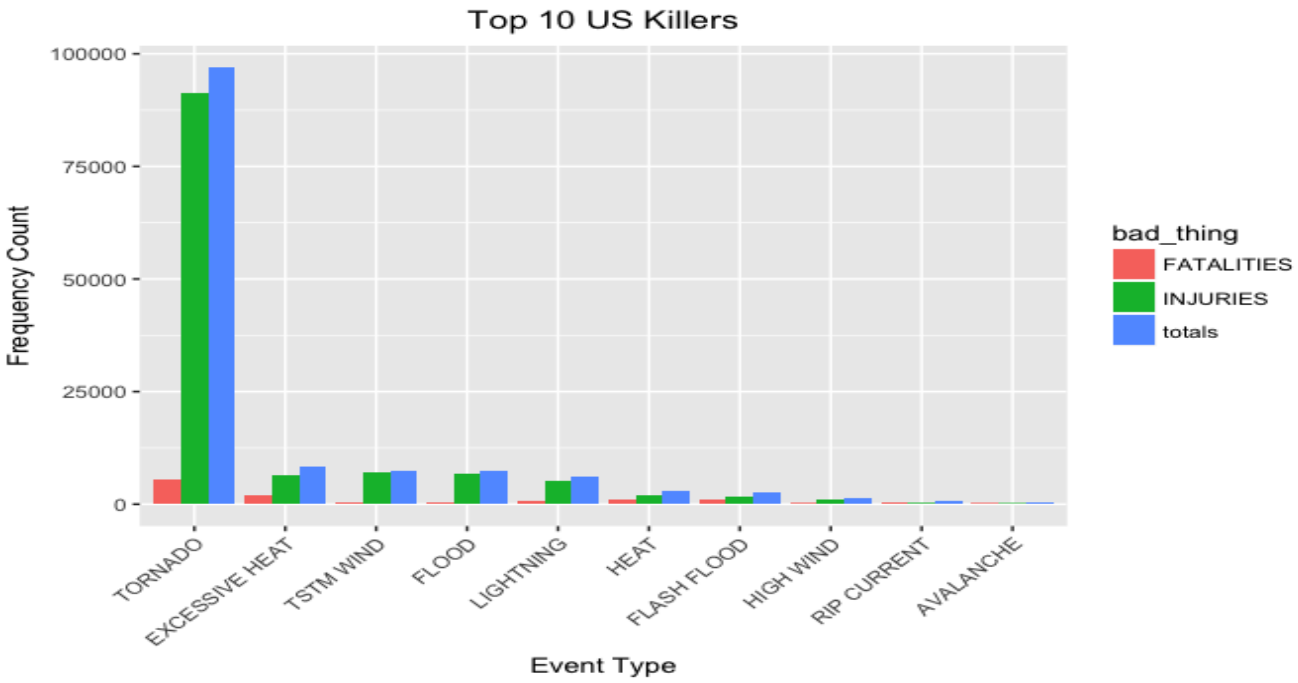
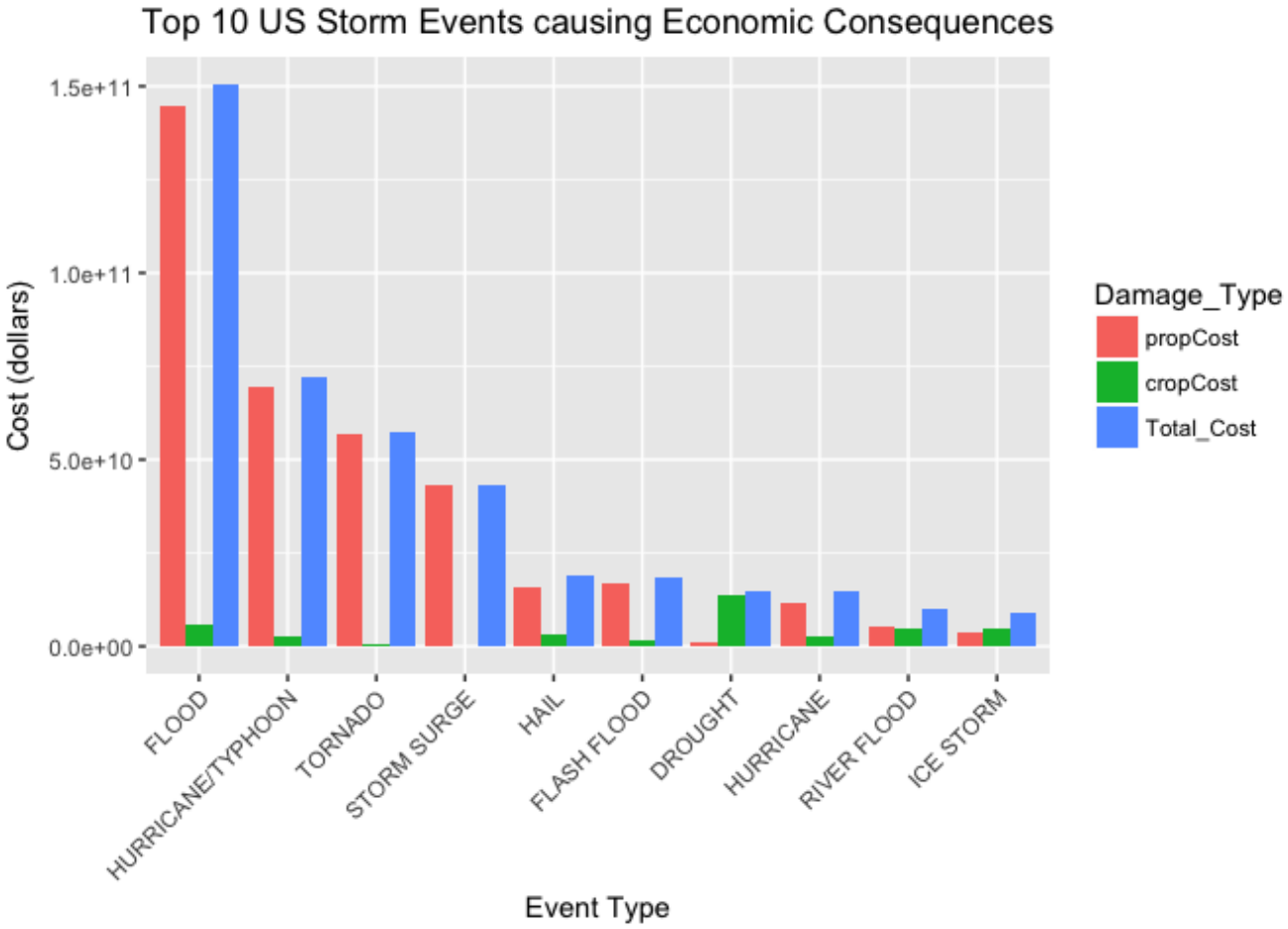

