

Impact of Severe Weather Events in the U.S.

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2025-03-14

Synopsis

Severe weather events cause significant damage to both public health and the economy. This report analyzes the U.S. National Oceanic and Atmospheric Administration (NOAA) Storm Database to identify the most harmful weather events in terms of fatalities, injuries, and economic consequences. The dataset spans from 1950 to November 2011, though records are more complete and accurate in recent years. By understanding which events cause the most harm, municipal and government managers can better prioritize resources for disaster preparedness and mitigation efforts.

Data Processing

Load Libraries

```
library(dplyr)
library(ggplot2)
library(readr)
```

Load Data

```
storm_data <- read_csv(bzfile("repdata_data_StormData.csv.bz2"))
```

Data Cleaning and Transformation

```
storm_data <- storm_data %>%
  select(EVTYPE, FATALITIES, INJURIES, PROPDMG, PROPDMGEXP, CROPDMG, CROPDMGEXP) %>%
  mutate(PROPDMGEXP = toupper(PROPDMGEXP),
         CROPDMGEXP = toupper(CROPDMGEXP))

# Function to convert damage exponents
dmg_exp <- function(exp) {
  ifelse(exp == "K", 1e3,
  ifelse(exp == "M", 1e6,
  ifelse(exp == "B", 1e9, 1)))
}
```

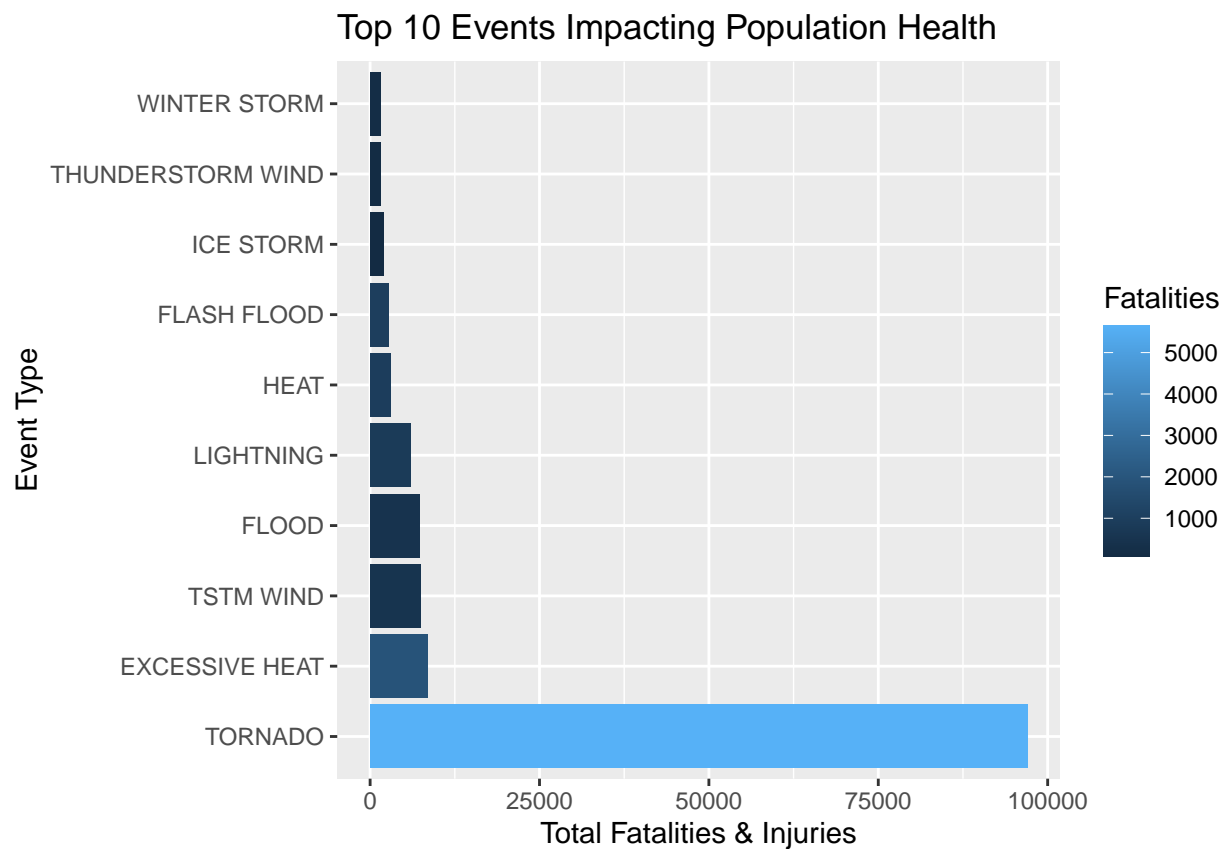
```
# Apply transformations
storm_data <- storm_data %>%
  mutate(
    PROPDMG = PROPDMG * dmg_exp(PROPDMGEXP),
    CROPDMG = CROPDMG * dmg_exp(CROPDMGEXP))
```

Results

Events Most Harmful to Population Health

```
health_impact <- storm_data %>%
  group_by(EVTYPE) %>%
  summarise(
    Fatalities = sum(FATALITIES, na.rm = TRUE),
    Injuries = sum(INJURIES, na.rm = TRUE)) %>%
  arrange(desc(Fatalities + Injuries)) %>%
  top_n(10, wt = Fatalities + Injuries)

# Plot
health_plot <- ggplot(health_impact, aes(x = reorder(EVTYPE, -(Fatalities + Injuries)), y = Fatalities + Injuries)) +
  geom_bar(stat = "identity") +
  coord_flip() +
  labs(
    title = "Top 10 Events Impacting Population Health",
    x = "Event Type", y = "Total Fatalities & Injuries")
health_plot
```

