Economic Losses Due to Natural Disasters

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Problem Statement

Problem 11 Prompt: Using Indeed or Glassdoor data, combined with number and type of affected businesses to estimate the expected economic loss due to a disaster

In other words...

Can we accurately predict wage loss in hurricane areas so as to prepare for the financial impact on its government & citizens?

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How to Quantify Damage Caused by a Hurricane?

Property Damage

Trade / Commerce

Ecological Damage:

Wage / Labor Markets

HURRICANE DAMAGE BY CATEGORY

SAFFIR-SIMPSON SCALE: MEASURES WIND STRENGTH DURING A HURRICANE ON A 1–5 SCALE

CATEGORY 1

74 TO 95 MPH

SHINGLES FLY OFF

TREES BEND IN THE WIND

EVERYTHING IS BASICALLY INTACT

POWER OUTAGE FOR A FEW DAYS

CATEGORY 2

96 TO 110 MPH

WINDOWS BREAK DUE TO DEBRIS

SIDING PULLS AWAY FROM HOUSE

POWER LOSS FOR DAYS TO WEEKS

CATEGORY 3

111 TO 129 MPH

DOOR OF HOUSE BLOWS IN

ROOF CAN BE RIPPED UP FROM WEAK POINTS

TREES START TO FALL

ROADS ARE BLOCKED DUE TO DEBRIS

ELECTRICITY AND WATER WON'T BE AVAILABLE FOR DAYS TO WEEKS

CATEGORY 4

130 TO 156 MPH

MOST WINDOWS BREAK

WEAK PARTS OF THE ROOF ARE TORN OFF

FALLEN TREES AND POWER LINES ISOLATE RESIDENTIAL AREAS

HOME IS UNINHABITABLE FOR WEEKS TO MONTHS

CATEGORY 5

> 157 MPH

CATASTROPHIC DAMAGE

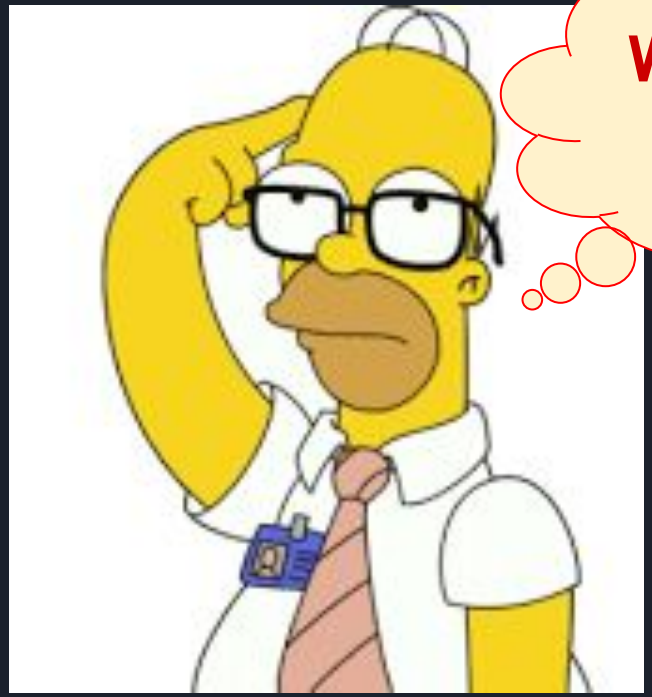
WALLS BEGIN TO FALL DUE TO HOLES IN ROOF

