INAUSPICIOUS IMPACTS OF U.S STORMS ON HEALTH AND ECONOMY

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Github Repository for the Project: Reproducible Research Project 2

1. Synopsis

Tempests and other extreme climate occasions have gigantic effect on general wellbeing and monetary issues for districts and their occupants. Some of serious occasions can cause wounds property harm and even lead to death. This investigation present which kinds of occasions are generally hurtful concerning populace wellbeing and which have the best financial outcomes.

The objective of the task is to investigate the NOAA Storm Database and investigate the impacts of extreme climate occasions on both populace and economy.The database covers the timeframe among 1950 and November 2011.

The accompanying examination researches which sorts of extreme climate occasions are generally destructive on:

1. Health (injuries and fatalities)
2. Property and crops (economic consequences)

Information on the Data: Documentation

2. Data Processing

2.1: Data Loading

Download the raw data file and extract the data into a dataframe and converting it into data.table.

```
# Reading packages

library("data.table")
library("ggplot2")
```

```
## Warning: package 'ggplot2' was built under R version 4.0.2
```

```
# Downloading data

USStormNOAA <- "https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2"
download.file(url = USStormNOAA, destfile = "USStormDataNOAA")
```

```r
# Reading data

stormDF <- read.csv(bzfile("USStormDataNOAA"),sep = ",",header=TRUE)

# Converting data.frame to data.table

stormDT <- as.data.table(stormDF)
```

2.2: Examining Column Names

```r
colnames(stormDT)
```

```
##  [1] "STATE__"    "BGN_DATE"   "BGN_TIME"   "TIME_ZONE"  "COUNTY"
##  [6] "COUNTYNAME" "STATE"      "EVTYPE"     "BGN_RANGE"  "BGN_AZI"
## [11] "BGN_LOCATI" "END_DATE"   "END_TIME"   "COUNTY_END" "COUNTYENDN"
## [16] "END_RANGE"  "END_AZI"    "END_LOCATI" "LENGTH"     "WIDTH"
## [21] "F"          "MAG"        "FATALITIES" "INJURIES"   "PROPDMG"
## [26] "PROPDMGEXP" "CROPDMG"    "CROPDMGEXP" "WFO"        "STATEOFFIC"
## [31] "ZONENAMES"  "LATITUDE"   "LONGITUDE"  "LATITUDE_E" "LONGITUDE_"
## [36] "REMARKS"    "REFNUM"
```

2.3: Subsetting required data

Subset the dataset on the parameters of interest. Basically, we remove the columns we don't need for clarity.

```r
# Finding columns to remove

cols2Remove <- colnames(stormDT[, !c("EVTYPE"
  , "FATALITIES"
  , "INJURIES"
  , "PROPDMG"
  , "PROPDMGEXP"
  , "CROPDMG"
  , "CROPDMGEXP")])

# Removing columns

stormDT[, c(cols2Remove) := NULL]

# Only use data where fatalities or injuries occurred.

stormDT <- stormDT[(EVTYPE != "?" & (INJURIES > 0 | FATALITIES > 0 | PROPDMG > 0 | CROPDMG > 0)), c("EV
```

2.4: Converting Exponent Columns into Actual Exponents instead of (-,+, H, K, etc)

Making the PROPDMGEXP and CROPDMGEXP columns cleaner so they can be used to calculate property and crop cost.

```r
# Change all damage exponents to uppercase.

cols <- c("PROPDMGEXP", "CROPDMGEXP")
stormDT[,  (cols) := c(lapply(.SD, toupper)), .SDcols = cols]

# Map property damage alphanumeric exponents to numeric values.

propDmgKey <-  c("\"\"" = 10^0,
                 "-" = 10^0,
                 "+" = 10^0,
                 "0" = 10^0,
                 "1" = 10^1,
                 "2" = 10^2,
                 "3" = 10^3,
                 "4" = 10^4,
                 "5" = 10^5,
                 "6" = 10^6,
                 "7" = 10^7,
                 "8" = 10^8,
                 "9" = 10^9,
                 "H" = 10^2,
                 "K" = 10^3,
                 "M" = 10^6,
                 "B" = 10^9)

# Map crop damage alphanumeric exponents to numeric values

cropDmgKey <-  c("\"\"" = 10^0,
                "?" = 10^0,
                "0" = 10^0,
                "K" = 10^3,
                "M" = 10^6,
                "B" = 10^9)

stormDT[, PROPDMGEXP := propDmgKey[as.character(stormDT[,PROPDMGEXP])]]
stormDT[is.na(PROPDMGEXP), PROPDMGEXP := 10^0 ]
stormDT[, CROPDMGEXP := cropDmgKey[as.character(stormDT[,CROPDMGEXP])] ]
stormDT[is.na(CROPDMGEXP), CROPDMGEXP := 10^0 ]
```

