Flood Insurance Coverage in Dare County: Before and After Hurricane Floyd

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National Flood Insurance Program

- Flooding is a ‘catastrophe risk’
  - Losses correlated across parcels
  - Limited data for estimating probabilities & loss
  - Government provision of disaster relief – ‘charity hazard’
  - ‘Adverse selection’ – only risky parcels will insure
- Private insurers reluctant to offer flood insurance
- National Flood Insurance Program (1968):
  - Create incentives for sound floodplain management
  - Make insurance available through partnership with private insurance agencies (sale/service – WYO)

National Flood Insurance Program

- Initial phases of NFIP– Flood Insurance Rate Maps
  - Subsidized insurance premium apply to pre-FIRM
  - Post-FIRM required to meet stricter building standards
- Initially, low demand for flood insurance
- Subsequent legislation encouraged purchase & mitigation projects
  - Mandatory coverage for mortgaged properties in SFHA
  - Incentives for community hazard mitigation – CRS
  - Erosion losses occurring during flooding covered

Objectives

- Combine data on flood insurance demand in Dare County for different time periods
  - How have coverage and deductible changed over time?
  - Are mandatory provisions being enforced?
  - How has subsidy status changed over time?
  - Does demand vary with subsidy status?
  - Does demand vary by risk classification (flood zone)
  - How sensitive is demand to price? Income? Demographic factors?

Dare County, North Carolina

- 386 square miles of land
- 30,000 residents; 6 millions tourists/year
- 20,400 residential structure – est. replacement value of $2.9 billion (2000 – 2002)
- Vulnerable to ocean and sound flooding/storm surge
  - Source: Dare County Hurricane Mitigation Plan

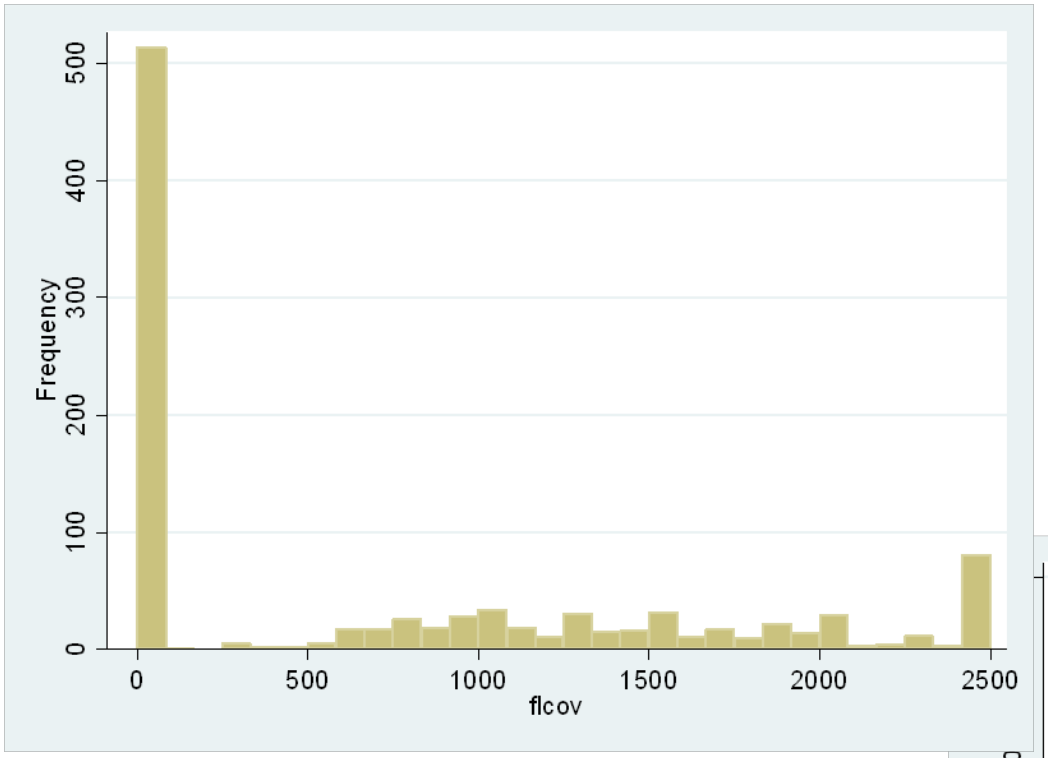
Data

- 1998 survey of homeowners in the near coastal zone (included site visits, GIS, and tax assessor data)
  - Initiated by FEMA to examine influence of erosion on NFIP
  - N = 1064, but for many variables only about 400 obs.
- 2008 survey of homeowners on barrier islands (includes GIS and tax assessor data)
  - Explore the effect of hazard perceptions on mitigation & behavior (RENCI)
  - N = 137

