Title: Severe Weather Damages Property and Impacts Public Health

Synopsis: In order to briefly describe and summarize this analysis we will find, in short, that severe storms and other dangerous weather conditions often result in economic damage to property and public health issues. Severe weather is hard to predict. Dangerous storms can appear or disappear with little warning. These storms can also change direction and strength without any observable cause. Using data from the U.S. National Oceanic and Atmospheric Administration's (NOAA) storm database, we will investigate the types of events that are most harmful ecnomically and heathfully.

Useful Links

Storm Data (https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2)

Documentation for Data File (https://d396qusza40orc.cloudfront.net/repdata%2Fpeer2_doc%2Fpd01016005curr.pdf)

National Climatic Data Center Storm Events FAQ (https://d396qusza40orc.cloudfront.net/repdata%2Fpeer2_doc%2FNCDC%20Storm%20Events-FAQ%20Page.pdf)

Data Processing

The compressed file can be read direct into memory, but it is preferableh to not repeat that processing over and over. Will uncompress the file once and read it uncompressed. Download.file() to tranfer the compressed file from the web to the local system. bunzip2() to (conditionally) uncompress the file to the local system. read.csv() to load the data into memory.

```
if(F) {
  dataUrl <- 'https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz
2'
  download.file(dataUrl, 'StormData.csv.bz2')
  rm(dataUrl)
}
bunzip2("StormData.csv.bz2", "StormData.csv", remove = FALSE, skip = TRUE)
```

```
## [1] "StormData.csv"
## attr(,"temporary")
## [1] FALSE
```

```
storms <- read.csv('StormData.csv')
```

We get a DataFrame of 902297 observations and 37 variables.

Data Exploration

The data set contains 985 unique types of weather events.

Values in the PROPDMG column need to be adjusted by PROPDMGEXP. This adjustment is not clearly defined in the above provided document. Found info at the following link that further clarifies the treatment of PROPDMGEXP.

Exp Treatment (http://rstudio-pubs-static.s3.amazonaws.com/58957_37b6723ee52b455990e149edde45e5b6.html)

Create adjustment lookup table and merge it with the base data set.

```
propdmgexp <- read.csv('propdmgexp.csv')
storms <- merge(storms, propdmgexp, by.x='PROPDMGEXP', by.y='PROPDMGEXP')
rm(propdmgexp)
```

Adjust Prop Damage values with the merged exp values to get final prop damage total

```
storms$propDmgTot <- with(storms, PROPDMG * EXP)
summary(storms$propDmgTot)
```

```
##      Min.   1st Qu.    Median      Mean   3rd Qu.      Max.
## 0.000e+00 0.000e+00 0.000e+00 4.736e+05 5.000e+02 1.150e+11
```

Combine Injuries and Fatalities to arrive at total human impact.

```
storms$humanImpact <- with(storms, FATALITIES + INJURIES)
```

Results

Aggregate human cost and total adjusted property damage by event type.

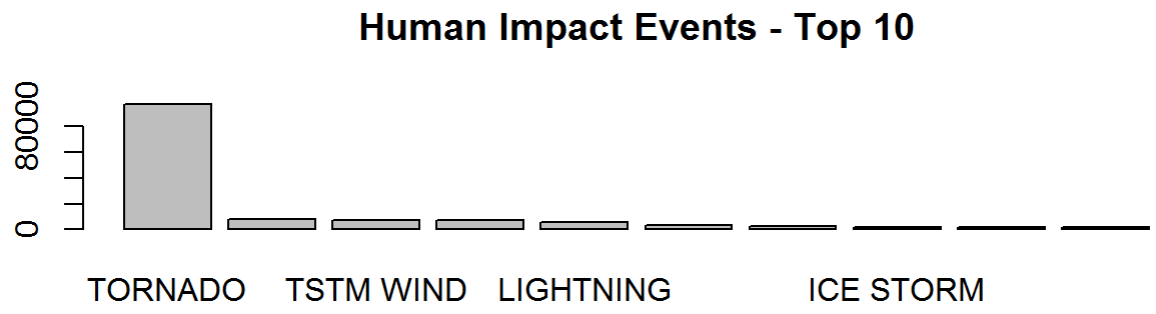
```
propSmmry <- aggregate(propDmgTot~EVTYPE, storms, sum)
pplSmmry <- aggregate(humanImpact~EVTYPE, storms, sum)
```

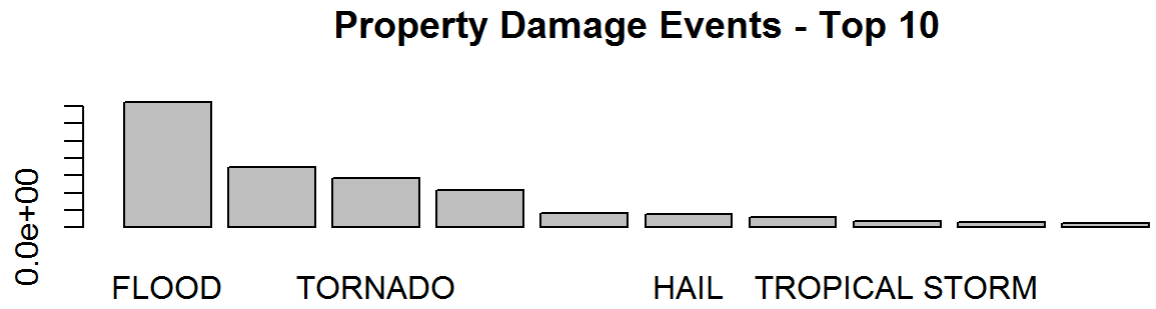
Sort both summary sets descending by impact.

```
pplSmmry <- pplSmmry[order(pplSmmry$humanImpact, decreasing = T), ]
propSmmry <- propSmmry[order(propSmmry$propDmgTot, decreasing = T), ]
```

Plot the distributions of the top events for each type.

```
par(mfrow=c(2,1))
with( pplSmmry[0:10,], barplot(humanImpact, names.arg=EVTYPE, main='Human Impact Even
ts - Top 10') )
with( propSmmry[0:10,], barplot(propDmgTot, names.arg=EVTYPE, main='Property Damage E
vents - Top 10') )
```





The top 10 events by human impact are:

```
pplSmmry[0:10,]
```

EVTYPE <fctr>	**humanImpact** <dbl>
TORNADO	96979
EXCESSIVE HEAT	8428
TSTM WIND	7461
FLOOD	7259
LIGHTNING	6046
HEAT	3037
FLASH FLOOD	2755
ICE STORM	2064
THUNDERSTORM WIND	1621
WINTER STORM	1527

1-10 of 10 rows

The top 10 events by property damage are:

```
propSmmry[0:10,]
```

EVTYPE <fctr>	**propDmgTot** <dbl>
FLOOD	144657709800
HURRICANE/TYPHOON	69305840000
TORNADO	56937162897
STORM SURGE	43323536000
FLASH FLOOD	16140815011
HAIL	15732269877
HURRICANE	11868319010
TROPICAL STORM	7703890550
WINTER STORM	6688497260
HIGH WIND	5270046280

1-10 of 10 rows

Conclusion

The events that are most harmful to population health are **TORNADO**.

The events that have the greatest economic consequences are **FLOOD**.