2.5: Making Economic Cost Columns

```r
stormDT <- stormDT[, .(EVTYPE, FATALITIES, INJURIES, PROPDMG, PROPDMGEXP, propCost = PROPDMG * PROPDMGE
```

2.6: Calcuating Total Property and Crop Cost

```r
totalCostDT <- stormDT[, .(propCost = sum(propCost), cropCost = sum(cropCost), Total_Cost = sum(propCos
totalCostDT <- totalCostDT[order(-Total_Cost), ]
totalCostDT <- totalCostDT[1:10, ]
head(totalCostDT, 5)
```

```
##               EVTYPE     propCost   cropCost   Total_Cost
## 1:             FLOOD 144657709807 5661968450 150319678257
## 2: HURRICANE/TYPHOON  69305840000 2607872800  71913712800
## 3:           TORNADO  56947380677  414953270  57362333947
## 4:       STORM SURGE  43323536000       5000  43323541000
## 5:              HAIL  15735267513 3025954473  18761221986
```

2.7: Calcuating Total Fatalities and Injuries

```
totalInjuriesDT <- stormDT[, .(FATALITIES = sum(FATALITIES), INJURIES = sum(INJURIES), totals = sum(FAT
totalInjuriesDT <- totalInjuriesDT[order(-FATALITIES), ]
totalInjuriesDT <- totalInjuriesDT[1:10, ]
head(totalInjuriesDT, 5)
```

```
##            EVTYPE FATALITIES INJURIES totals
## 1:        TORNADO       5633    91346  96979
## 2: EXCESSIVE HEAT       1903     6525   8428
## 3:    FLASH FLOOD        978     1777   2755
## 4:           HEAT        937     2100   3037
## 5:      LIGHTNING        816     5230   6046
```