Summary Statistics: Dare County

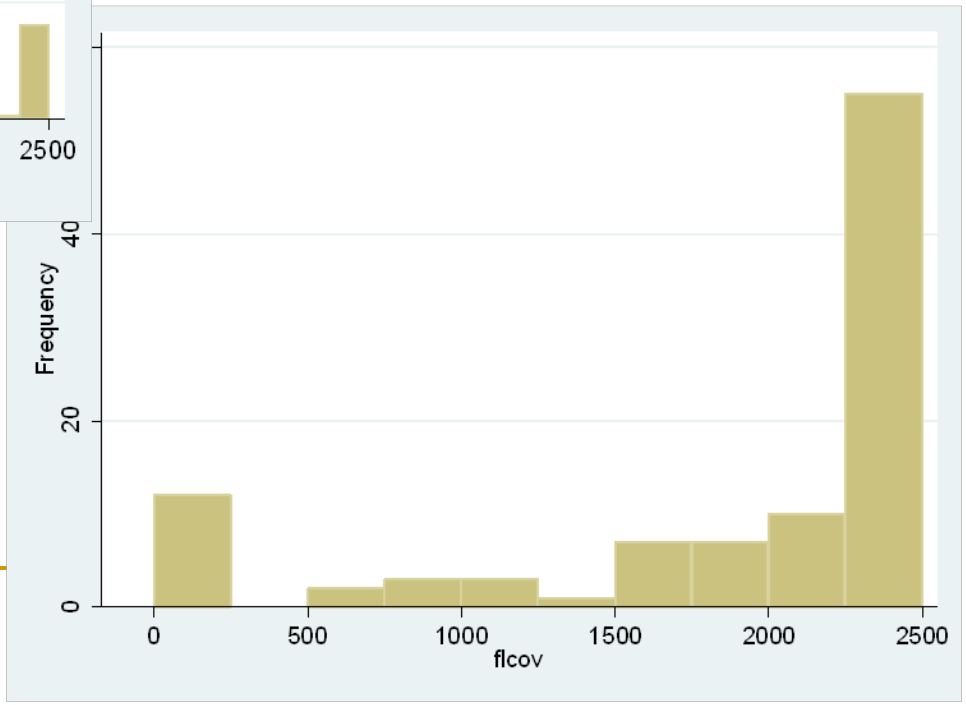
Variable	1998 (s.d.)	2008 (s.d.)	Test statistic (p)
Participation	0.533 (0.499)	0.903 (0.296)	χ^2 = 65.97 (<0.00)
Flood insurance (2008$)	121,204 (140,005)	189,859 (85,536)	*MW* = 6.37 (<0.00)
Building value (2008$)	114,054 (189,644)	228,296 (166,407)	*MW* = 10.76 (<0.00)
Insurance/value	0.556 (1.075)	1.147 (0.764)	*MW* = 2.54 (0.0108)
Deductible (2008$)	1927 (3623)	3177 (4096)	*MW* = 7.95 (<0.00)
Mortgaged	0.490 (0.500)	0.760 (0.428)	χ^2 = 13.26 (<0.00)
Required	0.118 (0.323)	0.615 (0.488)	χ^2 = 99.75 (<0.00)
Subsidy	0.424 (0.494)	0.232 (0.423)	χ^2 = -19.03 (<0.00)

Flood Insurance Coverage (thousands 2008$)



- 2008
  - Low frequency of non-participants
  - Many at upper bound

- 1998
  - High frequency of non-participants
  - Few at upper bound



Methods

- Multivariate regression analysis to analyze insurance coverage choice
- *Tobit* model with upper ($0) and lower ($250K) bound – maximum likelihood estimation
  - Marginal premium
  - Risk (flood zone)
  - Assessed building value
  - Subsidy status, mortgage status
  - Income, education

Results

- Price responsiveness:
  - ε_p = -0.645 for average property in 1998
  - ε_p = -0.018 for average property in 2008
- Coverage in V-zone $29,900 greater
- Coverage in A-zone $9800 greater
- Very small effect for building value: $1 increase in assessed building value increases coverage by $0.02.

Results

- Coverage is $14,100 greater for mortgaged properties
- $1 increase in household income increases coverage by $0.52
- Coverage lower for those for whom high school is highest level of educational attainment.

Discussion: Dare County

- Participation in NFIP has increased significantly
  - This is probably due to better enforcement of federal requirements regarding federally backed mortgages in SFHA (100-year flood zone)
    - More mortgaged properties
    - More property owners claim they were required to purchase flood insurance
- Coverage amounts have increased (in real dollars)
- Deductibles have increased
- Number of subsidized properties has decreased

Discussion: Dare County

- Flood insurance demand is not very responsive to price (likely reflects federal requirements)
- Coverage is greater in higher risk zones
  - Could partly reflect requirements in SFHA
  - But, V-zone is much greater than A-zone
- Coverage greater for higher valued buildings
- Coverage increasing in income and education