NO TREES STAND IN THE NEIGHBORHOOD

FRAMED HOMES DESTROYED

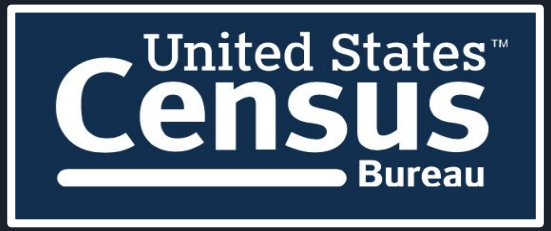
UNINHABITABLE UNTIL REBUILT

Data Requirement



- Quarterly
- County
- Industry
- Wages
- Employment

Original Data Sources

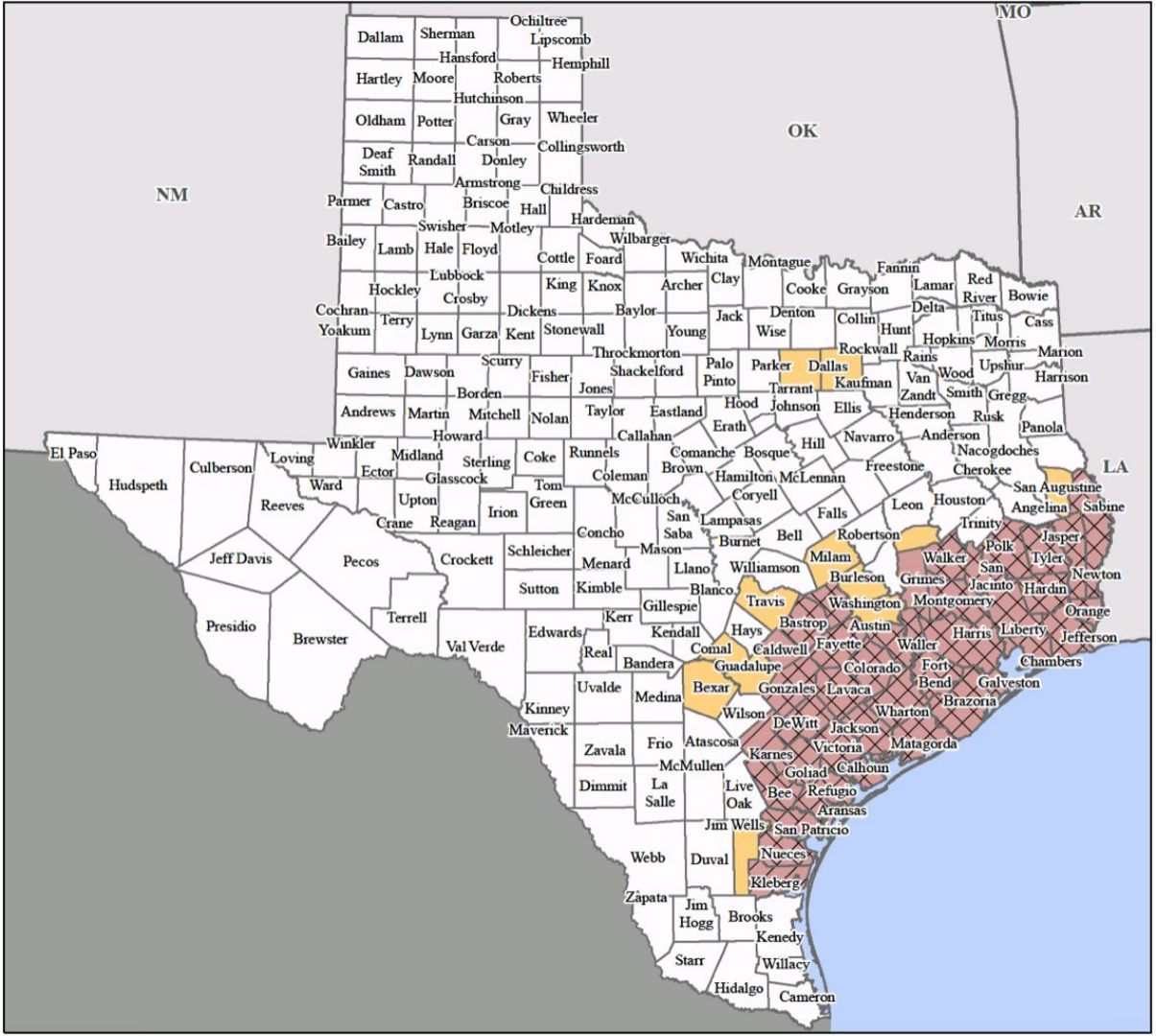


- FEMA Disaster Data
  - Public Assistance
  - Mitigation Assistance
  - Individual Assistance
  - Disaster Type
- US Census Bureau Data
  - County Business Patterns
  - Quarterly Workforce Indicators
- US Bureau of Labor Statistics
  - US Unemployment Data

Final Data Source

US Department of Labor- Bureau of Labor Statistics

- Quarterly, County, Industry, Avg Wages, Employment



Which Counties?

