NOAA Storm Data Analyis - Health & Economic Impacts

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Exploring the U.S. National Oceanic and Atmospheric Administration's (NOAA) storm database - Health and Economic Impacts

Storms and other severe weather events can cause both public health and economic problems for communi

This project involves exploring the U.S. National Oceanic and Atmospheric Administration's (NOAA) sto

This report gives us a brief idea about the weather events in the United States that cause major dest

Data Processing

First, we download data from the NOAA storm database and load the same into R.

```
fileURL <- "https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2"
if(!dir.exists("./Data/")){
      dir.create("./Data/")
      download.file(fileURL, "./Data/data.csv.bz2")
}
stormData <- read.csv(bzfile("./Data/data.csv.bz2"))
```

Transforming Dataset suitable for Analysis

Now, we can see that for our analysis there are only a few columns of our interest which include the

We clean the dataset to classify events into appropriate categories. Then, we calculate the actual co

```
dataSet <- stormData[,c("EVTYPE","FATALITIES","INJURIES","PROPDMG","PROPDMGEXP","CROPDMG","CROPDMGEXP")]
str(dataSet)
```

```
## 'data.frame':    902297 obs. of  7 variables:
##  $ EVTYPE    : Factor w/ 985 levels "   HIGH SURF ADVISORY",..: 834 834 834 834 834 834 834 834 834 8
##  $ FATALITIES: num  0 0 0 0 0 0 0 0 1 0 ...
##  $ INJURIES  : num  15 0 2 2 2 6 1 0 14 0 ...
##  $ PROPDMG   : num  25 2.5 25 2.5 2.5 2.5 2.5 2.5 25 25 ...
##  $ PROPDMGEXP: Factor w/ 19 levels "","-","?","+",..: 17 17 17 17 17 17 17 17 17 17 ...
##  $ CROPDMG   : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ CROPDMGEXP: Factor w/ 9 levels "","?","0","2",..: 1 1 1 1 1 1 1 1 1 1 ...
```

```r
dataSet$EVENT[grepl("HAIL", dataSet$EVTYPE, ignore.case = TRUE)] <- "HAIL"
dataSet$EVENT[grepl("HEAT", dataSet$EVTYPE, ignore.case = TRUE)] <- "HEAT"
dataSet$EVENT[grepl("FLOOD", dataSet$EVTYPE, ignore.case = TRUE)] <- "FLOOD"
dataSet$EVENT[grepl("STORM", dataSet$EVTYPE, ignore.case = TRUE)] <- "STORM"
dataSet$EVENT[grepl("WINTER", dataSet$EVTYPE, ignore.case = TRUE)] <- "WINTER"
dataSet$EVENT[grepl("WIND", dataSet$EVTYPE, ignore.case = TRUE)] <- "WIND"
dataSet$EVENT[grepl("SNOW", dataSet$EVTYPE, ignore.case = TRUE)] <- "SNOW"
dataSet$EVENT[grepl("TORNADO", dataSet$EVTYPE, ignore.case = TRUE)] <- "TORNADO"
dataSet$EVENT[grepl("RAIN", dataSet$EVTYPE, ignore.case = TRUE)] <- "RAIN"
table(dataSet$EVENT)
```

```
##
##   FLOOD    HAIL    HEAT    RAIN    SNOW   STORM TORNADO    WIND  WINTER
##   82686  289270    2648   12241   17664    3668   60700  364853   19597
```

```r
head(dataSet$PROPDMGEXP)
```

```
## [1] K K K K K K
## Levels:  - ? + 0 1 2 3 4 5 6 7 8 B h H K m M
```

```r
head(dataSet$CROPDMGEXP)
```

```
## [1]
## Levels:  ? 0 2 B k K m M
```

```r
dataSet$PROPDMGEXP <- as.character(dataSet$PROPDMGEXP)
dataSet$CROPDMGEXP <- as.character(dataSet$CROPDMGEXP)
#NA values as 10^0
dataSet$PROPDMGEXP[is.na(dataSet$PROPDMGEXP)] <- "0"
dataSet$CROPDMGEXP[is.na(dataSet$CROPDMGEXP)] <- "0"
#Everything except K, M & B as 10^0
dataSet$PROPDMGEXP[!(grepl("K|M|B", dataSet$PROPDMGEXP, ignore.case = TRUE))] <- "0"
dataSet$CROPDMGEXP[!(grepl("K|M|B", dataSet$CROPDMGEXP, ignore.case = TRUE))] <- "0"
#Thousands as 10^3
dataSet$PROPDMGEXP[grep("K", dataSet$PROPDMGEXP, ignore.case = TRUE)] <- "3"
dataSet$CROPDMGEXP[grep("K", dataSet$CROPDMGEXP, ignore.case = TRUE)] <- "3"
#Millions as 10^6
dataSet$PROPDMGEXP[grep("M", dataSet$PROPDMGEXP, ignore.case = TRUE)] <- "6"
dataSet$CROPDMGEXP[grep("M", dataSet$CROPDMGEXP, ignore.case = TRUE)] <- "6"
#Billions as 10^9
dataSet$PROPDMGEXP[grep("B", dataSet$PROPDMGEXP, ignore.case = TRUE)] <- "9"
dataSet$CROPDMGEXP[grep("B", dataSet$CROPDMGEXP, ignore.case = TRUE)] <- "9"
#Converting powers to Numeric Values
dataSet$PROPDMGEXP <- as.numeric(dataSet$PROPDMGEXP)
dataSet$CROPDMGEXP <- as.numeric(dataSet$CROPDMGEXP)
#Calculating actual damage
dataSet$property.damage <- dataSet$PROPDMG * 10^dataSet$PROPDMGEXP
dataSet$crop.damage <- dataSet$CROPDMG * 10^dataSet$CROPDMGEXP
str(dataSet)
```

```
## 'data.frame':    902297 obs. of  10 variables:
```

```
##  $ EVTYPE         : Factor w/ 985 levels "   HIGH SURF ADVISORY",..: 834 834 834 834 834 834 834 834
##  $ FATALITIES     : num  0 0 0 0 0 0 0 0 1 0 ...
##  $ INJURIES       : num  15 0 2 2 2 6 1 0 14 0 ...
##  $ PROPDMG        : num  25 2.5 25 2.5 2.5 2.5 2.5 2.5 25 25 ...
##  $ PROPDMGEXP     : num  3 3 3 3 3 3 3 3 3 3 ...
##  $ CROPDMG        : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ CROPDMGEXP     : num  0 0 0 0 0 0 0 0 0 0 ...
##  $ EVENT          : chr  "TORNADO" "TORNADO" "TORNADO" "TORNADO" ...
##  $ property.damage: num  25000 2500 25000 2500 2500 2500 2500 2500 25000 25000 ...
##  $ crop.damage    : num  0 0 0 0 0 0 0 0 0 0 ...
```