Top 10 US Killers
Frequency Count
100000
75000
50000
25000
0
TORNADO
EXCESSIVE HEAT
TSTM WIND
FLOOD
LIGHTNING
HEAT
FLASH FLOOD
HIGH WIND
RIP CURRENT
AVALANCHE
Event Type
bad_thing
FATALITIES
INJURIES
totals


Top 10 US Storm Events causing Economic Consequences
Cost (dollars)
1.5e+11
1.0e+11
5.0e+10
0.0e+00
FLOOD
HURRICANE/TYPHOON
TORNADO
STORM SURGE
HAIL
FLASH FLOOD
DROUGHT
HURRICANE
RIVER FLOOD
ICE STORM
Event Type
Damage_Type
propCost
cropCost
Total_Cost

---

title: "Analysis of the Adverse Health and Economic Impacts of US Storms"
author: ""

output: html_document

Github repo for the Course: [Reproducible Research](https://github.com/mGalarnyk/datasciencecoursera/tree/master/5_Reproducible_Research)
</br>
Github repo for Rest of Specialization: [Data Science Coursera](https://github.com/mGalarnyk/datasciencecoursera)

1: Synopsis

The goal of the assignment is to explore the NOAA Storm Database and explore the effects of severe weather events on both population and economy.The database covers the time period between 1950 and November 2011.

The following analysis investigates which types of severe weather events are most harmful on:

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

Information on the Data: [Documentation](https://d396qusza40orc.cloudfront.net/repdata%2Fpeer2_doc%2Fpd01016005curr.pdf)

2: Data Processing

2.1: Data Loading

Download the raw data file and extract the data into a dataframe.Then convert to a data.table

```{r DataLoading}
library("data.table")
library("ggplot2")

fileUrl <- "https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2"
download.file(fileUrl, destfile = paste0("/Users/mgalarny/Desktop", '/repdata%2Fdata%2FStormData.csv.bz2'))
stormDF <- read.csv("/Users/mgalarny/Desktop/repdata%2Fdata%2FStormData.csv.bz2")

# Converting data.frame to data.table
stormDT <- as.data.table(stormDF)
```

2.2: Examining Column Names

```{r ColumnNames}
colnames(stormDT)
```

2.3: Data Subsetting

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

```{r DataSubsetting, results="hide"}

# 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("EVTYPE"
, "FATALITIES"
, "INJURIES"
, "PROPDMG"
, "PROPDMGEXP"
, "CROPDMG"
, "CROPDMGEXP") ]
```

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 CorrectingExponents, results="hide"}
# 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 EconomicCostColumns}
stormDT <- stormDT[, .(EVTYPE, FATALITIES, INJURIES, PROPDMG, PROPDMGEXP, propCost = PROPDMG * PROPDMGEXP, CROPDMG, CROPDMGEXP, cropCost = CROPDMG * CROPDMGEXP)]
```

2.6: Calcuating Total Property and Crop Cost

```{r TotalPropertyCropCost}
totalCostDT <- stormDT[, .(propCost = sum(propCost), cropCost = sum(cropCost), Total_Cost = sum(propCost) + sum(cropCost)), by = .(EVTYPE)]
totalCostDT <- totalCostDT[order(-Total_Cost), ]
totalCostDT <- totalCostDT[1:10, ]
head(totalCostDT, 5)
```

2.7: Calcuating Total Fatalities and Injuries

```{r TotalFatalitiesInjuriesCalc}
totalInjuriesDT <- stormDT[, .(FATALITIES = sum(FATALITIES), INJURIES = sum(INJURIES), totals = sum(FATALITIES) + sum(INJURIES)), by = .(EVTYPE)]
totalInjuriesDT <- totalInjuriesDT[order(-FATALITIES), ]
totalInjuriesDT <- totalInjuriesDT[1:10, ]
head(totalInjuriesDT, 5)
```

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

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

```{r healthChart}
# 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
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 US Killers") + 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 EconConsequences}
econ_consequences <- melt(totalCostDT, id.vars="EVTYPE", variable.name = "Damage_Type")
head(econ_consequences, 5)
```

```{r econChart}
# 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.title = element_text(hjust = 0.5))
econChart
```