3. Results

3.1: Events that are Most Harmful to Population Health

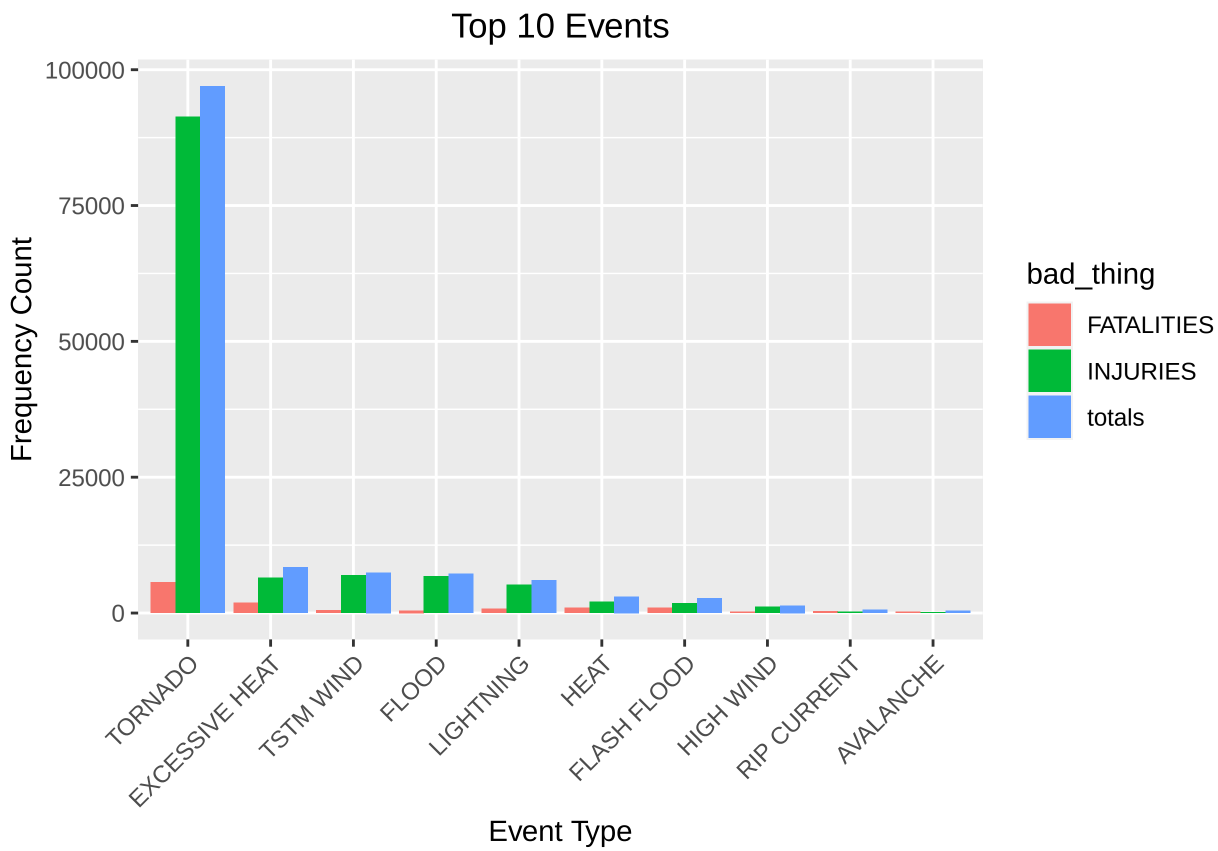
Melting data.table so that it is easier to put in bar graph format

```
bad_stuff <- melt(totalInjuriesDT, id.vars="EVTYPE", variable.name = "bad_thing")
head(bad_stuff, 5)
```

```
##            EVTYPE  bad_thing value
## 1:        TORNADO FATALITIES  5633
## 2: EXCESSIVE HEAT FATALITIES  1903
## 3:    FLASH FLOOD FATALITIES   978
## 4:           HEAT FATALITIES   937
## 5:      LIGHTNING FATALITIES   816
```

```
# Create chart

healthChart <- ggplot(bad_stuff, aes(x=reorder(EVTYPE, -value), y=value))

# Plot data as bar chart

healthChart = healthChart + geom_bar(stat="identity", aes(fill=bad_thing), position="dodge")

# Format y-axis scale and set y-axis label

healthChart = healthChart + ylab("Frequency Count")

# Set x-axis label
```

```r
healthChart = healthChart + xlab("Event Type")

# Rotate x-axis tick labels

healthChart = healthChart + theme(axis.text.x = element_text(angle=45, hjust=1))

# Set chart title and center it

healthChart = healthChart + ggtitle("Top 10 Events") + theme(plot.title = element_text(hjust = 0.5))
healthChart
```



