as well as care for HIV, TB, and malaria in those facilities. The findings suggest that integrating aid, government investments, and other funding sources is crucial for improving service availability in rural healthcare centers. Ensuring aid additionally should be given high priority when designing policy instruments for achieving aid effectiveness.

Under the leadership of Dr. Barbara Bierer, the Multi-Regional Clinical Trials (MRCT) Center of BWH and Harvard improves the design, conduct, and oversight of multi-regional clinical trials, focusing on sites in or involving the developing world, simplifying research through the use of best practices, and fostering respect for research participants, efficacy, safety, and fairness in transnational, transcultural, human-subject research. The Center undertakes this work by convening investigators, patients, and representatives from industry, nonprofit organizations, academia, and patient advocacy groups to create practical resources for the ethical design and conduct of multi-regional clinical trials.

This year, the MRCT Center addressed a call for an increased level of data sharing. The Center focused its multi-stakeholder base on providing a forum for discussion of the rationales, barriers, and implications of this paradigm change and to formulate potential solutions. The MRCT Center, the Wellcome Trust,

the Institute of Medicine, the Laura and John Arnold Foundation, and Deloitte Consulting spearheaded an initiative on sharing of clinical trials data, to enable stakeholders to comply with guidelines on clinical trial data sharing: facilitating broad stakeholder clinical trials data sharing and sharing participant-level data with researchers. To advance this initiative, the MRCT Center convened stakeholders from the U.S., Europe, and international organizations who decided that a global, federated portal of all data-sharing sites from industry, academia, and government would most effectively promote and facilitate the sharing of clinical trials data. A unified data-sharing model emerged in 2015 and grew to plan and launch a multi-stakeholder nonprofit organization with authority and accountability to implement the data-sharing initiative. This effort, named Vivli, will have a central user interface with a robust search engine to obtain clinical trial data from around the world.

Transparency was a particular focus of the MRCT Center's efforts this year, reinforcing a commitment to working with sponsors, regulators, investigators and participants to expand discovery of and access to clinical trials data, a vital step to advance scientific knowledge and respect participants.

This year 52 participants from academia, industry, nonprofit organizations, professional associations, and regulatory agencies gathered at Harvard for a workshop on "Core Competencies in Clinical Research: Real World Applications, Convergence and Evolution of Framework." This workshop focused on the evolution of the Harmonized Core Competencies Framework for the Clinical Research Professional first published in 2014 by the Joint Task Force for Clinical Trial Competency of which the MRCT Center is a member.

Ebola Virus Disease


In the aftermath of the 2014 EVD outbreak in Liberia and Sierra Leone, Dr. Eugene Richardson has continued his research in Sierra Leone focusing on interdisciplinary, mixed-methods approaches to understand the structural determinants of disease outcomes as well as biosocial interventions for containment and prevention.

Future Directions

The division will undertake the following new and expanded initiatives in the coming academic year:

