DEAN'S RESEARCH VENTURE INITIATIVE

We are delighted to present a summary of key activities and research findings from 2022 funding recipients of the Dean's Research Venture Initiative.

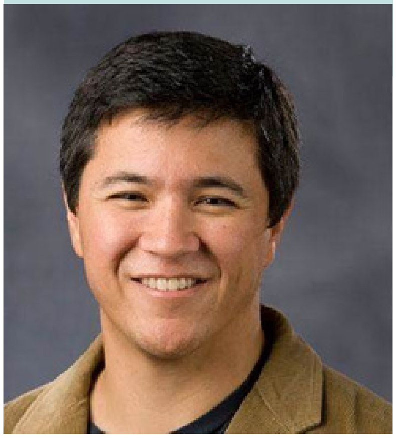
This funding allows the Nicholas School to build world-class research initiatives — ones that advance early concepts, lowering the financial barriers for our faculty to launch innovative and novel research ideas. These ideas also help prepare our graduate and PhD students to become future environmental leaders with the skills and knowledge they need to make a positive impact on our world. It helps facilitate our study of important environmental issues, informs policy, and guides our approach to creating solutions to improve the natural world and protect human health.

Additional follow-on funding secured by Dean's Research Venture Initiative grants has exceeded $6 million, and more than $4 million in funding is now being sought by faculty after receiving their Dean's Research Venture funding.

BILL PAN: PREVENTING MALARIA TRANSMISSION ON MIGRATION ROUTES

"Malaria elimination is definitely possible in the Americas, but we must have global commitments and support immediately, before climate change pushes this goal out of reach."

Bill Pan, DrPH



THE ISSUE

Malaria cases in Panama have skyrocketed in recent years, with more than 10,000 cases reported in 2023 compared with 715 cases in 2018. In the remote Darién region, a critical transit point for migrants traveling north, the situation is even worse.

Though it seems migration is accelerating malaria transmission, more evidence is needed to advocate for additional resources along migration routes to prevent further spread. Bill Pan, DrPH, leads a research team in Panama to help elucidate how malaria cases are related to international migration, and to develop new and more reliable methods of forecasting where and when malaria outbreaks may occur.

THE RESEARCH

Pan's team classified communities based on whether they were directly impacted by migration (known transit points for migrants), highly impacted (less than 10 kilometers away from a transit point), less impacted (10-25 kilometers away), or not impacted (more than 25 kilometers away).

They found that directly impacted communities experienced a significantly higher increase in malaria cases than other communities. The team estimated that 38 percent of malaria cases in communities within 10 kilometers of migration routes—and 16 percent of cases in the country overall—were attributable to migration.

THE IMPACT

Thanks to ongoing support from the Dean's Research Venture Initiative, the team's work is having a major impact on U.S. policy regarding migration and the refugee crisis. With over half a million U.S.-bound migrants crossing through the Darién region in 2023, the team's work has been critical in providing needed updates on the risk of malaria transmission. It has also been key in advocating for funding for malaria screening and treatment on migration routes and at the U.S. border.

KATE HOFFMAN: TRACKING DISPARITIES IN HEAT-RELATED ILLNESSES

"While we feel this work is important in its own right, through this project, we have established lasting and productive collaborations with colleagues across the university and our community that will greatly increase our capacity to make a public health difference moving forward."

Kate Hoffman, PhD

THE ISSUE

With record high temperatures year after year due to climate change, one of the growing threats to human health and well-being is heat-related illnesses and deaths. A study of urban areas found that historically redlined neighborhoods, or those denied services as a result of discrimination, are hotter than non-redlined neighborhoods. The Dean's Research Venture Initiative enabled Kate Hoffman, PhD, and her team to determine the prevalence of heat-related illnesses and deaths in six redlined neighborhoods in Durham, N.C.

