Harvard School of Public Health

Center for Communicable Disease Dynamics

Summer Program in Quantitative Sciences
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2011 Group Research Projects and Mentors

Project Title:
Age of immigration and duration in the United States as predictors of diabetes prevalence among older Latinos

Faculty Mentors:
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Program Participants:
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Dr. Maria Glymour, Henry Jackson, Amanda Alexander, Ashia Wilson, and Dr. Eric Tchetgen Tchetgen

Project Description:
Type 2 diabetes is far more common among Latinos than non-Hispanic whites in the US.1 The explanation for this pattern is unclear, but it is hypothesized that immigrant Latinos adopt unhealthy American behavioral patterns and these exacerbate other risk factors.2 Previous studies in the Multi-Ethnic Study of Atherosclerosis suggested that the relationship between acculturation and diabetes prevalence differed for Mexican Americans vs other Hispanics.3 Previous studies have focused on prevalence of diabetes, rather than incidence. This project uses data from the Health and Retirement Study, a nationally representative longitudinal study of Americans age 50+, to assess the relationship between age of immigration, and duration in the US, and diabetes in older Hispanics. Diabetes is self-reported during each biennial interview. In 2006, approximately half the sample provided Hemoglobin A1c readings, allowing validation of the self-reported diagnosis against an HbA1c criterion. Comparisons of self-reports to HbA1c based criteria indicate the self-reports perform well, but this has not been examined for Hispanic vs non-Hispanic or US born vs non-US born. The cohort includes about 1,600 Mexican Americans and 1,500 Hispanics of other national origin, and approximately half are US born.

Project Title:
Are smoking bans associated with improved cardiovascular health among older Americans?

Faculty Mentor:
Dr. Christopher Barr

Graduate Student Mentor:
Shanshan Li, PhD candidate in Epidemiology

Program Participants:
Sarah Anoke
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Steele Valenzuela, Dr. Christopher Barr, Katherine Cauthen, Sarah Anoke, and Shanshan Li

Project Description:
Exposure to secondhand smoke is associated with many negative health outcomes, including increased risk of acute myocardial infarction (AMI) and other cardiovascular diseases (CVD). Smoke, whether inhaled passively or actively, damages the lining of blood vessels and causes platelets to clot which might are contributing factors to AMI or stroke. Exposure to smoke has been found to induce angina, arrhythmias, constriction of the blood vessels, and it is associated with hardening of the arteries. It is estimated that among non-smokers, secondhand smoke exposure causes approximately 46,000 premature deaths from cardiovascular disease per year in the United States [2]. Exposure to secondhand smoke in the workplace or at home increases the risk of developing CVD for non-smokers by 25-30% [5].

In response to the growing literature on the negative health outcomes for secondhand smoke exposure, governments have implemented various tobacco control laws and movements. More recently, legislation has been enacted to prohibit smoking in public places and workplaces, with the intention of limiting exposure to secondhand smoke and reducing the prevalence of smoking.

The effectiveness of smoking bans on reducing cardiovascular disease is continually being assessed. One study conducted in Helena, Montana investigated admissions for AMI, and they found that after enactment of restrictions on smoking in public places and the workplace admissions decreased by 40% [6]. When the restrictions were lifted hospital admissions for AMI returned to pre-restriction levels. A study on the effect of a comprehensive smoking ban in New York state on hospital admissions for AMI and stroke showed an 8% reduction after controlling for a linear secular trend [3]. It is unclear whether the reduction in hospital admissions for cardiovascular events post-ban compared to pre-ban are an effect of the ban itself or if a secular trend might account for these differences.

Our study sought to assess the association between the Cook County, Illinois smoking ban and hospital admissions for AMI and other forms of CVD by controlling for the secular trend with a quadratic term.

[2] C. for Disease Control and Prevention. Smoking-attributable mortality, years of potential life lost, and productivity losses | United States, 2000{2004. Morbidity and Mortality Weekly Report, 57(45):1226-1228, November 2008.

[3] H. R. Juster, B. R. Loomis, T. M. Hinman, M. C. Farrelly, A. Hyland, U. Bauer, and G. S.Birkhead. Declines in hospital admissions for acute myocardial infarction in New York state after implementation of a comprehensive smoking ban. Am. J. Public Health, 97(11):2035-2039,2007.

[5] U. S. D. of Health and H. Services. The health consequences of involuntary exposure to tobacco smoke: A report of the surgeon general. http://www.surgeongeneral.gov/library/secondhandsmoke/report/, 2006.

[6] R. P. Sargent, R. M. Shepard, and S. A. Glanz. Reduced incidence of admissions for myocardial infarction associated with public smoking ban: before and after study. Brit. Med. J., 328:977-980, 2004.

Project Title: Assessing the impact of the hyper-infectious state of Vibrio cholerae on the outcome of vaccination campaigns

Faculty Mentor:
Dr. Marc Lipsitch

Post-Doctoral Mentor:
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Program Participants:
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Michelle Rendón

Gabrielle Milner, Dr. Elsa Hansen, Cassandra Baker, and Michelle Rendón

Project Description:
Cholera is a diarrheal disease that affects individuals in many developing countries, with an estimated several million cases per year, mostly in Asia and Africa. It is caused by a Gram negative bacterium called Vibrio cholerae, a facultative pathogen that can live in the environment as well as cause disease in humans. Cholera exists endemically in multiple locations, most notably in the Indian subcontinent, and can cause epidemic outbreaks, like those seen in Zimbabwe in 2008-2009 and more recently in Haiti, with over 100,000 individuals reported to have cholera and over 4000 deaths in each of these epidemics. Cholera is transmitted fecal-orally, with contamination of water reservoirs thought to be the main mode of transmission. Vibrio cholerae make cholera toxin, a toxin that causes profuse secretory diarrhea through its effects on the absorptive cells in the intestines. The diarrhea can be extremely severe, up to 15 Liters a day, and is classically described as "rice water stools". Without rehydration therapy, individuals with severe cholera can die in hours. Proper therapy can lower case fatality rates to less than 1%. Understanding the spread of cholera and the mechanisms underlying its transmission is therefore an important goal in the effort to control the disease and limit the illness and death cholera causes.

An important first step in modeling the spread of cholera is to judiciously pick what details of the disease are important to include in the model. This will be partly determined by the specific question that is being addressed. For example, a potentially important detail about Vibrio cholerae is that it is most infectious when it first enters the environment (i.e., immediately after excretion from the human host). This hyper-infectious state is short lived lasting only a few hours at which point the Vibrio become less infectious. At the outset it is not clear how important this hyper-infectious state is. On one hand it may significantly increase the rate at which cholera spreads through the population. On the other hand, the hyper-infectious state is short lived and since the pathogen spends most of its lifetime in a less infectious state it may not be necessary to model the hyper-infectious state. In this project we will investigate the importance of the hyper-infectious state in the context of how (or if) it effects the outcome of a vaccination campaign. As a starting point we will consider two different scenarios. First, a proactive vaccination campaign where a cholera outbreak in one region prompts a preemptive vaccination campaign in a neighboring region. Second, a reactive vaccination campaign where we are not able to vaccinate a population before the epidemic, but instead vaccinate the population while the outbreak is occurring.