- Dr. Paul Farmer is completing a book for publication on EVD reflecting his own fieldwork on Health Systems Strengthening Framework.
- COPE will continue to collaborate to improve the lives of Navajo people with additional research funding addressing nutrition as well as chronic diseases. COPE will also continue discussions to expand its successful model of training, education, and health-systems integration to other under-served tribal (and non-tribal communities) across the U.S.
- In Haiti, division faculty will continue to play a critical role in the planning and implementation of a long-term strategy for strengthening healthcare infrastructure, and provide healthcare and support services to those patients most in need. Focus will increase on collaboration with the government on health-system financing and on cost analysis within the ZL system.
- As HUM, the national teaching hospital in Haiti, becomes fully operational, faculty will work towards providing primary care services to a catchment area of 185,000 people in Mirebalais and two nearby communities serving 500-700 outpatients per day. The newest residency programs in obstetrics and gynecology, and emergency medicine, began in October 2014, providing specialty-training programs for Haitian clinicians in an environment that allows them to have the resources they need to provide the highest quality of care possible. Throughout calendar year 2017, DOM faculty will continue an internal review of residency programs to help them prepare for ACGME accreditation.
- In Haiti, educational initiatives will continue to grow with each of the five residencies enrolling their next classes of students and the David Walton Administrative Fellowship and Exchange bringing a fourth cohort to the division to further build the pipeline of future administrative leaders. Dr. Michelle Morse will lead EqualHealth's seventh annual Haiti-wide Medical Education Conference.
- Dr. Raj Panjabi, working with HarvardX and support from the TED Foundation and Gates Foundation, will establish the Community Health Academy (CHA) that will launch its first online course in 2018. The goal of CHA is "to recruit the largest army of community health workers the world has ever known, by creating the Community Health Academy, a global platform to train, empower, and connect." The CHA aims to reinvent the education of community health workers – and the leaders who support them – for the digital age. At the Gates Foundation's 2017 Goalkeepers event, Dr. Panjabi and a coalition of over 15 partners launched the first phase of the CHA, which will be an open, online continuing education platform for policy makers, managers, and NGOs looking to build stronger community health systems. The courses will be taught by leading community health innovators from Africa, Asia, and Latin America through the CHA. Ultimately they plan to create a mobile app that will enable CHWs to receive the very best in digital education resources, and will work with countries to help accredit healthcare professionals.
- In Guatemala, Dr. Peter Rohloff will use Charles Hood Foundation funding develop quality-improvement methodology and mobile health/smartphone technology to assist traditional birth attendants and midwives to identify and evaluate high-risk neonates in rural settings and refer them to a higher level of care as necessary.

- In Liberia, Dr. Corrado Cancedda will continue implementation of his 2017 HRSA grant: Strengthening Health Professional Training in Liberia and Achieving Sustainability through Synergy and Coordination, coordinating efforts of five partner U.S. academic institutions. In September 2017, PIH opened a new MDR-TB ward at J.J. Dossen Hospital, making it the first decentralized hospital to treat MDR-TB outside of Monrovia.
- In Madagascar, PIVOT will continue to track progress closely with its monitoring and evaluation system generating information for dissemination on best practices. PIVOT plans to upgrade the district hospital, expand to more health centers, and launch a comprehensive malnutrition program working at all levels of the health system including with a network of trained community health workers.
- In Malawi, APZU plans the opening of new infrastructure projects, supporting the Ministry of Health in district strategic planning, integrating primary healthcare services, expanding the CHW program, and expanding programs in academic training and mentorship.
- Dr. Sonya Shin will continue her childhood development work in Peru. She has developed a community-based early stimulation coaching and social support for children 6-24 months to implement an early-childhood development intervention program called CASITA in Carabayllo, Peru.
- The division will continue to collaborate on the implementation of human resources for the Health Rwanda Medical Education Initiative alongside the government of Rwanda, PIH, and HMS to dramatically increase the clinical training of Rwanda healthcare providers and specialists. The program will continue to grow as the second year of HRH Liberia is implemented.
- In Rwanda, the UGHE flagship Master of Science in Global Health Delivery degree students will extend coursework. Over the coming years, UGHE will add programs in undergraduate medicine, nursing, and dentistry, and graduate programs in veterinary medicine and health management.
- Also in Rwanda, Dr. Marla McKnight has submitted a grant to move forward work related to the biopsy project developing a four-to-six-week training for internal medicine clinicians, radiologists, pathologists, and laboratory staff. This will occur in early 2018 coinciding with the conclusion of division fellow Thierry Zawadi's training in renal pathology and his return to Rwanda. At conclusion of this training, the program hopes to have developed capacity for a fully sustainable renal biopsy program in Rwanda. Dr. McKnight is also planning to engage with the NCD division at the ministry regarding a proposal to the Declaration of Istanbul Custodian Group to write a white paper outlining a roadmap for establishing an in-country renal transplantation program in Rwanda.
- Dr. Andrew Ellner launched Firefly Health as a digital health initiative replacing primary care practices with tools and services to enable delivery of comprehensive, personalized care, 24/7, in homes and workplaces. He anticipates launching with patients in 2018.
- Dr. Margaret Bourdeaux will be creating an educational program in collaboration with the Harvard Kennedy School of Government to teach best practices for health-systems strengthening in post-conflict states. The course will be the first executive education course jointly developed by the Kennedy School and HMS. This course on global health security and leadership, which was held in June 2017, will be oriented to security policy makers and military operations planners.
- Dr. Gene Bukhman, as chair of the The Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion will prepare his report for release in 2018. He will be working to develop a consensus statement and report for the commission and engaging with a number of countries to create NCD strategic plans. Drs. Bukhman, Gupta, and Park will work together to further efforts on NCDs globally with support from the Leona M. and Harry B. Helmsley Charitable Trust.