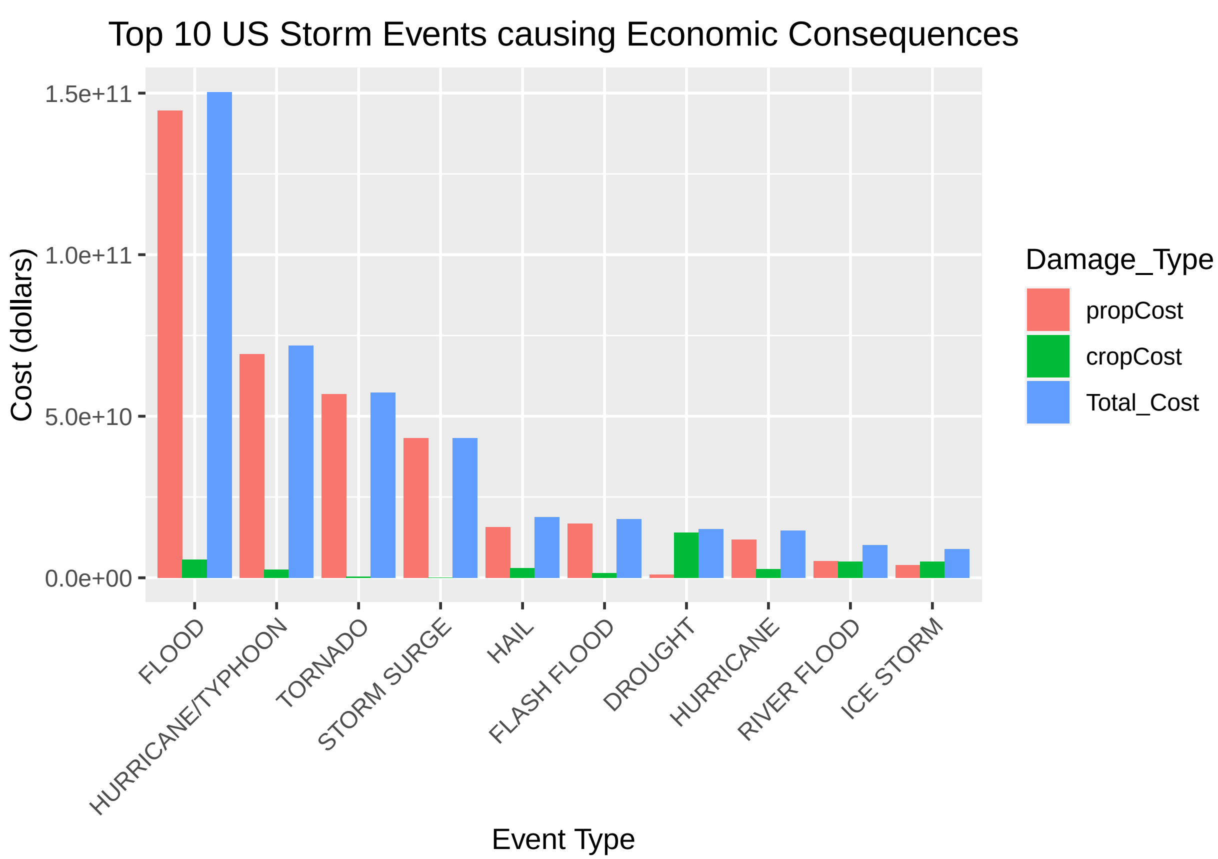
3.2: Events that have the Greatest Economic Consequences

Melting data.table so that it is easier to put in bar graph format

```r
econ_consequences <- melt(totalCostDT, id.vars="EVTYPE", variable.name = "Damage_Type")
head(econ_consequences, 5)
```

```
##              EVTYPE Damage_Type        value
## 1:            FLOOD    propCost 144657709807
## 2: HURRICANE/TYPHOON   propCost  69305840000
## 3:          TORNADO    propCost  56947380677
## 4:      STORM SURGE    propCost  43323536000
## 5:             HAIL    propCost  15735267513
```

```r
# Create chart

econChart <- ggplot(econ_consequences, aes(x=reorder(EVTYPE, -value), y=value))

# Plot data as bar chart

econChart = econChart + geom_bar(stat="identity", aes(fill=Damage_Type), position="dodge")

# Format y-axis scale and set y-axis label

econChart = econChart + ylab("Cost (dollars)")

# Set x-axis label

econChart = econChart + xlab("Event Type")

# Rotate x-axis tick labels

econChart = econChart + theme(axis.text.x = element_text(angle=45, hjust=1))

# Set chart title and center it

econChart = econChart + ggtitle("Top 10 US Storm Events causing Economic Consequences") + theme(plot.ti
econChart
```



4. Conclusion

As should be obvious above flood has the best financial outcomes. Twister is the most unsafe to populace wellbeing in light of the fact that caused the most losses of life and wounds.