Analysing the Final Results

Perform analysis on the data to generate results(dividing the datasets into categories so that plottin

```
data <- dataSet[,c("EVENT","FATALITIES","INJURIES","property.damage","crop.damage")]
str(data)
```

```
## 'data.frame':    902297 obs. of  5 variables:
##  $ EVENT          : chr  "TORNADO" "TORNADO" "TORNADO" "TORNADO" ...
##  $ FATALITIES     : num  0 0 0 0 0 0 0 0 1 0 ...
##  $ INJURIES       : num  15 0 2 2 2 6 1 0 14 0 ...
##  $ property.damage: num  25000 2500 25000 2500 2500 2500 2500 2500 25000 25000 ...
##  $ crop.damage    : num  0 0 0 0 0 0 0 0 0 0 ...
```

```
fatalties <- tapply(data$FATALITIES, data$EVENT, sum)
fatalties <- data.frame(names(fatalties), "fatalty", fatalties, row.names = NULL)
names(fatalties) <- c("event","type","count")
injuries <- tapply(data$INJURIES, data$EVENT, sum)
injuries <- data.frame(names(injuries), "injury", injuries, row.names = NULL)
names(injuries) <- c("event","type","count")
populationHealth <- rbind(fatalties, injuries)
populationHealth
```

```
##       event    type count
## 1     FLOOD fatalty  1524
## 2      HAIL fatalty    15
## 3      HEAT fatalty  3138
## 4      RAIN fatalty   114
## 5      SNOW fatalty   164
## 6     STORM fatalty   206
## 7   TORNADO fatalty  5661
## 8      WIND fatalty  1420
## 9    WINTER fatalty   277
## 10    FLOOD  injury  8602
## 11     HAIL  injury  1371
## 12     HEAT  injury  9224
## 13     RAIN  injury   305
## 14     SNOW  injury  1164
## 15    STORM  injury  2900
## 16  TORNADO  injury 91407
## 17     WIND  injury 11455
## 18   WINTER  injury  1876
```

```
propertyDamage <- tapply(data$property.damage, data$EVENT, sum)
propertyDamage <- data.frame(names(propertyDamage), "property", propertyDamage, row.names = NULL)
names(propertyDamage) <- c("event","type","amount")
cropDamage <- tapply(data$crop.damage, data$EVENT, sum)
cropDamage <- data.frame(names(cropDamage), "crop", cropDamage, row.names = NULL)
names(cropDamage) <- c("event","type","amount")
economicDamage <- rbind(propertyDamage, cropDamage)
economicDamage
```