- Dr. Serena Koenig will continue to implement and evaluate evidence-based interventions to maximize HIV treatment outcomes at every step in the process from HIV diagnosis through long-term care. This includes initiating treatment on the day of HIV diagnosis and providing fast-track follow-up care, with the goal of developing effective models of care for scale-up at the national level in Haiti and other resource-poor settings.
- Dr. Chunling Lu will be working with the Program in Global Health Economics and Social Change at HMS to track the resources allocated to mental health in developing countries through collaboration with the Department of Mental Health and Substance Abuse at the WHO.
- Dr. Duncan Maru will be working with the HMS Program in Global Primary Care and Social Change on understanding the value of CHWs in healthcare delivery and evaluating strategies to strengthen healthcare delivery systems.
- Dr. Michelle Morse will be working to obtain international accreditation for residency training programs based at HUM. She will also be co-leading the social medicine components of the clerkship for HMS students.
- Drs. Michelle Morse and Sonya Shin will lead the SMC forward with an international conference to be held in April 2018 in Gallup, New Mexico. The conference is entitled "Health Equity and Collective Liberation: Advancing Social Medicine in Action."
- Dr. Joia Mukherjee's undergraduate global health textbook, *An Introduction to Global Health Delivery: Practice, Equity, Human Rights*, was published in November 2017.
- Dr. Bisola Ojikutu will co-chair Massachusetts' Getting to Zero Campaign, which is a coordinated strategy by the state to drive rates of HIV transmission down to zero new infections. She led the HIV Care and Treatment Subcommittee to draft a report with recommendations that was released on World AIDS Day, December 1, 2016.
- Dr. Daniel Palazuelos is working with the HMS Program in Global Primary Care and Social Change to undertake a multi-country analysis of CHW programs. He will be convening a group of faculty to examine community health worker programs across the globe and develop a framework to understand the design and implementation of these programs. He is also developing a community health experts network, made up of Possible, PIH, Last Mile Health, Hope Through Health, and Muso, which will write and disseminate expert advice and best practices. They are writing a paper to complement the forthcoming WHO CHW guidelines.
- Dr. Ruma Rajbhandari will develop local evaluation and research capacity at the Nick Simons Institute in Nepal. Her research will include evaluation of skilled birth attendant training and evaluation of hospital minimum service standards.
- Dr. Joseph Rhatigan will be working on a medical education collaborative with Cuban medical educators to strengthen the teaching of social medicine at HMS.
- Drs. Michael Rich and KJ Seung will continue their research efforts on the endTB project and prepare a comprehensive report on progress to date on this ambitious and critical program.
- Dr. Dan Schwarz joined the division and will work as chief medical officer with Possible in Nepal where he will focus on delivering high-quality, low-cost healthcare working with the government's existing infrastructure. He will also collaborate with the Primary Healthcare Performance Initiative at Ariadne Labs. 

FACULTY ROSTER

PRIMARY**Professor**

Barbara Bierer, M.D.
 Paul Farmer, M.D., Ph.D.
 Howard Hiatt, M.D.
 Edward Nardell, M.D.

