Estimates of the Impact of Natural Disasters on Total Enrollments and First-Year Undergraduate Enrollments at U.S. Colleges and Universities

Rodney Hughes, West Virginia University and Center for the Future of Land-Grant Education
Alexa Cecil, West Virginia University

Introduction
- Recent examples of natural disasters: hurricanes, tornadoes, and wildfires
- Potential impact on higher education enrollments; broader local economic impact; response from university-based cooperative extension services

Related Literature
- Short-term declines in test scores and college enrollment in New Orleans after Hurricanes Katrina and Rita (Sacerdote, 2012)
- L'Aquila earthquake in Italy had no significant effect on first-year enrollment for the next three cohorts (Cerqua & DiPietro, 2017) but reduced persistence and completion (DiPietro, 2018)
- Severe disasters (causing 25 or more deaths) led to U.S. county-level out-migration and higher poverty rates (Boustan et al., 2019)
- On the other hand, college enrollment may increase in the wake of economic shocks that lead to job losses (Hubbard, 2017)

Research Questions
- What are the impacts, if any, of a natural disaster in an institution’s own county on next year’s total enrollment and first-time, first-year enrollment?
- What are the impacts of severe disasters (causing 25 or more deaths) or disasters in adjacent counties, other disasters in the same state, or disasters in adjacent states?
- What are the impacts of total enrollments in the set of all institutions in a given county, for two-year enrollment, four-year enrollment, and enrollment at any institution?

Data and Methods
- Data on natural disaster incidence (type, date, county, state) from OpenFEMA Disaster Declaration Summaries – V1 database (Full Data)
- Linked data on number of deaths from each disaster from the EM-DAT international disaster database at the Centre for Research on the Epidemiology of Disasters
- Data on institutions’ annual enrollments, locations, and other characteristics from Integrated Postsecondary Education Data System (IPEDS)
- Identified adjacent counties and states using U.S. Census Bureau TIGER/Line shapefiles and QGIS open-source GIS software
- Boustan et al. (2019): no evidence of political influence on the disaster declaration process, so we treat natural disasters as exogenous events
- With disaster dates, we associate enrollment in (for example) school year 2014-15 with disasters that occurred between July 2013 and June 2014
- Model enrollment as:
  \[ Y_{it} = \beta_0 + \text{Disasters}_{it-1} + Y_{i-1} + \epsilon_{it} \]
  where \( Y_{it} \) will reflect both counts of enrollment and logged enrollment for institutions on counties \( i \) in year \( t \) in separate models, \( \text{Disasters}_{it-1} \) is a vector of measures of disasters around institution or county \( i \) in year \( t-1 \), \( Y_{i-1} \) is a fixed effect for institution or county \( i \), \( \epsilon_{it} \) is a fixed effect for year \( t \), \( \epsilon_{it} \) is an error term specific to institution or county \( i \) and year \( t \), and \( \beta_0 \) is a vector of regression coefficients to be estimated.

Interpretation of Results
- Statistically significant decrease in total enrollment and first-year undergraduate enrollment at public four-year institutions after a disaster in the same county (FY about 1.6 percent in log terms)
- Increase in first-year enrollment after disasters in adjacent counties and small decrease after disasters in other counties in the same state, also at public four-year institutions
- Decrease in total county-level enrollment after a disaster in the same county (driven by a decrease at public four-year institutions)
- Large increase in county enrollments after disasters in adjacent counties; slightly smaller increase after disasters in other counties in the same state
- Not pictured: reduction in counts of first-year undergraduate enrollment at public four-year institutions after severe disasters in adjacent states; driven by in-state students and also present in county-level results

Significance
- Room to investigate associated impact on institutions’ finances (tuition revenue, state appropriations, public service expenditures)
- Represents a starting point for characterizing potential impacts on enrollments from CoViD-19 (although exogeneity of CoViD-19 impacts are perhaps less plausible)

References and full regression results available from authors upon request (via rodneyhughes@mail.wvu.edu).