Title: Health and Economic Impact of NOAA Storm

Synopsis

The basic goal of this article is to analyse the NOAA Storm Database and show impacts of NOAA storm on health and economics. The article shows the most harmful weather events that cause major impact to population health. The second phases shows the most harmful weather events that cause major economic damage. After the analysis, we could conclude that **tornado** caused the most damage to population health whereas **Flood** lead to major economic consequences.

Loading Data

The data is downloaded from here, with documentation on how most of the variables were constructed and defined available here. The downloaded file of comma seperated format is zipped in bz2 format.

```
unzipped <- bunzip2("repdata_data_StormData.csv.bz2", destname =
"repdata_data_StormData.csv",
    overwrite = TRUE)
```

```
## Error: could not find function "bunzip2"
```

```
f <- file(file.path(getwd(), "repdata_data_StormData.csv"))
dt <- data.frame(read.csv(f, header = TRUE))
```

Total Number of data entries loaded into the data frame.

```
## [1] 902297
```

Preparing data

Here, the data prepared for the analysis. Health_impact and Economic_impact are created to store the data for the analysis. By this, we dont need to use whole dataset but only the columns needed. Also, exponent are adjusted so the values and exponents are not individual but together.

```
health_impact <- data.frame(EVTYPE = dt$EVTYPE, FATALITIES = dt$FATALITIES,
    INJURIES = dt$INJURIES)

economic_impact <- data.frame(EVTYPE = dt$EVTYPE, CROP.DAMAGE = dt$CROPDMG,
    PROPERTY.DAMAGE = dt$PROPDMG)

property <- rep(0, times = dim(dt)[1])
crop <- rep(0, times = dim(dt)[1])

property[dt$PROPDMGEXP == "K" | dt$PROPDMGEXP == "k"] <- 1000
crop[dt$CROPDMGEXP == "K" | dt$CROPDMGEXP == "k"] <- 1000

property[dt$PROPDMGEXP == "M" | dt$PROPDMGEXP == "m"] <- 1e+06
crop[dt$CROPDMGEXP == "M" | dt$CROPDMGEXP == "m"] <- 1e+06

property[dt$PROPDMGEXP == "B" | dt$PROPDMGEXP == "b"] <- 1e+09
crop[dt$CROPDMGEXP == "B" | dt$CROPDMGEXP == "b"] <- 1e+09

for (i in as.character(0:9)) {
    property[dt$PROPDMGEXP == i] <- 10^as.numeric(i)
    crop[dt$CROPDMGEXP == i] <- 10^as.numeric(i)
}

economic_impact$CROP.DAMAGE <- dt$CROPDMG * crop
economic_impact$PROPERTY.DAMAGE <- dt$PROPDMG * property
```

Result

Analysis showing health and economic impacts of different weather events.

Health Impact

To determine which types of events are most harmful with respect to population health, we need to find the total number of fatalities and injuries by each type of event. This is done first for fatalities, then for injuries.

```
health_impact <- health_impact[health_impact$FATALITIES > 0 |
health_impact$INJURIES >
    0, ]

fatalities <- aggregate(health_impact$FATALITIES, by = list(evtype =
health_impact$EVTYPE),
    sum, na.rm = TRUE)
injuries <- aggregate(health_impact$INJURIES, by = list(evtype =
health_impact$EVTYPE),
    sum, na.rm = TRUE)

# Ordering weather events causing fatalities
order_fatalities_x <- order(fatalities$x, decreasing = TRUE)
fatalities <- fatalities[order_fatalities_x, ]

# Ordering weather events causing injuries
order_injuries_x <- order(injuries$x, decreasing = TRUE)
injuries <- injuries[order_injuries_x, ]
```

The health impacts of each weather event type are shown in decresing order of their magnitude and the top 6 results are plotted here.