Associate Professor

Heidi Behforouz, M.D.
 Louise Ivers, M.D.
 Salmaan Keshavjee, M.D., Ph.D.
 Joia Mukherjee, M.D.
 Megan Murray, M.D., Sc.D.
 Joseph Rhatigan, M.D.
 Sonya Shin, M.D.
 Norma Ware, Ph.D.

Assistant Professor

Gene Bukhman, M.D., Ph.D.
 Corrado Cancedda, M.D., Ph.D.
 Lisa Cosimi, M.D.*
 Andrew Ellner, M.D.
 Lisa Gruenberg, M.D.
 Serena Koenig, M.D.
 Chunling Lu, Ph.D.
 Duncan Maru, M.D., Ph.D.
 Bisola Ojikutu, M.D.
 Michael Rich, M.D.
 Katherine Semrau, Ph.D.
 Kwonjune Seung, M.D.
 Rebecca Weintraub, M.D.

Assistant Professor, Part-time

Peter Drobac, M.D.
 Sara Stulac, M.D.

Instructor

MaryCatherine Arbour, M.D.
 Jason Beste, M.D. (pending)
 Margaret Bourdeaux, M.D.
 Avik Chatterjee, M.D.

Ranvir Dhillon, M.D.
 Patrick Elliott, M.D.
 Hugo Flores Navarro, M.D.
 Neil Gupta, M.D.
 Jonathan Iralu, M.D.
 Louise King, M.D.
 Fernet Leandre, M.D.
 Rebecca Li, Ph.D.
 Hema Magge, M.D.
 Michelle Morse, M.D.
 Marla McKnight, M.D.
 Daniel Palazuelos, M.D.
 Rajesh Panjabi, M.D.
 Paul Park, M.D.
 Ruma Rajbhandari, M.D.
 Eugene Richardson, M.D., Ph.D.
 Peter Rohloff, M.D., Ph.D.
 Hind Satti, M.B.B.S.
 Ryan Schwarz, M.D.
 Sara Selig, M.D.
 Neo Tapela, M.D.
 Dylan Tierney, M.D.
 Andrew Van Wieren, M.D.
 David Walton, M.D.
 Emily Wroe, M.D.
 Courtney Yuen, Ph.D.

Instructor, Part-time

Lara Hall, M.D.
 Ravi Kavasery, M.D.
 Alishya Mayfield, M.D.
 Morgan Esperance, M.D.*
 Ravi Kavasery, M.D.
 Aaron Mann, M.D.
 Jonathan Quick, M.D.

Lecturer

Kerry Dierberg, M.D.
 William Rodriguez, M.D.

*Connotes secondary appointment in the
 Division of Global Health Equity

SELECT MAJOR FACULTY ACCOMPLISHMENTS

MaryCatherine Arbour, M.D.

- Named, Primary Care physician preceptor at the Jen Center for Primary Care
- Co-directed, Institute for Healthcare Improvement Expert course in Lima, Peru, developing curriculum and serving as faculty for a group of 18 physicians and education experts from Chile, Peru, and Argentina
- Named, Peabody Society Global Health Research Fellow

Jason Beste, M.D.

- Facilitated, Liberia's National MDR-TB Training Course
- Published, "The post-Ebola baby boom: time to strengthen health systems," *The Lancet*

Barbara Bierer, M.D.

- Awarded, A System for Academic Recognition of Data Generators, Greenwall Foundation
- Awarded, Governance To Facilitate Open Science, PCORI
- Published, Revised "Common Rule" Shapes Protections For Research Participants, *Health Affairs*
- Published, "Data Authorship as an Incentive to Data Sharing," *New England Journal of Medicine*

Margaret Bourdeaux, M.D.

- Speaker, TEDx Brookline, "Why civilians suffer more once a war is over"
- Convened, Summit on Threatened Health Systems, Harvard Global Health Institute
- Moderated, Global Health Security Alliance's interdisciplinary and multisectoral forum to generate global health security policy options to be presented at the Munich Security Conference

Gene Bukhman, M.D., Ph.D.