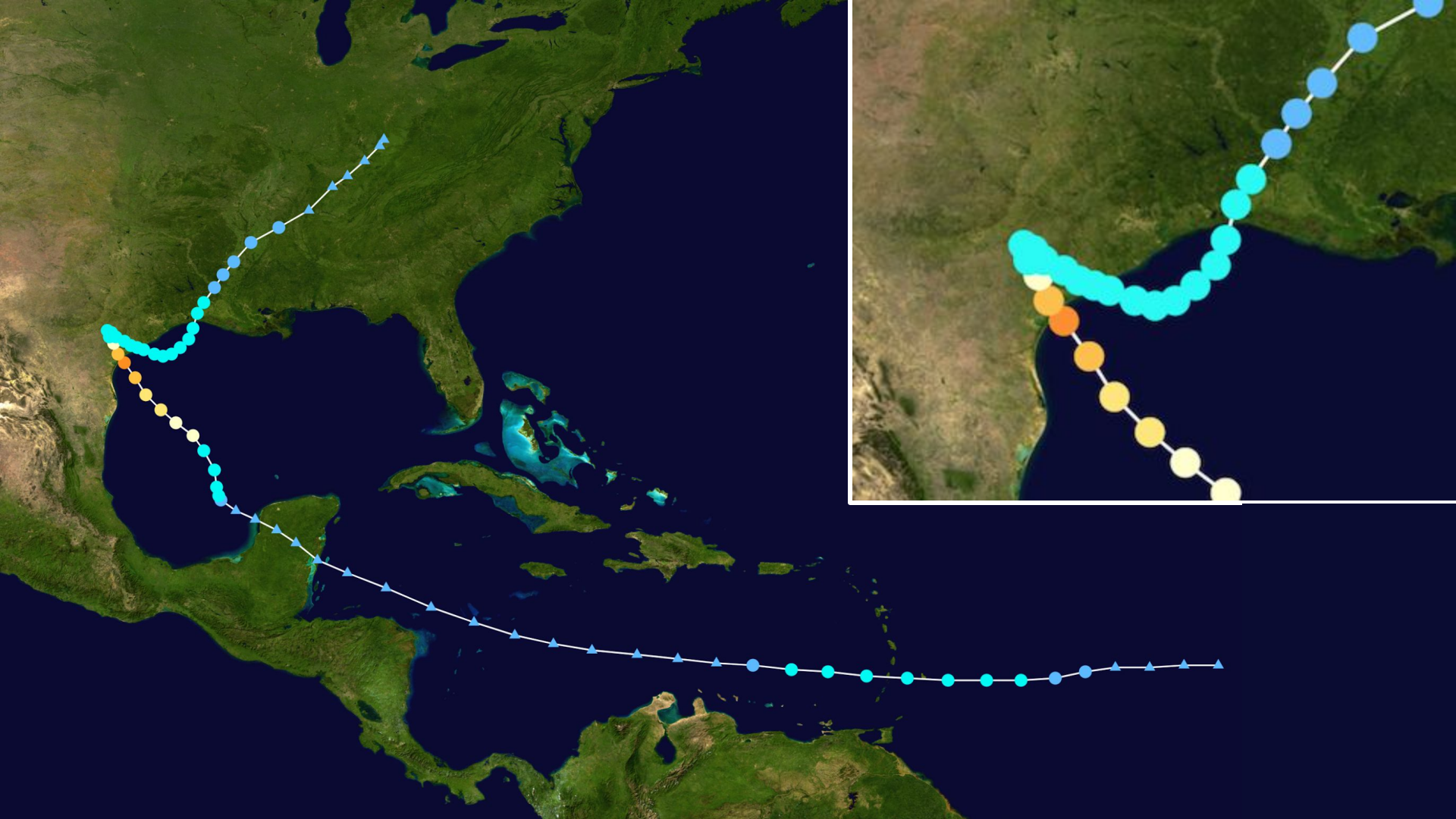
- 41 out of 254 Counties
- Individual Assistance:

  373,649 Individuals
- Total Individual &

  Households Program:

