Climate Driven Natural Disasters and Medical Insurance Premiums in the United States

Comprehensive Research Report

(IN PROGRESS)

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ABSTRACT

This project is an exploratory research and data analysis project that seeks to examine the relationship between natural disasters costs and medical insurance premiums, focusing on demographic and geographic variations. Climate-driven natural disasters are increasing in frequency and intensity raising questions about their tremendous financial costs, including, their potential impact on medical insurance premiums in the United States.

Using data from FEMA, NOAA, and public medical insurance datasets (KFF), various statistical modeling methods will be used to quantify the impact of natural disaster costs on insurance premiums, explore correlations / relationships between key variables, and evaluate demographic and regional disparities.

The goal is to provide data-driven findings for stakeholders to understand the hidden economic implications of climate-driven natural disasters for insured individuals and plan providers.

TERMINOLOGY

- **FEMA:** Federal Emergency Management Agency
- **NOAA:** National Centers for Environmental Information
- **KFF:** Kaiser Family Foundation
- **Insurer / carrier:** Entity selling the health insurance plan, taking on financial risk of providing health coverage in exchange for premium costs
- **Plan providers:** Entity purchasing, and offering health insurance plans
- **Insured:** Individuals enrolled on a health insurance plan, having health insurance coverage

METHODS

Research Questions

1. How do climate-driven natural disasters affect the cost of medical insurance premiums?
2. In the hypothetical scenario that increased climate-driven natural disasters correlate to a higher cost of medical insurance premium, what are the projected financial changes?
3. How are different demographic groups of insured populations affected across various geographic regions, states, or counties?
4. What geographic areas are at low, medium, or high risk for increased severity or frequency of natural disasters?

Study Area / Population

Study area is the United States, and its subcategories of region, states, and counties. The population being studied / analyzed are 1) all insured individuals that held a policy for an entire calendar year, or partially during the year for any given year and 2) plan providers.

Research Design

All data will be collected through secondary sources. The datasets and relevant documentation will be reviewed in order to 1) determine data completeness, quality, and consistency across all datasets 2) understand how the data was collected, transformed for analysis, and stored 3) prepare the data by cleaning and validating to ensure missing / outlier data points are resolved, and naming conventions and data types are consistent across all datasets.

Methods of analysis used to answer the research questions include (but not limited to): correlation analysis, regression analysis, time series analysis, descriptive statistics, and analysis of variance (ANOVA). Inferential statistics will be used to generalize findings from the sample (insured individuals that participated in the Employer Medical Benefits Survey) to the

population(s) during analysis.

Independent, dependent, and other variable types are yet to be fully determined. Data review and preparation is still in progress. As such, the study design will be updated thereafter.

Data Collection

All data will be obtained through secondary sources through public databases or granted by request.

Data Tools

- Excel, and SQL will be used to store, and prepare/clean data for analysis
- SQL, Python, and R, will be used in conjunction to conduct the analysis
- Python, R, and Tableau will be used to visualize the findings of the data

Data Sources

KFF and the Employer Medical Benefits Survey, KFF, accessed January 15th, 2025, https://www.kff.org/health-costs/report/2024-employer-health-benefits-survey/

NOAA National Centers for Environmental Information (NCEI), U.S. Billion-Dollar Weather and Climate Disasters (2025).

https://www.ncei.noaa.gov/access/billions/, DOI: 10.25921/stkw-7w73

FEMA Federal Emergency Management Agency, National Risk Index: Future Risk Prototype

https://fema.maps.arcgis.com/home/item.html?id=41df240466094967bdd48690a9711fa4

RESULTS

LIMITATIONS

RECOMMENDATIONS