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, tornados, 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 (Carcuà & 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, 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 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 on 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) for 2005 – 2016
• Linked data on number of deaths from each disaster from the EM-DAT international disaster database at the Centre for Research on the Epidemicology of Disasters
• Concurrent 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:
  \[ Y_t = \beta_0 + \text{Disasters}_{t-1} + \gamma_1 + t_1 + e_{t1} \]

where \( Y_t \) will reflect both counts of enrollment and logged enrollment for institutions or counties in year \( t \) in separate models. \( \text{Disasters}_{t-1} \) is a vector of measures of disasters around institution or county in year \( t-1 \); \( \gamma_1 \) is a fixed effect for year \( t \); \( e_{t1} \) is an error term specific to institution or county \( j \) and year \( t \); and \( \beta_1 \) is a vector of regression coefficients to be estimated.

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

Selected Results

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 is perhaps less plausible)