  $1,654,136,272.31
- Total Public Assistance

  Grants: $1,408,884,236.20

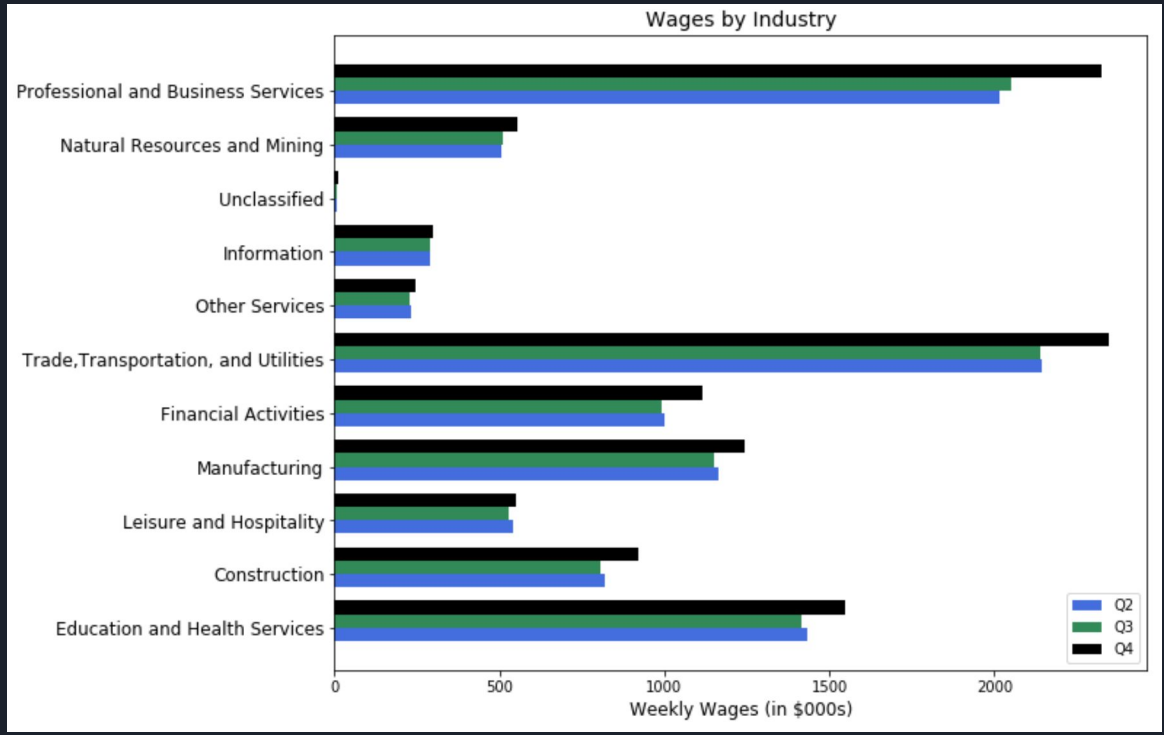


Data Processing

- We analyzed the economic loss in different parts :
  - Economic Value Quarterly By County
  - Economic Value Quarterly By Industry
  - Economic Value Quarterly By County and Industry (Merged)
  - Impacted/ Non-impacted

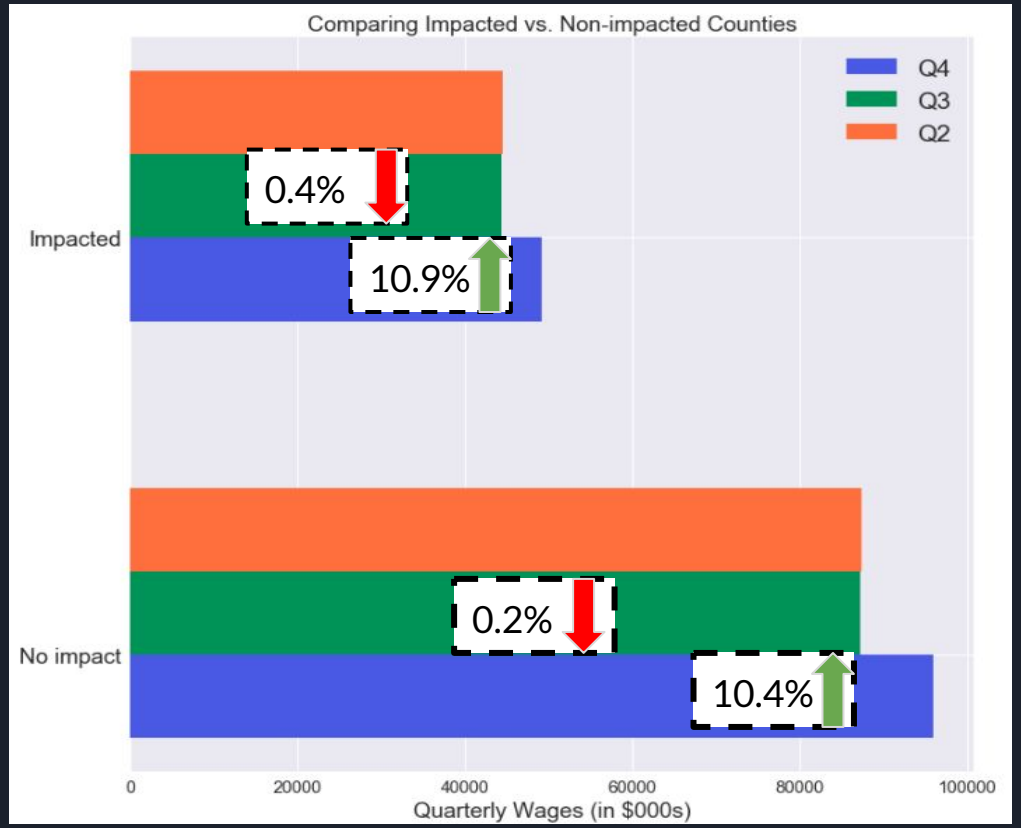
Economic Impact: Wages by Industry

- Education and health services saw the biggest decrease in wages from Q2-Q3 ($19M per week, -1.3%)
- Professional and business services & natural resources/mining saw an *increase* in wages despite the hurricane($34M per week, +1.7%)



