Aims/Significance

Administered by the Federal Emergency Management Agency (FEMA) and established in 1968, the National Flood Insurance Program (NFIP) is one of the world's longest standing public insurance programs (Michel-Kerjan, 2010). By 2012, NFIP had provided approximately $1.2 trillion of insurance coverage to nearly 6 million commercial and residential policyholders (FEMA, 2013). Because NFIP solely relies on premium collection from property owners, the unexpected number of claims caused by major hurricanes in 2005, 2008, and 2012 led to NFIP debt of nearly $30 billion, (CBO, 2013). Some residents remained socially and physically vulnerable as a result.

To address NFIP debt, the Flood Insurance Reform Act of 2012 (CBO, 2012) requires FEMA to restructure its Digital Flood Insurance Rate Map (DFIRM) to reflect the "true risk" of properties in newly identified Special Flood Hazard Areas (SFHAs). The act also authorized FEMA to support research on the participation and affordability of flood insurance for eligible policyholders (CBO, 2012).

This case study is the first step in developing an affordability framework for NFIP that also addresses the property needs of vulnerable populations. Specifically, when Hurricane Ike swept Galveston County in 2008, over 30% of the population resided in FEMA-designated SFHAs. More than $2 billion economic loss to housing properties would have been otherwise mitigated if they had been covered by NFIP (FEMA 2008). However, the impacts of NFIP on community recovery for NFIP policyholders at different levels of social and physical vulnerability are as yet unknown.

Questions

This case study uses disaster vulnerability theory (Zakour & Gillespie, 2013) together with social and physical vulnerability data from Galveston County, to answer: Which groups are in most need of the NFIP? Which groups can and cannot afford to protect themselves from potential losses? How does NFIP mediate the effects of social vulnerability and physical vulnerability on community recovery?

Methods/Findings

We examined Galveston County's total population, 284,157, in 131,072 housing units distributed across129 census tracts, using spatial and multivariate analyses to explain and predict the levels of social and physical vulnerability and the levels of NFIP participation. Social vulnerability was measured by a social vulnerability index tailored to Galveston by principal component analysis; physical vulnerability was measured by the level of flood zones designated by FEMA that indicate different risks of flood exposure. We used structural equation modeling to analyze how much of the total effects (direct plus mediated effect) on community recovery are explained by the mediator, NFIP. GIS mapping illustrated the geographic variation of social and physical vulnerabilities before Hurricane Ike, and the impact of NFIP on disaster recovery across Galveston communities afterward.

High levels of social vulnerability were associated with low rates of NFIP penetration and with populations who most needed but were least likely to afford NFIP across Galveston. However, once covered by NFIP, communities and residents with high levels of social and physical vulnerability showed greater recovery than their counterparts not covered by NFIP. Thus, these two vulnerability factors should be considered while constructing eligibility for NFIP in receiving policy support.