

its anchor an existing joint AdeKUS/TU Master of Science in Public Health (MSPH) program. The Caribbean Public Health Agency (CARPHA) is a regional network to engage other countries with similar EOH threats and to disseminate findings.

**Outcome & Evaluation:** To date, almost 60 graduates are embedded in Suriname's research, medical and public health enterprise. Under the CCREOH short-term research-training umbrella, Surinamese laboratory scientists learned various cell-culture techniques in Tulane's EOH labs. At the mid-career level certificates in EOH and Industrial Hygiene are building critical capacity. A special CCREOH deliverable is a cadre of 5 Surinamese team members pursuing a new hybrid AdeKUS/Tulane PhD degree. In addition, two Surinamese MDs are in advanced stages of PhD training in EOH at TU. All candidates are pursuing research foci commensurate to CCREOH's area of scientific inquiry: examining the impact of exposures to Hg, Cd, Pb, and pesticides and early childhood neurodevelopment. A 2017 Caribbean EOH research workshop on climate change is scheduled.

**Going Forward:** CCREOH was awarded a GEOHealth hub to assess the impact of environmental exposures on 1000 maternal-child dyads recruited during pregnancy and followed prospectively through four years of age in Suriname (U01-Suriname) complemented by a robust research training portfolio (U2R-Tulane).

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### Piloting a Model for Holistic Environmental Contamination Assessment that Could Be Implemented by Community Scientists

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**Background:** Zambia has vast mineral resources that contribute to the country's gross domestic product, but often have negative impacts on the communities that surround the mines. Kabwe is the location of a former lead and zinc mine open between 1906 and 1994; its environmental impacts are still affecting the surrounding communities. Despite numerous remediation efforts in the past 20 years, individual studies repeatedly have shown high lead blood levels of children and widespread soil contamination.

**Methods:** Given that people live in the impoverished areas surrounding the mine, it is critical to understand the pathways of exposure. Towards this end we conducted a pilot study collaborating across 7 disciplines and 5 institutions (2 Zambian, 3 American) to explore the feasibility of using discrete methodologies that would enable partnerships with citizen-scientists to gather holistic environmental health

data and trace pathways of contamination, which would lead to collaborative and targeted amelioration efforts. Our pilot study involved teaching non-specialists methods for sampling air particles, dust from homes, soils, edible plants, water from multiple sources in the low-income communities closest to the mines.

**Findings:** As expected, soil lead concentrations were high, ranging from 227 to over 2800 mg/kg and decreased with increasing distance from the mine, however household water supply contaminations did not follow the same geographic logic. Lead, cadmium, and chromium in stored in four houses, were as high as 2.07, 0.969 and 0.108 mg/L, respectively, 690, 19 and 10 times the WHO guidelines. The reported sources of these waters were shallow wells and municipal supplies although none of our public samples found high metal concentrations, suggesting contamination is from another source. Our study also involved exploring the residents' openness to health surveys and willingness to collaborate on future efforts to assess and address local environmental health concerns. We were greeted with widespread enthusiasm for the project and availability of under-employed, educated community members eager to find solutions to their local environmental health problems.

**Interpretation:** Our findings suggest this holistic approach will simultaneously yield interesting data allowing the tracing of pathways of contamination, and will facilitate a collaborative research project with local citizen scientists.

**Source of Funding:** Global Health Research Innovation Center, Miami University (Oxford, Ohio).

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### Implementing Planetary Health Competencies into Medical Education

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**Program/Project Purpose:** Planetary health is an emerging field in medicine dealing with the health of human civilization and the state of the natural systems on which it depends. It is the health of human civilization and the state of the natural systems on which it depends. It has found its way into the curricula of school children and has now moved up into UME and GME. Richard Horton, editor of *The Lancet*, gave the keynote speech, "Making the Case for Planetary Health: Why and How" at the 2016 Consortium of Universities for Global Health (CUGH) conference.

The Rockefeller Foundation's investments in Planetary Health are dedicated to influence both international and national approaches to health through advocacy and education. Our program created a platform to introduce the concept of planetary health to family physicians and others along the continuum of medical education (students, residents and practicing physicians).

**Structure/Method/Design:** A literature review was done to understand the current concept of planetary health and the various methods in which the education was being implemented globally.