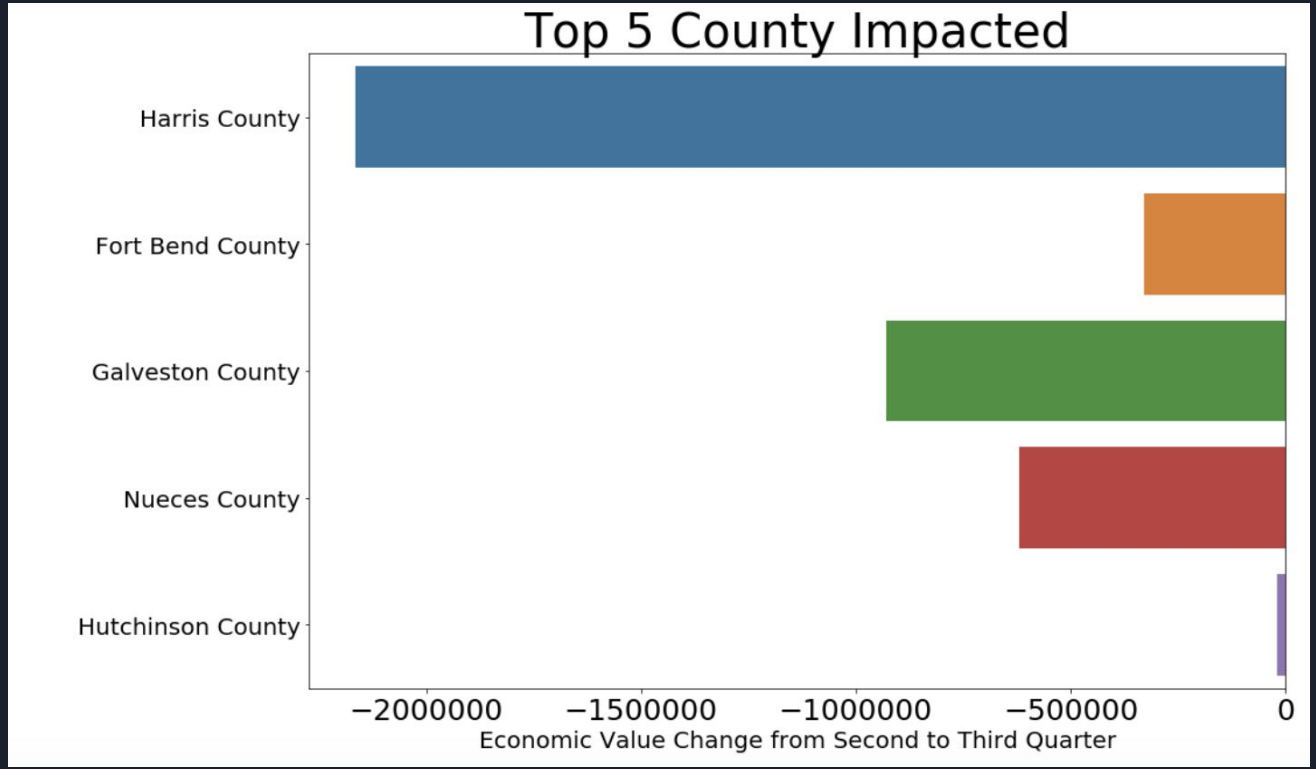
Economic Impact: Hurricane Zone

- Comparable QoQ changes between hurricane zone and areas that were not hit by Harvey
- Hurricane zone did indeed have more wage impact, but the difference was not material
- Wages increased back to above normal levels in Q4, indicating the effect of the hurricane lasted only one quarter at the most.