- Member, Global Coordination Mechanism on NCDs, WHO
- Co-chaired, The Lancet Commission on Reframing NCDs and Injuries for the Poorest Billion

Corrado Cancedda, M.D., Ph.D.

- Promoted from Instructor to Assistant Professor of Medicine and Assistant Professor of Global Health and Social Medicine at HMS
- Published, "Building Capacity in Abroad while Strengthening Global Health Programs at Home: Participation of Seven Harvard-Affiliated Academic Institutions in a Health Professional Training Initiative in Rwanda," *Academic Medicine*

Peter Drobac, M.D.

- Promoted from Instructor to Assistant Professor of Medicine at HMS

Andrew Ellner, M.D.

- Served on the Perspective Advisory Board for the *New England Journal of Medicine*
- Speaker, "Community-Based Primary Care at the Southcentral Foundation" and "Disruptive Innovations in U.S. Primary Care: Overview and a Digital Health Example," Bill & Melinda Gates Foundation Symposium

Paul Farmer, M.D., Ph.D.

- Featured in "Bending the Arc," Official Selection at Sundance Film Festival, Winner, Berkshire Film Festival, and Greenwich Film Festival
- Awarded, Bradford Washburn Award, Museum of Science, Boston
- Awarded, Honorary Doctorate of Civil Law, The University of the South, Sewanee, TN

SELECT MAJOR FACULTY ACCOMPLISHMENTS (continued)

- Keynote Speaker, Harvard Medicine Indivisible Town Hall
- Keynote Address, Doris Duke International Clinical Research Fellowship Annual Meeting
- Published, “Embracing Medical Education’s Global Mission,” *Academic Medicine*

Hugo Flores, M.D.

- Named, Aspen Institute Scholar for the Spotlight Health conference

Neil Gupta, M.D.

- Named, Clinical Director for the NCD Synergies Project and the Lancet Commission for Reframing NCDs and Injuries for the Poorest Billion

Lisa Gruenberg, M.D.

- Enrolled, MGH Institute for Health Professionals working toward a Masters in Health Profession Education focusing on medical education in resource poor settings
- Presented, “Medicine in the Holocaust and Beyond — the profound impact of trauma on memory,” University of Western Galilee, Western Galilee Hospital and Bar-Ilan University Israel

Louise Ivers, M.D.

- Served on the WHO Global Task Force on Cholera Control and Haiti National Task Force for Cholera

Salmaan Keshavjee, M.D., Ph.D.

- Named, Steering Committee member, Prince Alwaleed Bin Talal Islamic Studies Program, Harvard University
- Awarded, “Moving towards a tuberculosis elimination agenda for Russia: Zero TB initiative in Vladimir City, Russia,” Eli Lilly Foundation

Serena Koenig, M.D.

- Keynote Speaker, Center for AIDS Research Network Meeting: Same-Day Service: A Testing and Treatment Strategy to Decrease Mortality and Improve Retention in Care for People Living with HIV
- Published, “Trends in CD4 count testing, retention in pre-ART care, and ART initiation rates over the first decade of expansion of HIV services in Haiti,” PLOS ONE

Rebecca Li, Ph.D.

- Presented, “Multi-Regional Clinical Trials: Practice and Issues of Multi-Regional Clinical Trial’s Global Acceptance,” China Food and Drug Administrators Training Program at Yale University
- Presented, “Evolving, Adapting, and Thriving in the New Research Environment,” and “Global Trends in Clinical Trials: Patient Centric Research,” Association for the Accreditation of Human Research Protection Programs

Chunling Lu, Ph.D.

