Tornado Mitigation:
Results from the Oklahoma Safe Room Initiative

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Undergraduate Research at Austin College

- AC Weather Station
- Social Science Research Lab
  - Community Opinions
  - 2004 Florida Hurricanes
  - Saferoom Survey
    - Funded by Dept. of Commerce - NIST through Texas Tech, the Mellon Foundation, and Institute for Catastrophic Loss Reduction

Recent Insured Losses

- Tornadoes
  - April 2001 - $1.9 billion
- Hurricanes
  - Katrina - $38.1 billion
  - Ivan – $11.0 billion
  - Charley - $8.0 billion
- September 11th
  - $20.0 billion

Research Questions

- Empirical examination of mitigation attitudes from consumers of saferooms.
- Results provide policymakers more information about the types of people wanting tornado safe rooms and how much they are willing to pay

Previous Research

- "Consumer Attitudes on Tornado Shelters"
  - *Disaster Safety Review* Spring 2005
- "Buying Tornado Safety: What Will It Cost?" by Miller, Morgan, and Womack
  - *Southwestern Economic Review, 29 35-44.*
- Various Studies on Hurricanes and Tornadoes
  - Simmons, Kruze, and Willner

Data Sources

- Two Surveys of Oklahoma Residents:
  - Participants in the Oklahoma Saferoom Initiative - 2004
  - Residents of Oklahoma - 2005
- County Tax Assessor Survey- SQ 696
- Builder Interviews (Austin College and the University of Oklahoma)

Two Surveys

- Designed from input of academic economists, engineers, the Saferoom Assoc., and Saferoom providers.

Project Contributors

- Jamie Brown Kruse, East Carolina University
- Laura Dwyer, DuPont
- Kevin M. Simmons, Austin College
- Connie Dill, OK Dept. of Emer. Mgmt.
- Ernie Kiesling, Texas Tech University
- Ann Patton, Project Impact
- Jim Waller, Nat. Safe Room Assoc.