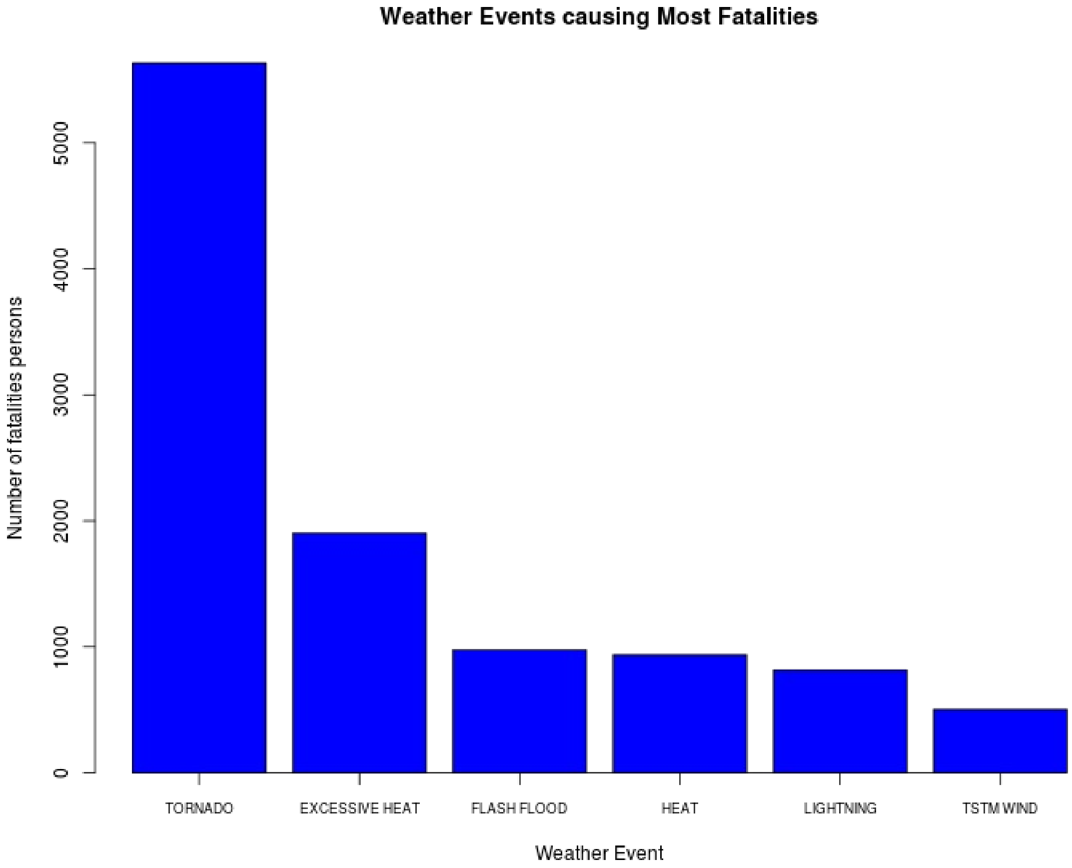
```
par(mfrow = c(2, 1))
head(fatalities)
```