A search was also done with regards to current policy within the various societies of family medicine in relation to planetary health.

Based on the preliminary information, a curriculum was created with the following objectives:

- Define planetary health. List the current elements of planetary health as they relate to family medicine. Determine future avenues of involvement for family physicians interested in planetary health.
- The course was rolled out to participants over a variety of venues and a webinar created for asynchronous learning.
- Surveys were done to determine participants' knowledge and/or understanding of planetary health and its relation to their current stage of medical practice.

**Outcome & Evaluation:** Preliminary studies show though planetary health is not a new concept in the field of public health, it is not very well known amongst family physicians. Current policies from various societies touch on various elements of planetary health, but as a whole it is not clarified as to the role of the family physician in this specialty. There is room for improvement with regards to educating family physicians on planetary health competencies and their role in its promotion.

**Going Forward:** Create an advanced planetary health elective/track.

**Source of Funding:** Departmental.

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### Drinking Water Provision and Quality in Low-Income Peri-Urban Communities of Lusaka, Zambia

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**Background:** Lusaka, Zambia, is a rapidly growing city with over 2 million people. About 65% of Lusaka's population lives in unplanned, low-income, periurban communities with historically poor access to safe drinking water. Almost all of the supply for these communities comes from a vulnerable, karst aquifer system, severely impacted by human activities, especially waste disposal and sanitation. Water-borne disease is frequent, including diarrhea, dysentery and cholera. To address this problem, in the early 2000s, CARE International partnered with Zambian government agencies to establish Water Trusts in several communities, completely run by community residents. The Water Trusts extract groundwater from relatively deep boreholes and deliver the water through underground pipes to numerous public tap stands. Vendors sell the water at limited times of the day for approximately \$0.02 per 20 L; the money is used to run and expand the water delivery systems. Not all residents, however, choose to purchase the Water Trust water. Instead, they may acquire water from shallow, hand-dug wells.

**Methods:** Research goals were to 1) assess the quality of water provided by the Water Trusts compared to water in the shallow wells, 2) assess the coverage provided by the Water Trusts, 3) explore why some residents might still acquire their drinking water from the shallow wells, and 4) document the reported extent of water-borne disease. Water quality was assessed in six communities mainly by measuring concentrations of *E. Coli* bacteria, an indicator of fecal contamination, and nitrate. Water Trust community coverage and attitudes towards different water sources were assessed with surveys given to Water Trust managers.

**Findings:** Water Trust-supplied water was generally high quality. Shallow well water was often directly influenced by nearby pit latrines as evidenced by high nitrate and *E. coli* concentrations. Water Trust managers reported that among the six communities, the percentage of people served ranged from 14 to 95% and averaged 55%. Many residents rely on the shallow well water due to the convenience (close by and always open) and the cost. Water Trust managers report much greater incidence of water-borne disease among residents drinking shallow well water.

**Interpretation:** Education and Water Trust provision expansion can decrease the incidences of these diseases.

**Source of Funding:** Fulbright Specialist Program Grant.

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### Disasters as a Global Health Topic: Understanding the Case of Haiyan in the Philippines

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**Background:** On 8 November 2013, typhoon Haiyan struck the central islands of the Philippines resulting in more than 6,000 deaths. This study seeks to characterize the global dimension of disasters through Haiyan and understand how it informs global health.

**Methods:** This is part of an ongoing study on typhoon Haiyan that seeks to identify the different factors that affect risk, recovery and resilience to disasters using a survey questionnaire, in-depth interviews and review of documents and literature.

**Findings:** Typhoon Haiyan is one of the major disasters in the recent times that attracted global attention due to a number of reasons. The devastation (death, injury, displacement and damages) was so massive resulting into a humanitarian appeal before a global audience. Governments, civil society and UN organizations provided massive support immediately after the disaster. Satellite technology enabled the international media to expect massive effect thus an anticipated response by the international community. International framework mechanisms in place were the rationale for many of the support. This includes bilateral and multilateral agreements, and international mandates of the international civil society organizations. Pledges amounted to USD 763 million with actual amount received at USD 336 million. Numerous humanitarian organizations were allowed to directly provide services sometimes undermining government efforts, which were seen inefficient. Managing