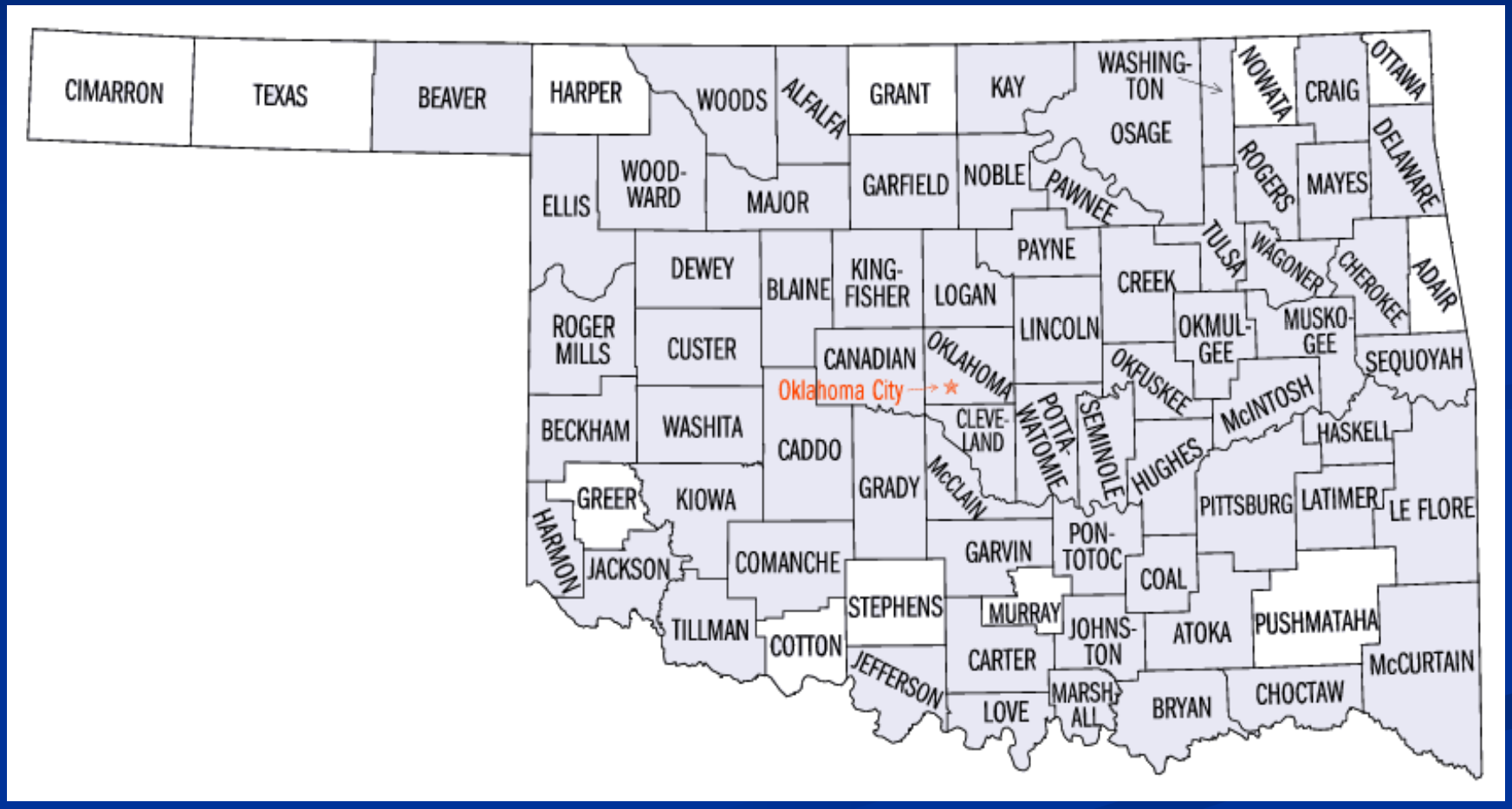
2004 Survey

- Funded by Department of Commerce - NIST grant through Texas Tech University
- 1300 surveys were mailed to approved applicants by the state of Oklahoma.
  - Three groups
    - Those who suffered damage
    - Those living in a county affected by a recent tornado
    - Residents of OK
- 280 surveys were returned for inclusion in the study.

2005 Survey

- Funded by Institute for Catastrophic Loss Reduction and Mellon Foundation
- 5000 surveys were mailed to approved applicants by the state of Oklahoma.
- 410 surveys were returned for inclusion in the study.
- Differences from 2004 survey
  - Question Order
  - Additional Questions
    - Ownership of saferoom
    - Household disaster safety plan

Counties Represented (65 of 72)



Test 1 - Direct Comparison

- Taking respondents 2004 survey and comparing their responses to those surveyed in 2005
- Drawing conclusions from statistically significant differences (means test)

Home Statistics* (Saferoom Owners vs. Non)

Owners

- House Age
  - Average - 1985
- Intended stay
  - 17.28 years
- Tenure
  - 10.89 years
- Value
  - <$100,000

Non-Owners

- House Age
  - Average - 1976
- Intended stay
  - 10.3 years
- Tenure
  - 12.93 years
- Value
  - $75,000

Risk Assessment* - Likert Scale

Owners

- Likelihood of tornado - 7.4
- Importance of saferoom - 9.45
- How seriously do you take warnings - 9.49

Non-Owners

- Likelihood of tornado – 5.6
- Importance of saferoom – 6.62
- How seriously do you take warnings – 8.51

Willingness to Pay

Owners

- Average: $3,000
- Range:
  - Minimum: $500
  - Maximum: > $7,500
- WTP compared to the value of the grant. ($2,000)
  - 60% willing to pay more than the grant
  - 40% not willing to pay more than the grant

Non-Owners

- Average: $1,435.14
- Range:
  - Minimum: $0
  - Maximum: $5,000

Inhabitants Special Needs

Owners

- People – 2 people
- Over 65
  - 20% had at least one senior member
- Small Children
  - 42% had small children
- Additional Assistance
  - 20% would need some type of assistance

