NAME: Dean Spears

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POSITION TITLE: Assistant Professor, Department of Economics

EDUCATION/TRAINING

<table>
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<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE</th>
<th>Completion Date</th>
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<td>University of Oklahoma, Norman, OK</td>
<td>BA</td>
<td>05/2005</td>
<td>International Studies</td>
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<td>University of Oklahoma, Norman, OK</td>
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<td>Princeton University, Princeton, NJ</td>
<td>PhD</td>
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A. Personal Statement

As a health and development economist and economic demographer, I conduct empirical research that spans several PRC primary research areas. These include Demography: Family Demography and Intergenerational Relationships, Population Health, and Reproductive Health. One strand of my research analyzes how social inequalities within and across households in India shape maternal nutrition, early-life health, and other determinants of child survival and growth. The second strand of my research examines the environmental determinants of child health outcomes in the developing world, with a particular focus on the role of poor sanitation, climate change and temperature, and air pollution, such as from coal plants. This developing-country work includes examination of how mothers’ exposure to environmental hazards during the in-utero period can affect child health after birth.

In the next five years, I intend to continue working in both strands. For my work in consequences of child health of social inequality, I have research in progress, in collaboration with my PRC colleague Diane Coffey, examining the importance for maternal nutrition of the low social rank of daughters-in-law in Indian joint households, and other research studying the causes of differences in average child height across children of castes of different rank. Professor Coffey and I are also working on a book about the consequences of open defecation in India for child health and mortality. Finally, in the coming year we plan to develop more deeply a project studying a novel stylized fact we have uncovered in Demographic and Health Survey data: neo-natal mortality in India steeply improves with later birth order in India, in a way that is not true in other developing countries and is not true of later-infancy mortality. We interpret this as evidence of the importance of social status for maternal nutrition: young women in India are often underweight, and gain weight across pregnancies. Developing and testing this interpretation will be a major focus of my work with Professor Coffey in the coming years.

In my continuing work on child health in the developing world, I am particularly excited about a new project I’ve begun, in collaboration with my PRC colleague Michael Geruso, examining how exposure to extreme weather and airborne pollutants affect child health and survival. There is good evidence on the impacts of extreme temperatures and airborne pollutants on health in the rich world, but we know very little to date about whether and to what extent the adverse health effects of these environmental factors differ for populations in poor countries, which have limited access to mitigating technologies such as air conditioning. We have planned several sub-projects within this research agenda that will cut across the areas of economic demography, reproductive health, and population health. We will analyze the effects of heat, humidity, ozone, and particulate matter pollution on infant and child physical health and outcomes like child cognitive development. We also have the data fidelity to examine how child health outcomes respond when the mother was exposed to these environmental hazards during the in-utero period. Another research project within this aspect of my agenda studies the change in respiratory health in Indian districts that acquired a coal power plant over the period from 2005-2012, relative to the districts that did not increase their exposure to coal smoke.

The UT PRC has been instrumental in helping me and Professor Geruso to launch the climate and pollution project. The PRC has provided pilot funds to hire research assistants so we may begin the task of harmonizing data from 116 distinct Demographic and Health Surveys: nationally representative developing country surveys.
The next step in the coming year will involve merging these geocoded developing country datasets to climate and pollution variables that correspond in place and time to the survey respondents. Constructing this dataset is the first critical step in this research agenda, and it involves start-up costs that would be insurmountable for us without financial and technical support from the PRC. Assembling this type of merged global dataset on climate and health has never been done before, and I expect that the creation of the dataset in itself will constitute a major contribution to science. Technical support from the PRC’s Science & Technical Core has been key in this effort, as data processing and storage immediately became an issue of importance given the sheer size of the databases involved in this project. As the project ramps up and builds several datasets in the terabyte range, this support will continue to be crucial.

B. Positions and Honors

Positions and Employment

2007-2008 Lecturer in Public and International Affairs, Princeton University
2012 Consultant, World Bank Water and Sanitation Program
2013-present Executive Director, r.i.c.e. (RICE Institute, Inc.)
2015-present Visiting Economist, Economics and Planning Unit, Indian Statistical Institute, Dehli
2016 (spring) Visiting Associate Research Scholar; WWS, Princeton University
2017-present Assistant Professor, Department of Economics, The University of Texas at Austin