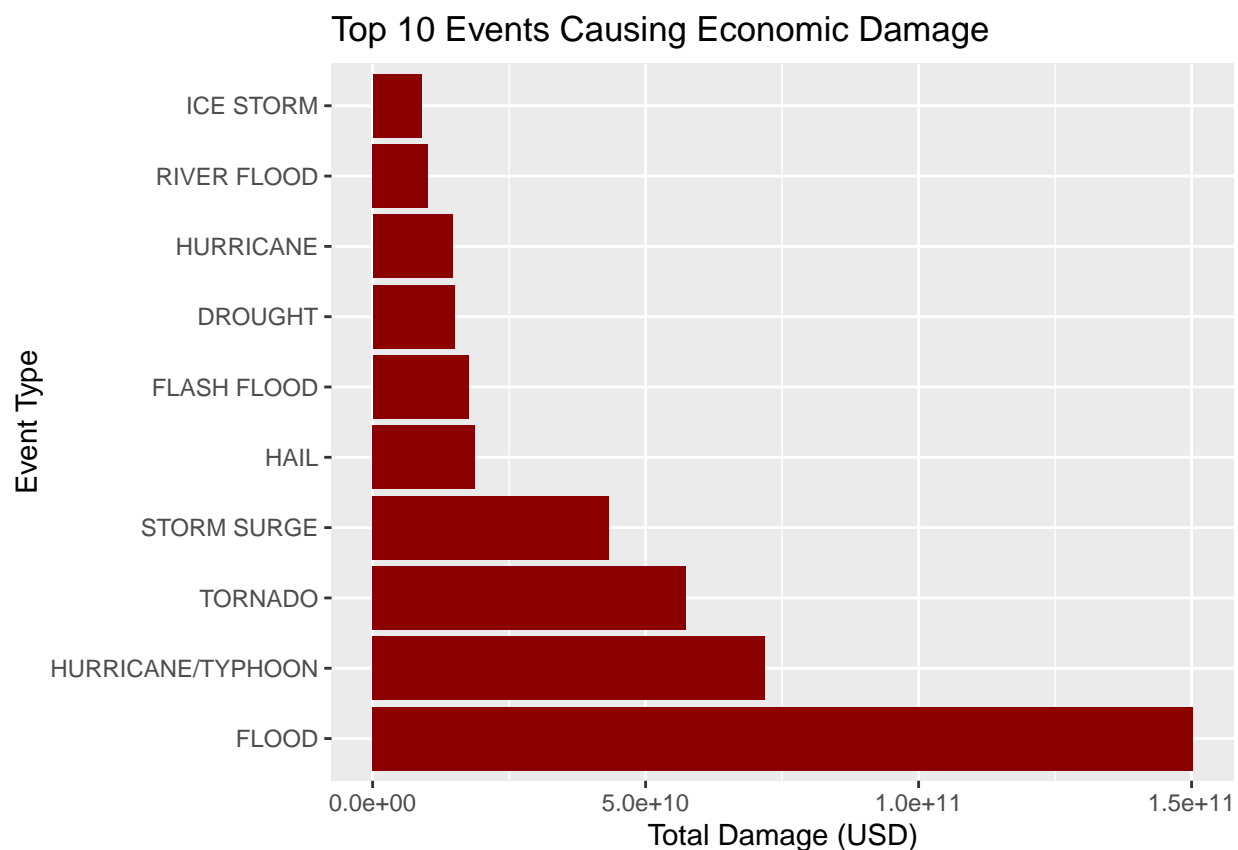


The bar chart above displays the top 10 severe weather events that have had the greatest impact on public health, measured by the combined number of fatalities and injuries. Tornadoes appear to be the most dangerous, causing the highest number of deaths and injuries. Other significant threats include excessive heat, floods, and thunderstorms. This information is crucial for emergency response teams and policymakers to prepare effective disaster response strategies and allocate medical resources where they are needed most.

Events with Greatest Economic Consequences

```
economic_impact <- storm_data %>%
  group_by(EVTYPE) %>%
  summarise(TotalDamage = sum(PROPDMG + CROPPDMG, na.rm = TRUE)) %>%
  arrange(desc(TotalDamage)) %>%
  top_n(10, wt = TotalDamage)

# Plot
econ_plot <- ggplot(economic_impact, aes(x = reorder(EVTYPE, -TotalDamage), y = TotalDamage)) +
  geom_bar(stat = "identity", fill = "darkred") +
  coord_flip() +
  labs(title = "Top 10 Events Causing Economic Damage",
       x = "Event Type", y = "Total Damage (USD)")
econ_plot
```



The chart above highlights the ten weather events that have caused the greatest financial damage in the United States. The total economic loss is calculated by combining property damage and crop damage.

Hurricanes and floods are the most financially devastating, often causing billions of dollars in losses due to destroyed infrastructure, homes, and agricultural damage. The results indicate the need for better flood control measures, insurance policies, and disaster preparedness initiatives to minimize financial losses.

Conclusion

Tornadoes have the highest impact on public health, leading to the most fatalities and injuries. Meanwhile, hurricanes and floods result in the greatest economic damage, primarily through extensive property destruction and agricultural losses. These findings provide valuable insights for decision-makers, enabling them to allocate resources effectively, improve disaster preparedness, and protect communities from the devastating effects of severe weather events.