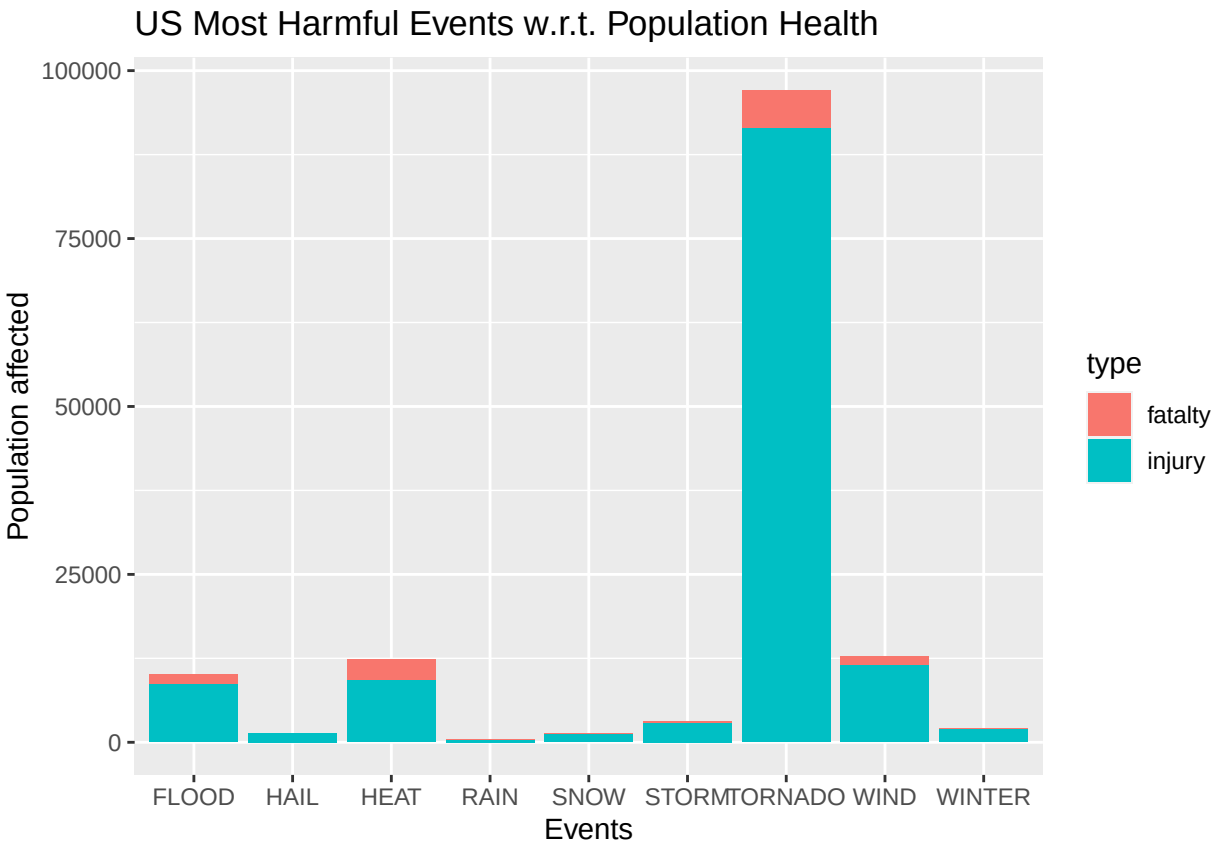
```
##       event     type       amount
## 1     FLOOD property 167502193929
## 2      HAIL property  15733043048
## 3      HEAT property     20325750
## 4      RAIN property   3270230192
## 5      SNOW property   1024669752
## 6     STORM property  61080059960
## 7   TORNADO property  58593098029
## 8      WIND property  16131522052
## 9    WINTER property   6716795251
## 10    FLOOD     crop  12266906100
## 11     HAIL     crop   3046837473
## 12     HEAT     crop    904469280
## 13     RAIN     crop    919315800
## 14     SNOW     crop    134683100
## 15    STORM     crop   5739219500
## 16  TORNADO     crop    417461520
## 17     WIND     crop   2043974538
## 18   WINTER     crop     42444000
```