- Awarded NIH grant to study public mental health services in South Asia, leading cost-data analysis and participating in designing the protocol and data-collection tools to conduct cost-effectiveness analysis
- Published, “Risk of poor development in young children in low-income and middle-income countries: an estimation and analysis at the global, regional, and country level,” *Lancet Global Health*
- Published, “Sustainable financing of the priority public health programmes in Mongolia: a case study on HIV and TB programees,” WHO Regional Office for the Western Pacific

SELECT MAJOR FACULTY ACCOMPLISHMENTS (continued)

Duncan Maru, M.D., Ph.D.

- Promoted from Instructor to Assistant Professor of Medicine and Assistant Professor of Global Health and Social Medicine at HMS
- Awarded, Boston Combined Residency Program, Faculty Teaching Honor Roll
- Panelist on Innovation in Humanitarian Response, World Economic Forum Annual Meeting of the New Champions
- Contributed, Lancet Global Health Blog, Huffington Post, STAT News

Michelle Morse, M.D.

- Awarded, Dr. Stephen C. Wright Award for Excellence in Teaching and Mentoring
- Published, "Where We Fall Down: Tensions in Teaching Social Medicine and Global Health," *Annals of Global Health*

Alishya Mayfield, M.D.

- Named, PIH Health System Strengthening Advisor

Joia Mukherjee, M.D.

- Completed, undergraduate global health textbook, *An Introduction to Global Health Delivery: Practice, Equity, Human Rights*
- Keynote Speaker, Social Medicine Consortium Annual Conference: "Beyond Reimaging, Accelerating Praxis"
- Social Medicine in Practice Today, Chicago, IL

Edward Nardell, M.D.

- Funded, Shared Air Fraction Estimate (SAFE): correlating a novel metric of TB infection risk and occupancy with health worker Quantiferon conversion in South Africa, HMS Center for Global Health Delivery – Dubai
- Published, "The epidemiology, pathogenesis, transmission, diagnosis, and management of multi-drug resistant, and incurable tuberculosis," *Lancet Respiratory Medicine*

Bisola Ojikutu, M.D.,

- Named Director of the Community Engaged Research Program for the Centers for AIDS Research at Harvard University
- Keynote Speaker, National Women and Girls' Day, sponsored by the Massachusetts Department of Public Health
- Poster Presentation at the Infectious Disease Society of America Annual Meeting: "Mass Incarceration and Economic Inequality: the Impact of the Criminal Justice System on HIV Prevalence within Neighborhoods in the US"

Daniel Palazuelos, M.D.

- Keynote Speaker, "What the US health system can learn from global health," Timmy Global Health Student Leadership Conference
- Presenter, "Financing CHW Programs – the Case, Financing Sources, Enablers and Prioritization Institutionalizing Community Health," USAID and UNICEF Conference, Johannesburg, South Africa
- Named, Co-director of the Social Medicine section of the Essentials of the Profession course at HMS

Rajesh Panjabi, M.D.

- Awarded, 2017 TED Prize
- Named, Knight Commander in the Most Venerable Order of the Pioneers, Republic of Liberia
- Presented, "A Visionary: Healthcare for Everyone, Everywhere Fortune," TIME Global Forum
- Published, "Implementation research on community health workers' provision of maternal and child health services in rural Liberia," *Bulletin of the World Health Organization*

Paul Park, M.D.

- Received, 2017 Early Career Achievement Award from Indiana University's School of Medicine
- Named, Director of Implementation at NCD Synergies in partnership with PIH

SELECT MAJOR FACULTY ACCOMPLISHMENTS (continued)

Ruma Rajbhandari, M.D.

- Served as Associate Faculty Director for the Harvard Initiative on Global Health Quality at the Harvard Global Health Institute

Joseph Rhatigan, M.D.

- Speaker, Beyond Flexner Conference, “Putting Social Medicine into Clinical Practice”

Michael Rich, M.D.

- Presented, “Introducing the Companion Handbook to the WHO policies for the management of drug-resistant TB,” the 46th Union World Conference on Lung Health
- Published, “Baseline population health conditions ahead of a health system strengthening program in rural Madagascar,” *Global Health Action*
- Published, “Priority-Setting for Novel Drug Regimens to Treat Tuberculosis: An Epidemiologic Model,” *PLOS Med*

Gene Richardson, M.D., Ph.D.