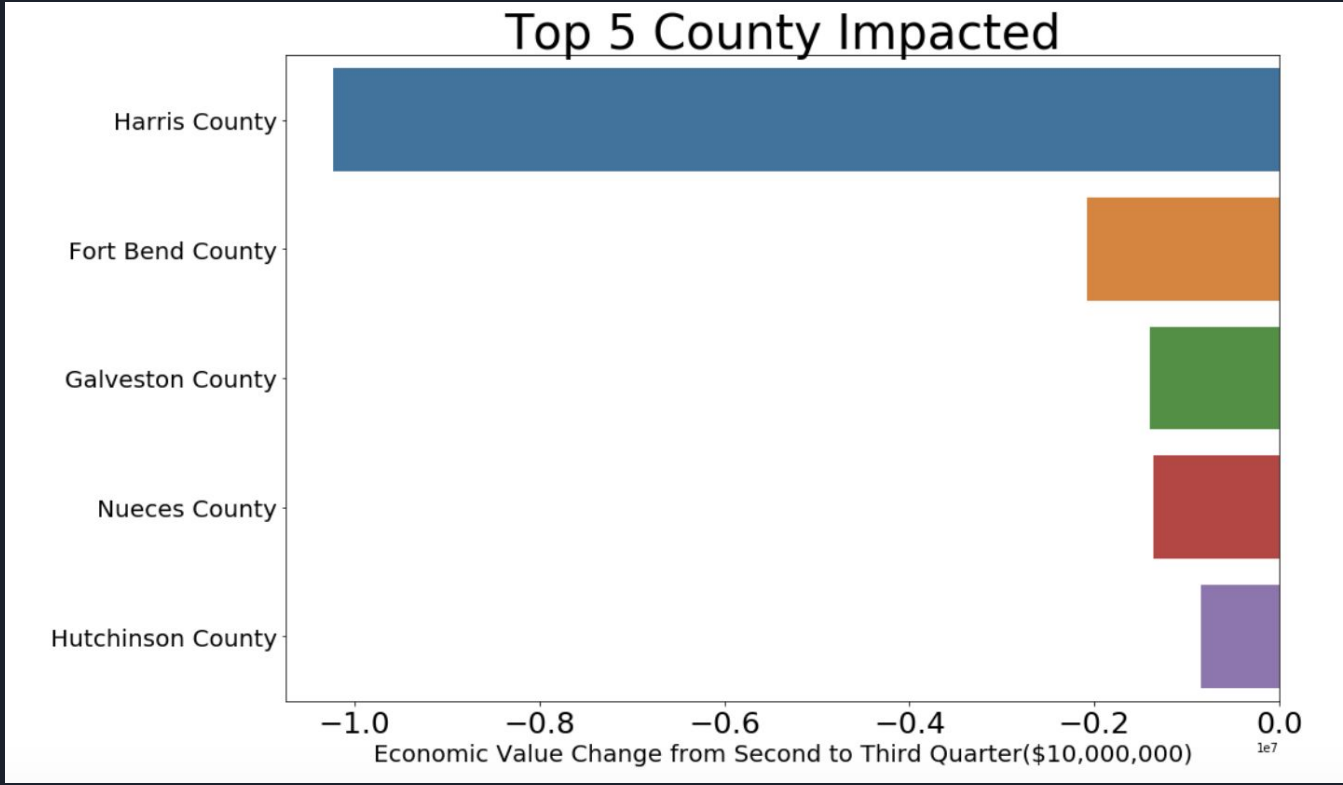
Industrial Impact: Leisure_Hospitality

- Harris County loss more than 2 millions.
- The top 4 counties was impacted.