RESULTS

From our analysis, we can conclude that Tornado has the most severe effect on the health on the popula

Here is a plot verifying the results :

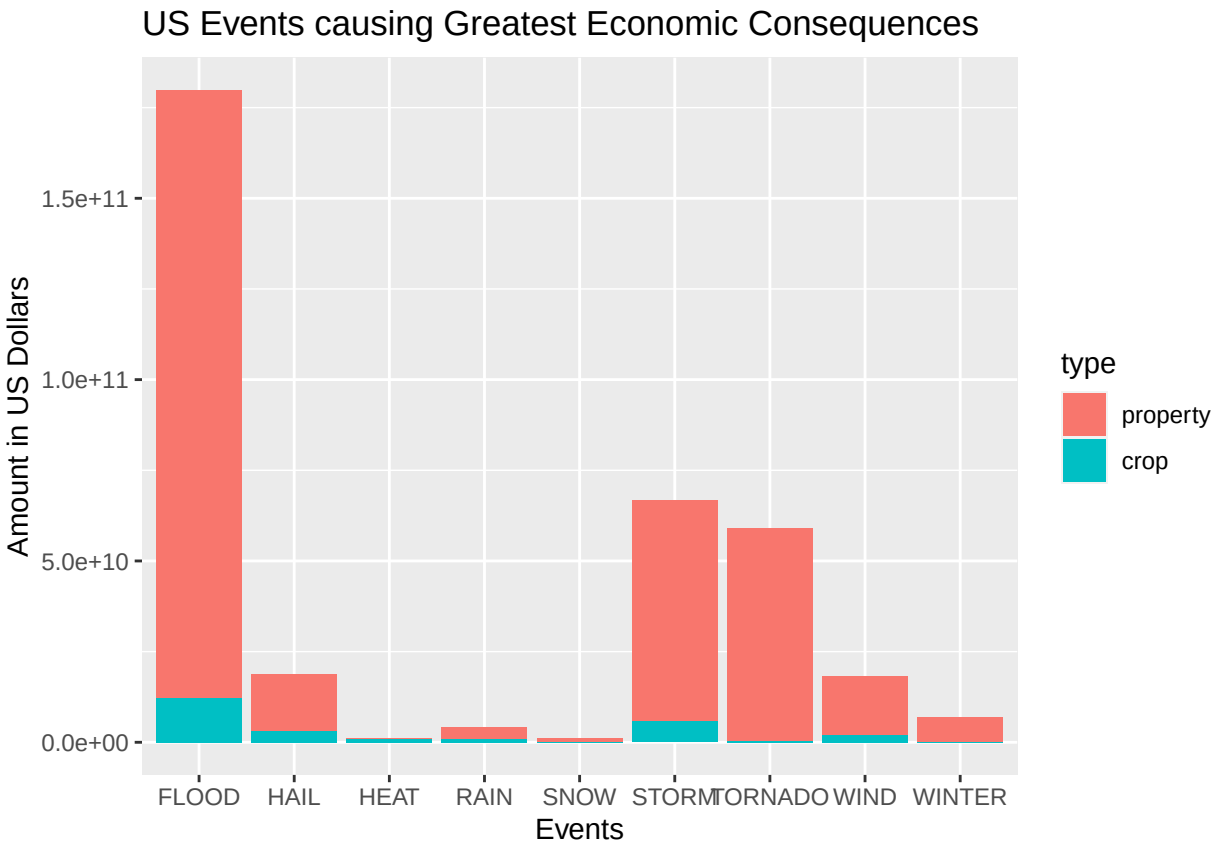
```
library(ggplot2)
ggplot(populationHealth, aes(x = event, y = count, fill = type)) + geom_bar(stat = "identity") + xlab("
```




```
From our analysis, we can conclude that Floods cause the greatest destruction to crop & property which
```

Here is a plot verifying the results :

```
library(ggplot2)
ggplot(economicDamage, aes(x = event, y = amount, fill = type)) + geom_bar(stat = "identity") + xlab("E
```


US Events causing Greatest Economic Consequences
Amount in US Dollars
1.5e+11
1.0e+11
5.0e+10
0.0e+00
FLOOD
HAIL
HEAT
RAIN
SNOW
STORM
TORNADO
WIND
WINTER
Events
type
property
crop