THE RESEARCH

The team first evaluated environmental quality in Durham's neighborhoods. Results showed that formerly redlined neighborhoods in Durham have less vegetation than non-redlined neighborhoods and that this pattern is persisting over time. This is particularly important since lack of vegetation is related to urban heat. The results also showed that people living in formerly redlined neighborhoods are disproportionately exposed to heat in the summer months.

The team then collected individual-level health data from Electronic Health Records (EHR) for all patients seen at the Duke University Medical Center and associated clinics from 2014 to 2021. Residents living in the historically redlined neighborhoods were three times as likely to be seen at a hospital or clinic for a heat-related illness. The team also found that non-Hispanic Black residents were more vulnerable to heat compared to non-Hispanic Whites. The study demonstrated how historical redlining continues to affect the community environment as well as residents' health in Durham.

THE IMPACT

Hoffman moderated a discussion of climate impacts on health for the June 2023 Climate Change and Immune Health Mini-Symposium sponsored by the Duke Center for Human Systems Immunology. Ruoxue Chen, then an NSOE graduate student, also presented these results during her Master's Project (MP) in May 2022. Since that time, she has guest-lectured on this work in several Duke courses.

Preliminary findings from this study supported an additional Duke Data Expeditions Team (Impact of Climate Change on Immune Resilience led by Dr. Georgia Tomaras). While the project proposal from this team was not ultimately funded, the assembled team is developing a proposal for the NIH RFA for Exploratory Grants (P20) on Climate Change and Health Research Centers in which Hoffman will play a central role.

Hoffman is currently collaborating with colleagues across the university, including the Duke Global Health Institute, to apply for a Burroughs Wellcome Fund Climate and Health Interdisciplinary Award. Their proposal, "Identifying opportunities for intervention to mitigate climate-related health risks," will investigate the impact of climate change on routine health care and potential intervention strategies to promote public health.

NISHAD JAYASUNDARA: LINKING WATER QUALITY & KIDNEY HEALTH

> "What I enjoy the most is the opportunity we get to learn and train people on both sides... we can work within a community, which can lead to better outcomes."
>
> Nishad Jayasundara, PhD

THE ISSUE

In recent years, a steep rise in kidney disease in young male farmers in South America and Central Asia caught the attention of Nishad Jayasundara, PhD, Juli Plant Grainger Assistant Professor of Global Environmental Health. In a Nicaraguan village, one in three men was diagnosed with end-stage renal failure; in a hospital in the Uddanam region of India, a new nephrology unit was set up for patients needing dialysis.

THE RESEARCH

Gifts to the Dean's Research Venture Initiative enabled Jayasundara's team to study chronic kidney disease in the most vulnerable communities. The most recent work focuses on Sri Lanka, where Jayasundara grew up, and where in certain villages one in five people has chronic kidney disease.

Jayasundara partnered with Lee Ferguson, associate professor of civil and environmental engineering at Duke, and Mangala De Silva of the University of Ruhuna, Sri Lanka, to sample hundreds of wells in four affected regions of the country. The team soon made a critical discovery.

Glyphosate, the active compound in Roundup weed killer, was previously thought to break down in the environment within a few days to weeks. However, the analysis found that glyphosate was interacting with cations--positively charged ions such as calcium and magnesium--and therefore was not breaking down as quickly as previously thought. Although the compound was banned in Sri Lanka, 44 percent of the wells in the affected area were still contaminated with glyphosate, compared to only 8 percent of those outside of it.

Parallel research in the Jayasundara lab showed that glyphosate and metal-ion complexes can be toxic to the kidneys, especially during human development. The team returned to Sri Lanka and found that children in these communities also showed higher levels of kidney damage.

THE IMPACT

Jayasundara teamed with Duke Global Health and the THEME (Technology, Health, Environment, Migration, Education and Ethics) Institute, a nonprofit in Sri Lanka which he co-founded to implement change at the local level.

With the help of community organizers and local doctors, the THEME Institute raised donations from the expatriate Sri Lankan community in North Carolina to establish water-filtration units at two schools in Sri Lanka.

The researchers agree that the results of their research should serve as a serious warning when considering risk of exposure to glyphosate.

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