Conclusions

- Flood insurance coverage along the coast of NC appears to have increased since Hurricane Floyd
- There are still parcels that qualify for subsidized flood insurance, but the proportion has decreased
- Coverage demand is not price sensitive
- Coverage greater in higher risk zones and for more valuable structures
- Coverage higher for wealthy and more educated

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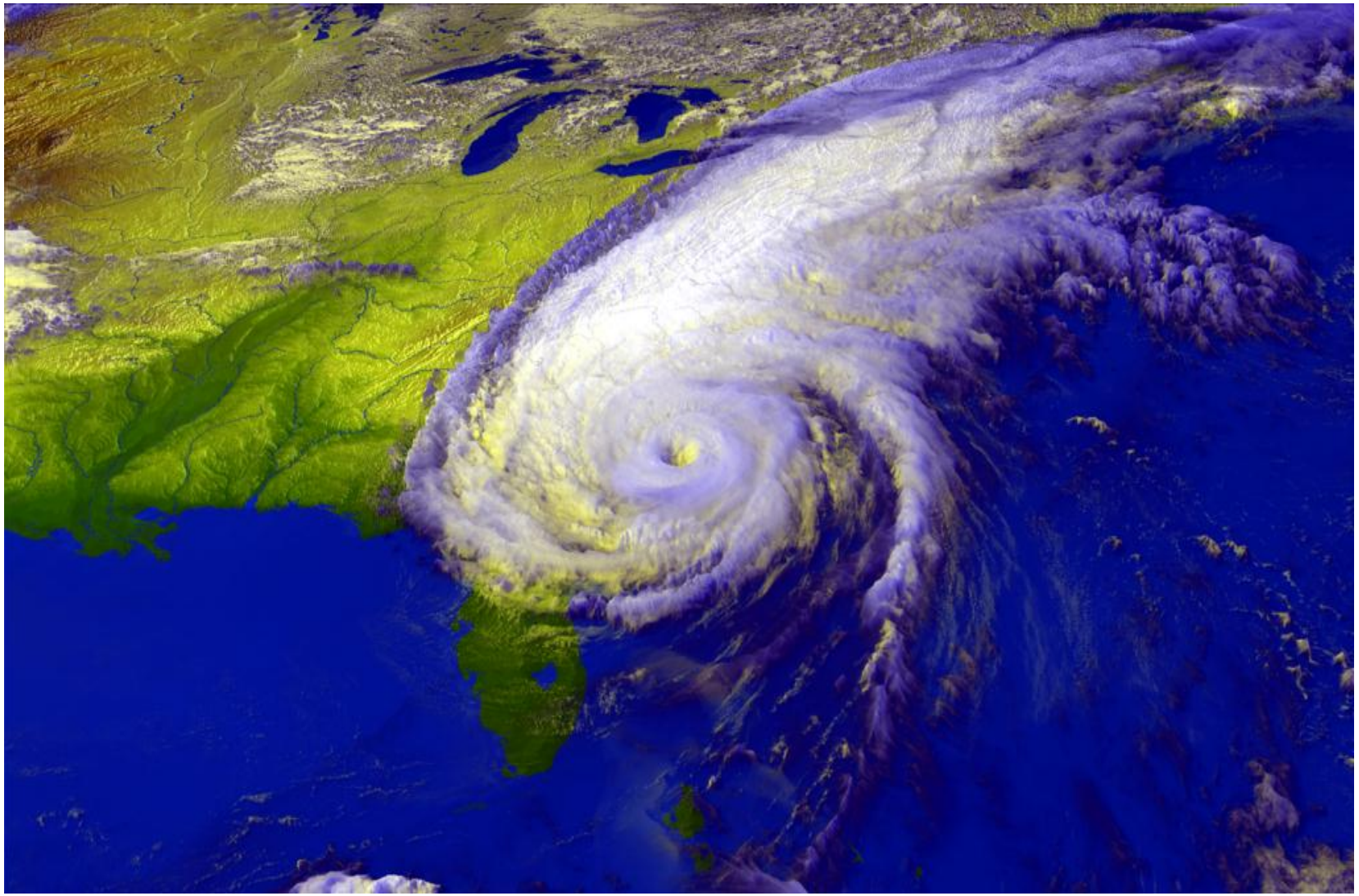

Hurricanes in Dare County

- 1999
  - **Dennis**: Aug. 28 to Sept 4
  - Stalled along the Outer Banks, pounded barrier island for 3 days, then looped back to make landfall on Cedar Island.
  - Thousands of people who did not evacuate were stranded and lashed with 70 mph winds. Beach erosion was massive.
  - Flooding stats

Hurricanes in Dare County

- 1999
  - **Floyd**: Sept. 15-16
  - Weakened from a cat 5 to a cat 2, brushed the NC coast.
  - Left behind record rainfall in an already saturated area.
  - Flooding stats
  - Largest natural disaster in state history
    - SOURCE: http://www.enctoday.com/articles/storm-4330-hurricane-north.html