- Awarded NIH-National Center for Advancing Translational Sciences to study the Social Epidemiology of Ebola
- Named, Fulbright Specialist to serve as expert consultant on curriculum, faculty development, institutional planning, and related subjects at academic institutions abroad
- Published, “Minimally symptomatic infection in an Ebola ‘hotspot’: A cross-sectional serosurvey,” *PLOS Neglected Tropical Diseases*, also featured in *Time Magazine*, *The Wall Street Journal*, NBC News, and NPR

Peter Rohloff, M.D., Ph.D.

- Appeared on NBC News segment “App saves lives of many women in Guatemala” focusing on his Grant Challenges-supported research

- Featured in the film *The Life Equation* focusing on the balance between cost-effective analysis of care and the humanitarian view of patient care in resource-limited settings

Ryan Schwarz, M.D.

- Presented, “Public-private partnership healthcare in post-democracy, post-earthquake Nepal: closing the service delivery gap,” Ariadne Labs
- Published, “Partnerships in Mental Healthcare Delivery in Low-Resource Settings: Developing an Innovative Collaboration for Mental Health Services in Rural Nepal,” *Globalization and Health*

Sara Selig, M.D.

- Named, Fellow, Leaders for Health Equity Fellowship Program, George Washington University Health Workforce Institute
- Presented, “Changing the Conversation About Health Research,” PCORI Annual Conference
- Published, “No Equity, No Triple Aim: Strategic Proposals to Advance Health Equity in a Volatile Policy Environment,” *American Journal of Public Health*

Sonya Shin, M.D.

- Presented, “Integrating Community Health Representatives in the Healthcare System,” Good Health and Wellness in Indian Country Grantee Meeting, Centers for Disease Control and Prevention
- Published, “Community-based accompaniment with supervised antiretrovirals for HIV-positive adults in Peru: a cluster-randomized trial,” *AIDS and Behavior*
- Presented, “Strengthening the Role of Community Health Representatives in the Navajo Nation,” American Public Health Association Annual Meeting and Exposition

SELECT MAJOR FACULTY ACCOMPLISHMENTS (continued)

KJ Seung, M.D.

- Promoted from Instructor to Assistant Professor of Medicine at HMS

Sara Stulac, M.D.

- Promoted from Instructor to Assistant Professor of Medicine at HMS

Dylan Tierney, M.D.

- Awarded, HMS Certificate of Excellence in Tutoring
- Presented, Infection Control Seminar: FAST Implementation, 47th Union World Conference on Lung Health

Norma Ware, Ph.D.

- Member, CFAR Developmental Grant Review Committee
- Awarded, Outcomes and Predictors of Successful Transition to Adult Care for HIV-infected Adolescents in South Africa, National Institutes of Health

Rebecca Weintraub, M.D.

- Awarded, Ariadne Labs Spark Grant to study the barriers and facilitators to UpToDate usage in resource-limited settings
- Honored, 2017 recipient of the "Outstanding Contribution to the Case Method" by the Case Centre
- Named, Aspen Institute Health Innovator Fellow
- Published, "11 Things the Healthcare Sector Must Do to Improve Cybersecurity," *Harvard Business Review*

Emily Wroe, M.D.

- Published, "The Rohingya people of Myanmar: health, human rights, and identity," *The Lancet*
- Published, "A Novel Scenario-Based Interview Tool to Evaluate Nontechnical Skills and Competencies in Global Health Delivery," *Journal of Graduate Medical Education*

Courtney Yuen, Ph.D.

- Presented, "Identifying high-risk individuals for tuberculosis screening in health facilities and communities: Western Kenya, 2015 – 2016," 48th Union World Conference on Lung Health
- Published, "The global burden of tuberculosis mortality in children: a mathematical modeling study," *Lancet Global Health*