Non-Owners

- People – more than 2
- Over 65
  - 25% had at least one senior member
- Small Children
  - 35% had small children
- Additional Assistance
  - 35% would need some type of assistance

Demographic Comparison

Owners

- Income* - $65,000
- Education – some college
- Age – 48
- Native
  - 58% born in Oklahoma

Non-Owners

- Income* - $50,000
- Education – some college
- Age – 50
- Native
  - 64% born in Oklahoma

Safety Information*

Owners

- 28% did not receive any information
- 37% within the last 6 months
- 31% within the last year
- 3% within 5 years

Non-Owners

- 75% did not receive any information
- 8% within the last 6 months
- 9% within the last year
- 7% within 5 years

Incentives: Range 1-6, most to least desired

Owners

- Tax Break – 2.5
- Mortgage Discount – 3.9
- Low Interest Rate Loans – 3.8
- Insurance Discounts – 2.6

Non-Owners

- Tax Break – 2.8
- Mortgage Discount – 4.2
- Low Interest Rate Loans – 4.0
- Insurance Discounts – 3.0

Saferoom Questions (owners only)

- Shelter Type
  - Below Ground – 86%
  - Above Ground – 14%
- Sharing
  - 70% will be sharing saferoom
  - Even higher in smaller populated counties

Safety Plan (non-owners)

- If given 20 minutes warning before a tornado is expected to strike your area would you . . .
  - Remain in your house – 50%
  - Travel to a neighbor's house - 10%
  - Travel to a nearby location that contains a tornado safe room/shelter – 40%

Comparison Results

- Significant variable differences for lack of saferooms
  - Safety Information – Less Information Received
  - House Age – Older houses
  - Tenure in House – Less time
  - House Value – Less Valuable homes
  - Perceived Likelihood of Tornado
- Age and Education hold some significance (older/less educated are not owners)

Other Comparison Results

- Natives of Oklahoma Attitudes about Tornadoes Differ from non-natives
  - More likely to seek shelter outside of own home
  - Less Likely to purchase/build saferooms
- SQ 696 – Saferoom Tax Abatement (Spring 2005)
  - Put into affect after Jan. 1, 2002
  - Oklahoma does not compile statewide participation
  - Found 2264 total claims in the entire state
    - About half were found in Oklahoma County alone
    - Only half of the counties had any claims

Test 2 - Probit Regression

- Compares the impact that selected demographic variables have on the probability that a household will decide to purchase a saferoom.
- Utilizes on 2005 respondents dividing those who had purchased saferooms (n=55) with those who had not (n=233).

Model

- In order to gain best model several regressions were run to test the significance and stability of all hypothesized variables
- Additional variables generated not in comparison study
  - Comparison of county average income and house value
  - Actual occurrence of tornados

Probit Results

Type III Analysis of Effects

Effect	DF	Wald Chi-Square	Pr > ChiSq
income	1	3.2590	0.0710
intend	1	4.1565	0.0415
wtp	1	4.2313	0.0397
value	1	0.0012	0.9722
built	1	0.0791	0.7785
age	1	0.0019	0.9655
people	1	1.9036	0.1677
native	1	0.0045	0.9468
likelihood	1	0.6072	0.4358
experience	1	0.3062	0.5800
county	1	3.8276	0.0504

Final Model

- Own = F (income, tenure in house, willingness to pay, population of county)

Effect	DF	Chi-Square	Pr > ChiSq
Income	1	3.7026	0.0543
Intend	1	3.8988	0.0483
Wtp	1	4.2627	0.0390
Bigc	1	2.5168	0.1126

What If?

- If Oklahoma budgeted $18 million for saferoom subsidies next year (assuming $2,000/saferoom)
  - 9,000 saferooms would be built
- However if the subsidy was reduced at a certain income level to $1,000/saferoom and if only a third of the applicants exceeded the income level then
  - 12,000 saferooms would be built

The Next Step

- Additional regression and modeling
- Another sample attempting to capture a larger group of Oklahoma residents
  - Florida/Louisiana residents facing rebuild after hurricanes
- Find optimal grant amount