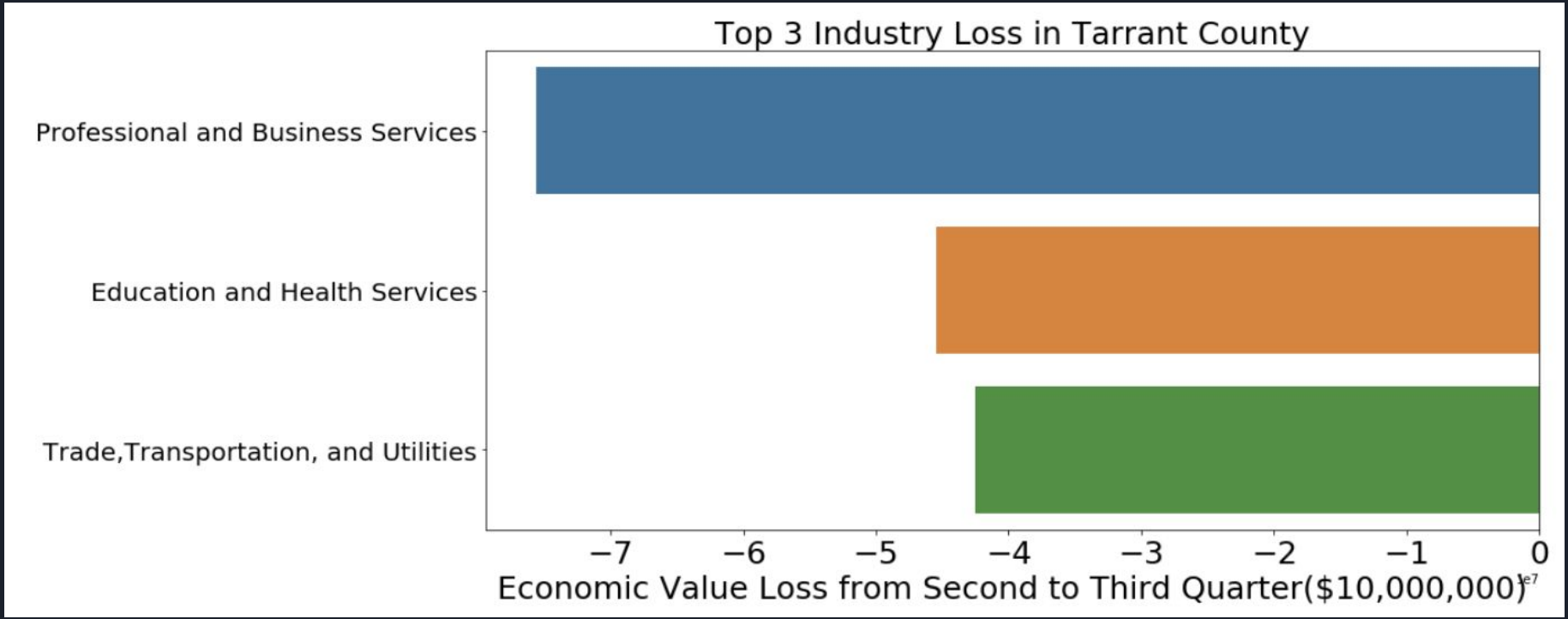


Industrial Impact: Construction

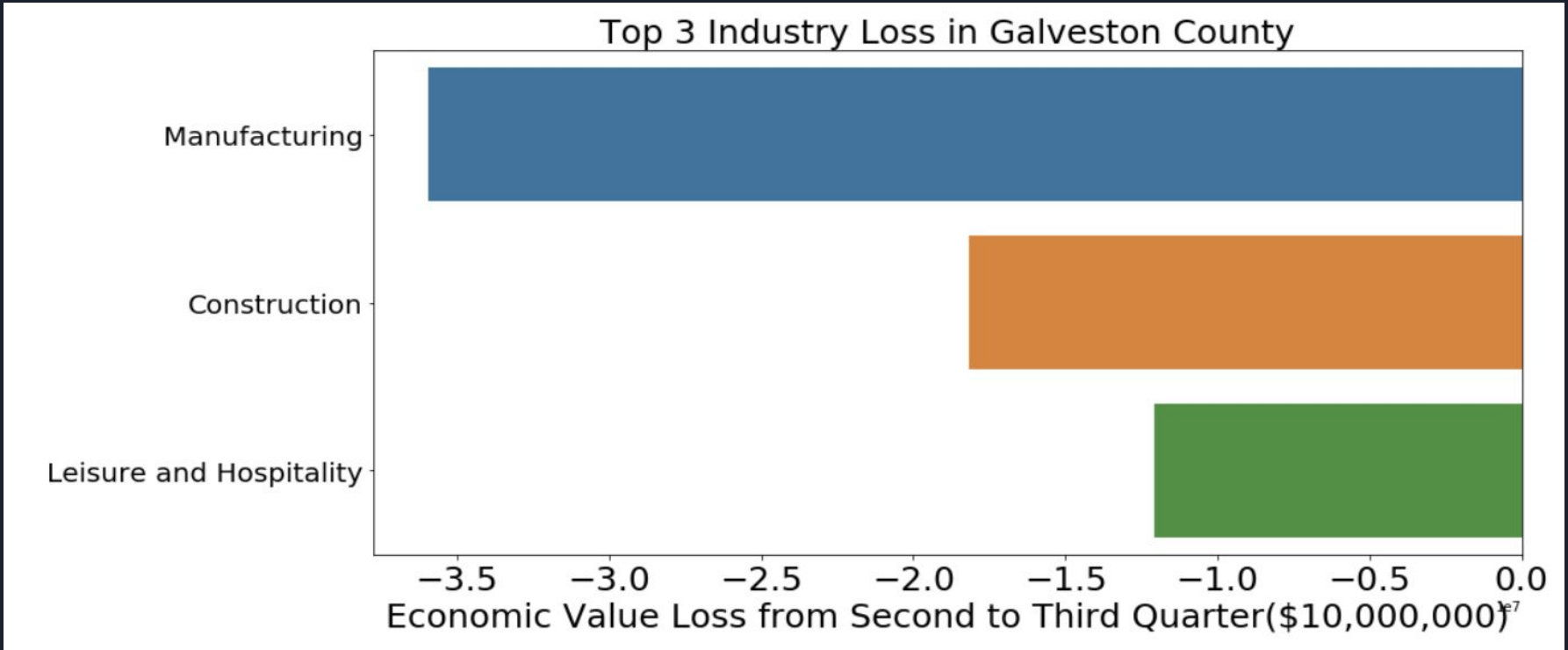
- Harris County has loss more than 10 million.
- The top 4 counties was impacted.



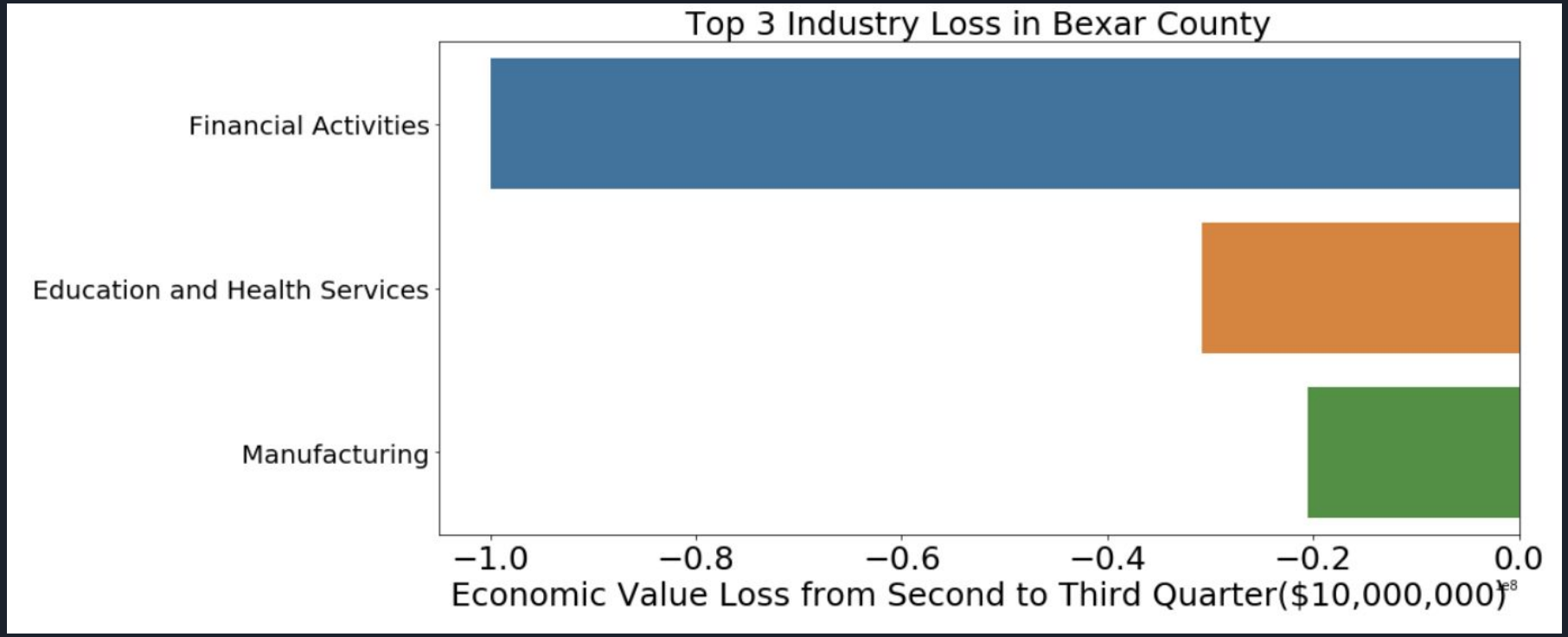
Top 3 Industries Loss in: Tarrant County



