HPC Newsletter

Nilanjan Chatterjee
Emily Haroz

Issue No. 13 April 19, 2018

Dr. Nilanjan Chatterjee, *School of Public Health*

Jointly appointed in the Department of Biostatistics and the School Of Medicine, Bloomberg Distinguished Professor, Dr. Nilanjan Chatterjee is an expert in disease risk prediction, developing models using genetic and non-genetic risk factors. Currently, he leads a research program that uses quantitative methods for design and analysis of modern large-scale biomedical studies with goals of identifying new risk factors and biomarkers, understanding disease mechanisms, developing models for disease risk prediction, and evaluating risk-based strategies for disease prevention.

Reducing Risk of Breast Cancer

In 2016, Dr. Chatterjee and colleagues published their groundbreaking work on a predictive model for breast cancer in JAMA Oncology. Celebrated in the press, they found that individuals with non-modifiable risk factors for breast cancer (high-risk genotypes) are able to reduce their risk through behavioral changes. Currently, Dr. Chatterjee and his team are working to validate the model prior to using it for clinical application. To achieve this, they are working with a multinational consortium of 10-15 prospective cohort breast cancer studies to update the model with new genetic information, which will allow them to see how many people develop breast cancer in the future.

Data-integration Methodology

An important contribution of the 2016 JAMA Oncology publication led by Dr. Chatterjee is the innovative methodology of data integration. Further elaborated in a 2017 working paper, the authors propose an approach to combining information on multivariate regression parameters across multiple different studies, each of which have varying levels of covariate information. Specifically, data-integration aims to estimate parameters of a theory-driven “maximal” model when subsets of covariates exist in different studies. Using information available from sets of parameter estimates from a series of “reduced" models available from these different studies as well as a small “reference” dataset that include all covariates, Dr. Chatterjee and collaborators propose a generalized meta-analysis method that utilizes the generalized method of moments approach with the iterated reweighted least square algorithm. With this data-integration method as well as its increasingly developed version, Dr. Chatterjee heads the Data-integration Arm of the Scientific Core of Hopkins Population Center to promote the integration of public health and epidemiological data and social science data.

Identifying Gene Variants Associated with Gallbladder Cancer

Along with investigators at the Tata Memorial Cancer Center in Mumbai and Center for Global Health of the National Cancer Institute US, Dr. Chatterjee led a large-scale genome-wide association study that led to the identification of a novel genetic locus associated with the risk of developing gallbladder cancer. Although rare, incidence of this highly fatal condition varies greatly based on geographic region and ethnic background. Through a study involving approximately 1,200 patients with gallbladder cancer and matched controls, Dr. Chatterjee and colleagues identified a specific common genetic variation near the gene region *ABCB1-ABCB4*, which have known biological significance, to be associated with an increased risk of this disease. They further estimated that disease susceptibility is likely to be determined by many additional common genetic variations and they altogether could explain as much as 25 percent of gallbladder cancer risk. Currently, Dr. Chatterjee and his collaborators are working to increase their sample size to over 3,000, with the goal of identifying additional gene variants associated with this cancer to contribute to population genetics of the specific cancer.

Future Directions

Based on Dr. Chatterjee and collaborators’ ongoing research to validate the predictive model of breast cancer risk, Dr. Chatterjee also plans to broaden the application of the model to other types of diseases. The end goal is to create a generalized framework that can be applied to various sets of risk factors and outcomes. Such a model requires integration of biomarkers and genetic information collected across a large number of studies, leading Dr. Chatterjee to characterize this work as a data integration project. An extension is to combine biomarkers in epidemiological studies and social processes in social science studies to promote interdisciplinary research of population dynamics.

HPC Newsletter
Nilanjan Chatterjee
Emily Haroz
Issue No. 13 April 19, 2018

Dr. Emily Haroz, *School of Public Health*
Appointed in the Department of Mental Health and with an affiliation at the Center for American Indian Health (CAIH), Dr. Emily Haroz directs her research towards alleviating health disparities in mental and behavioral health treatment access. Committed to underserved and low-resource populations, she works in partnership with local communities so that local perspectives are incorporated with rigorous science and big data. Interested in mixed methods research and trained in psychiatric epidemiologic methods, including advanced measurement models, Dr. Haroz focuses on cross-cultural mental health treatment, measurement, and implementation science.

Suicide Prevention in Refugee and Displaced Populations

Funding by the Johns Hopkins Alliance for a Healthier World, this global mental health project addresses health disparities impacting suicide in the context of displacement. This interdisciplinary project includes researchers from the School of Engineering. Filling a major empirical gap, this project uses Community-Based System Dynamics to plan for programs that will address the suicide burden among displaced persons in refugee camps in Western Thailand. Organizing a series of workshops with local experts and experts in the field of suicide prevention and health systems research, Dr. Haroz and her team generated dynamic systems model of suicidal behavior in refugee populations in order to better select interventions.
Using this innovative method, they simulated the impact of four prevention strategies to examine their effects on reducing suicide rates within their model and assist local partner organizations in implementing the most promising strategies. Taking into account the complexities of suicidal behaviors, such as domestic violence, increased abuse of substances, stress, and scarcity of food rations, their novel method will optimize local suicide prevention efforts among these vulnerable groups.

Using Machine Learning to Prevent Suicide Risk

As a co-principal investigator of a Bloomberg American Health Initiative (BAHI) Spark Award, the CAIH and Dr. Haroz will build and test a mobile-health tool that identifies those youths at imminent risk for suicide to increase efficiencies of interventions by Native American community mental health care workers. With longtime partner, the White Mountain Apache Tribe, Dr. Haroz and her team use machine learning approaches on community based suicide surveillance data in order to train the tool to predict which individuals will be a highest risk for the suicide and prioritize those individuals for immediate outreach.
The CAIH will assess whether or not the tool reduces suicide attempts and deaths as well as decreases time between the risk event and follow-up among other objectives. As the first U.S. study of its kind to use community-based data, it provides an innovative and accurate way to examine suicide risk among American Indian populations.

Future Directions

Dr. Haroz will continue to prioritize underserved population in her research, including employing systems science approaches to examining the impact of home-visiting programs on suicide and examining how to enhance the sustainability of community-based programs in low-resource settings.