Other Experience and Professional Memberships

2010-present Member, American Economic Association

C. Contributions to Science

Neighborhood Sanitation and Infant Mortality

Ending open defecation in the developing world has gained significant attention in recent years. Improving sanitation by ending open defecation has become a target of governments, of NGOs, and of private foundations. Epidemiological evidence suggests clear pathways by which exposure to fecal pathogens introduced by neighbors could lead to acute net malnutrition and ultimately death, but the prior literature had provided very little empirical evidence linking poor sanitation to infant death. In joint work with Prof. Mike Geruso, I have investigated the mortality externalities of poor sanitation. Using nationally representative microdata from India that allows us to observe the sanitation practices of neighbors as well as own household infant mortality, we estimate large infant mortality harms generated when neighbors defecate in the open. To put the finding in perspective: More than half of India’s population of 1.2 billion do not use toilets or latrines, either of which can serve to safely dispose of waste. Our findings, which are the first to estimate this relationship, are informative of the external harm generated by the one billion people worldwide who practice open defecation today. Our findings have been featured in the popular press, such as the New York Times and The Economist magazine, and have already been accumulating academic citations, despite the working paper being in a pre-publication phase. The paper, Geruso and Spears (2015), is now R&R at a top general interest economics journal. In summary, this work has significantly contributed to the scientific understanding of the environmental factors affecting infant health and survival.


The link between Sanitation and Child Anemia

Anemia is a widespread problem with serious health and economic consequences. Defined by low counts of
red blood cells or low levels of hemoglobin in the bloodstream, anemia implies a reduced capacity for the blood to carry oxygen. Previous research has shown that in adults, it reduces productivity and is associated with higher maternal mortality and that in children, it impairs physical and cognitive development. Globally, more than 40% of children have hemoglobin levels below the threshold for anemia. The previous literature has largely focused on the role of malaria or inadequate nutrition in causing anemia. My research with Diane Coffey and Mike Geruso is the first to propose and provide evidence for an innovative hypothesis: Poor sanitation (the unsafe disposal of human feces) also significantly contributes to anemia. We identify effects by exploiting rapid and differential improvement in sanitation across regions of Nepal between 2006 and 2011. Within regions over time, cohorts of children exposed to better community sanitation developed higher hemoglobin levels (i.e., lower rates of anemia). Our results highlight a previously undocumented externality of open defecation, and build on my prior work with Geruso. The paper, which was funded by an NIH R03 grant, is now R&R at a top general interest economics journal (The Economic Journal). The importance of this paper is that it fundamentally shifts our scientific understanding of what causes anemia: It is not just the calories that one consumes. Anemia also depends crucially on the calories lost to the type of intestinal parasites and illnesses that are caused by exposure to poor sanitation.


**The link between open defecation, nutrition in India, and the Indian calorie decline**

India is home to a number of enduring nutritional puzzles. Why are Indian children among the shortest in the world, even though they are richer, on average, than people in sub-Saharan Africa? Why has average household calorie consumption declined over time in India, even as households have become richer? My research in this project has contributed substantially to a new understanding of exceptionally widespread open defecation in India as an explanation for these nutritional puzzles. I was the first to propose and provide evidence for the explanation that open defecation, in the context of high population density, can account for the “Asian Enigma,” by which children in India are shorter than children in sub-Saharan Africa. With Josephine Duh, I showed that people in India who live in local areas where more people defecate in the open – and therefore where they have more intestinal disease that prevents them from absorbing and using the food they eat – eat more food on average, despite being poorer. This can account for an important fraction of the Indian calorie decline. Finally, in collaboration with UT PRC professor Diane Coffey and other researchers, we showed using every available Demographic and Health Survey matched with census data that the gradients between open defecation and child height and between open defecation and infant mortality are steeper in places with greater population density.

- Payal Hathi, Sabrina Haque, Lovey Pant, Diane Coffey, Dean Spears. “Place and child health: the interaction of population density and sanitation in developing countries” forthcoming Demography.

**D. Research Support**

**Ongoing Research Support**
OPP1125318 (D. Spears and D. Coffey, PIs) 08/01/15-07/31/19
Bill and Melinda Gates Foundation
Evidence, solutions, advocacy, and collaboration for India’s sanitation sector
Center grant to r.i.c.e. to support research on population-level health consequences of open defecation in rural India and evidence-based policy advocacy.
Role: Co-Principal Investigator
Responsibilities: Responsible for overall leadership of research and r.i.c.e. team, as well as authorship and co-authorship of several papers.

**Completed Research Support**
R03HD081209 (D. Spears and M. Geruso, PIs) 09/22/14-08/31/16
National Institute of Child Health and Human Development
Impacts of Sanitation on Child and Maternal Health
This project aimed to better understand how widespread inadequate sanitation in poor countries shapes human development, health outcomes, and nutritional status.
Role: Principal Investigator
Responsibilities: co-author of research papers, supervised research assistants.

OPP1071370 (D. Spears, PI) 08/01/13-07/31/15
Bill and Melinda Gates Foundation
SQUAT: Evidence based sanitation advocacy for India
This project funded quantitative and qualitative field research in rural north India about the causes of open defecation, about the extent of open defecation in rural India (including in households that own latrines) and consequences of open defecation for population health.
Role: Principal Investigator
Responsibilities: Responsible for overall leadership of research and r.i.c.e. team, as well as authorship and co-authorship of several papers.