Top 3 Industries Loss in: Galveston County



Top 3 Industries Loss in: Bexar County



Problem Statement Revisited

Can we accurately predict wage loss in potential hurricane areas so government entities can be adequately prepared for the financial impact on its citizens?

Answer: Not with the data available to us currently.

Modeling Considerations

Due to geographic parameters & industry components, it is not entirely realistic to predict economic impact by categorical number.

Examples of Uneven Impacts

Rita(2005): Cat 5 (at peak), $14.9 Billion, Gulf Coast

Katrina (2005): Cat 5 (at peak), $116.9 Billion, LA, MI, FL, Gulf Coast, Northeast

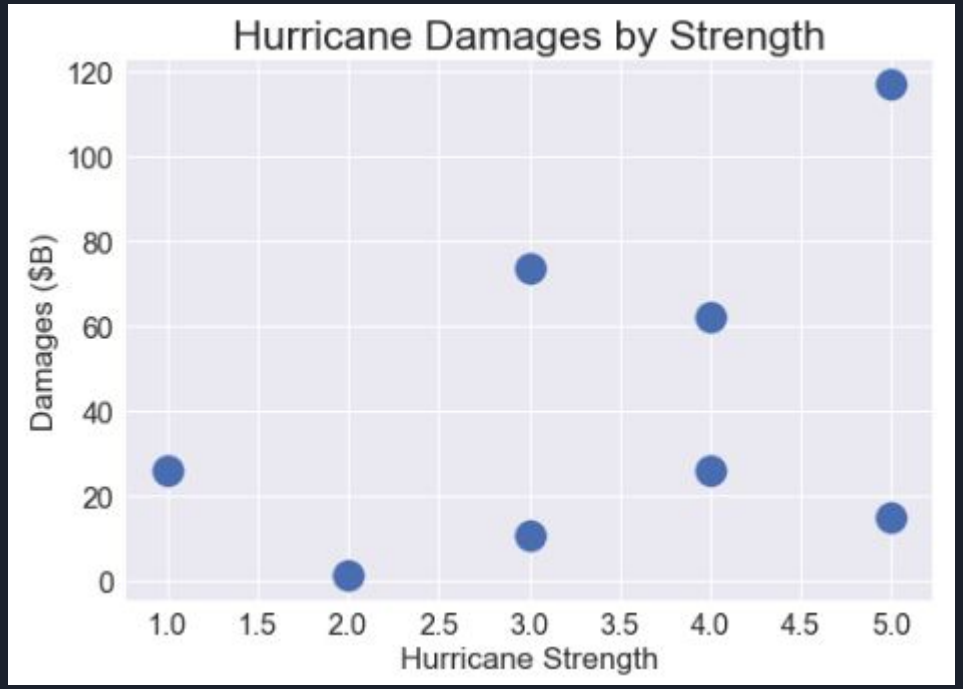
Ivan (2004): Cat 4 (at peak), $25.9 Billion, Gulf Coast

Irene (2011): Cat 3(at peak), $10.8 Billion, East Coast

Sandy (2012): Cat 3 (at peak), $73.5 Billion, East Coast

Dolly (2008) Cat 2 (at peak), $1.3 Billion, Texas

Agnes(1972): Cat 1 (at peak), $26.0 Billion , Eastern US



Considerations for Future Analysis

- Analyze other hurricanes to see if the impacts in the storm region were more prominent compared to non-affected counties
- Gather more granular data than quarterly to further break down the economic impact
- Cluster counties by their features and geography to see if similar counties experienced similar effects

Conclusions

Very difficult problem to solve due to complexity of weather and economic profiles:

- Impact of hurricanes dependent on multiple factors
- Lack of truly granular data
- Economic impact driven by *where* a hurricane hits rather than the strength of the hurricane itself.
- Economic impacts begin to correct after ~3 months

Sources & Citations:

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