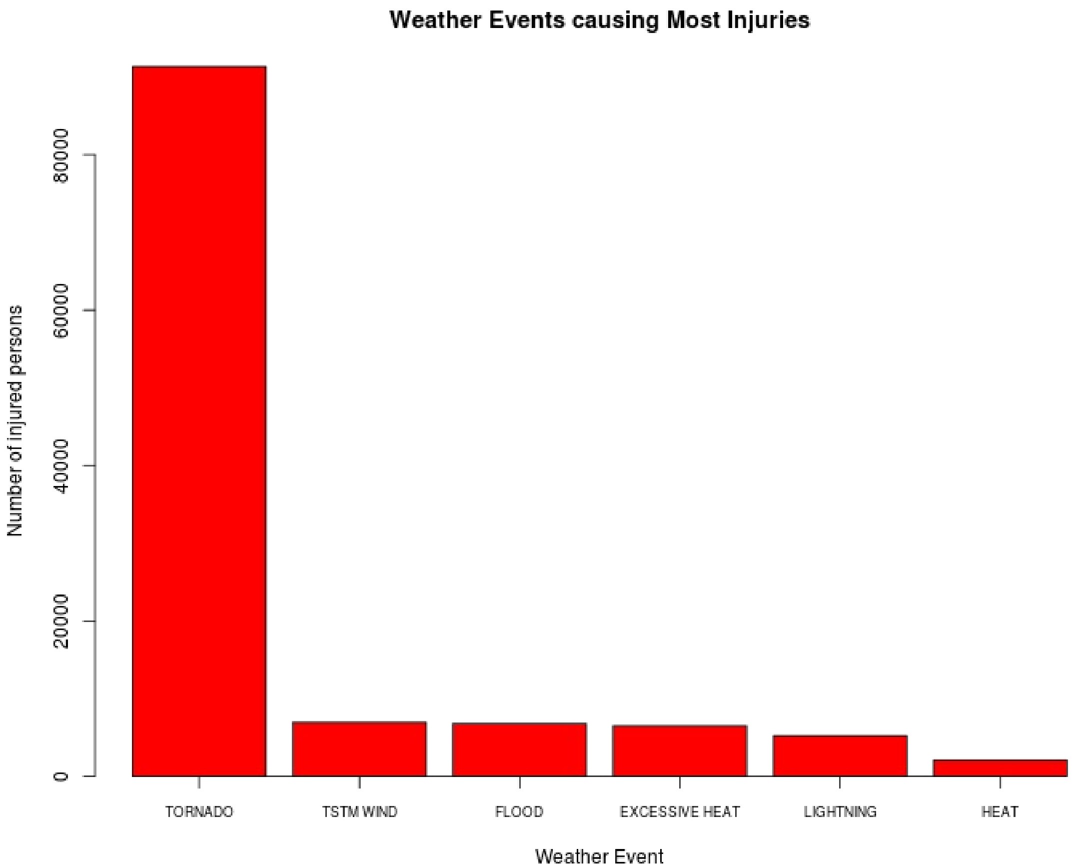
```
##              evtype    x
## 184        TORNADO 5633
## 32  EXCESSIVE HEAT 1903
## 42     FLASH FLOOD  978
## 69            HEAT  937
## 122      LIGHTNING  816
## 191      TSTM WIND  504
```

```
fplot <- barplot(fatalities[1:6, ]$x, main = "Weather Events causing Most
Fatalities",
    xlab = "Weather Event", ylab = "Number of fatalities persons", col = "blue",
    ylim = range(fatalities$x))
axis(1, at = fplot, lab = fatalities$evtype[1:6], cex.axis = 0.7)

head(injuries)
```

```
##              evtype     x
## 184        TORNADO 91346
## 191      TSTM WIND  6957
## 47           FLOOD  6789
## 32  EXCESSIVE HEAT  6525
## 122      LIGHTNING  5230
## 69            HEAT  2100
```

```
iplot <- barplot(injuries[1:6, ]$x, main = "Weather Events causing Most Injuries",
    xlab = "Weather Event", ylab = "Number of injured persons", col = "red",
    ylim = range(injuries$x))
axis(1, at = iplot, lab = injuries$evtype[1:6], cex.axis = 0.7)
```





Economic Damage

To determine which types of events have the greatest economic consequences, we calculate the aggregate damage (in US dollars) caused to both property and crops by each event type. This is performed by the following code:

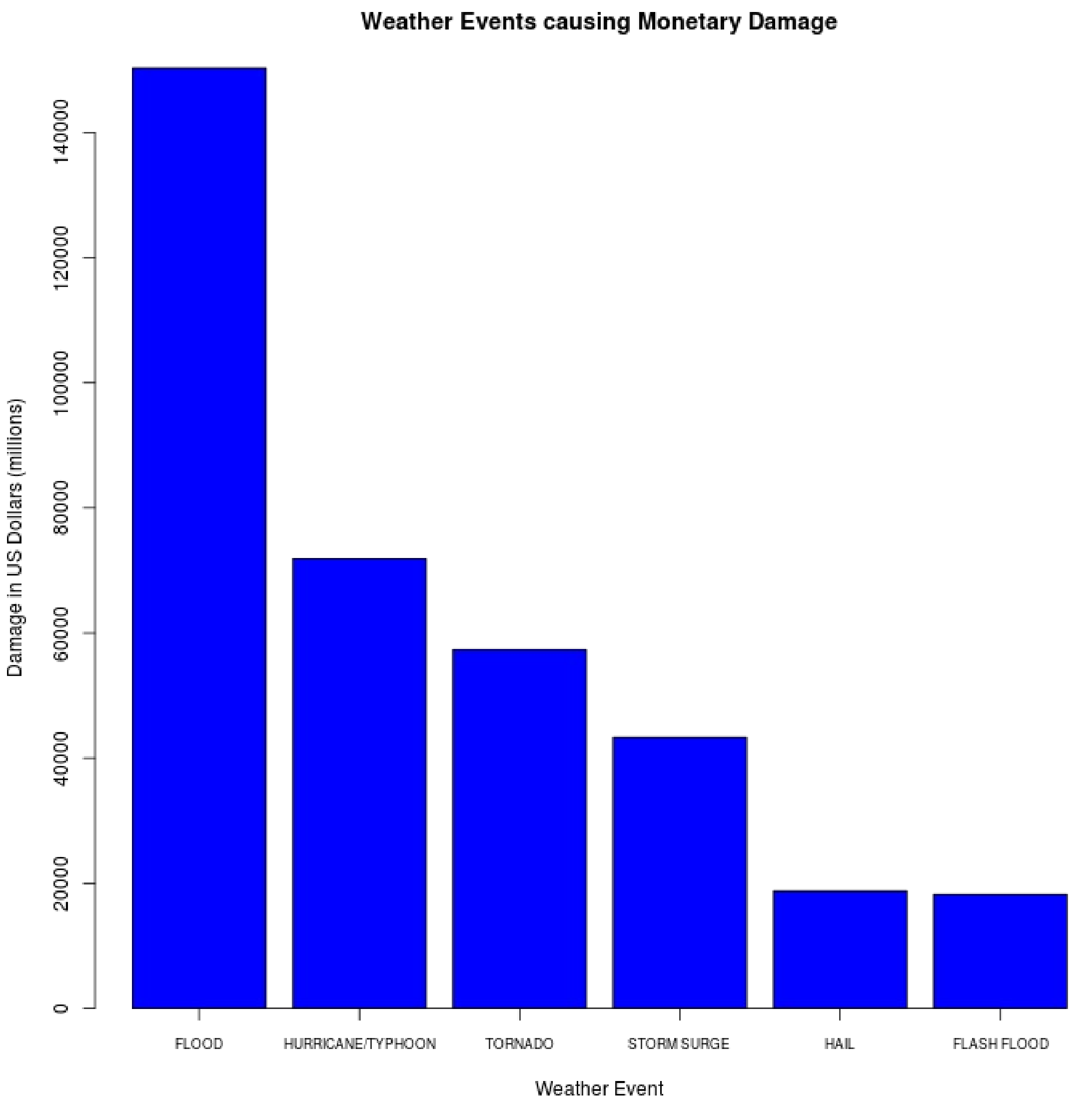
```
economic_impact$TOTAL.DAMAGE <- economic_impact$CROP.DAMAGE +
economic_impact$PROPERTY.DAMAGE

economic <- aggregate(economic_impact$TOTAL.DAMAGE, by = list(evtype =
economic_impact$EVTYPE),
    sum, na.rm = TRUE)

# Ordering weather events causing fatalities
order_economic_x <- order(economic$x, decreasing = TRUE)
economic <- economic[order_economic_x, ]
economic$x <- economic$x/1e+06
```

The economic impacts of each weather event type are shown in decreasing order of their magnitude and the top 6 results are plotted below.

```
head(economic)
```

```
##                evtype      x
## 164             FLOOD 150320
## 406 HURRICANE/TYPHOON  71914
## 830           TORNADO  57362
## 666       STORM SURGE  43324
## 238              HAIL  18761
## 147       FLASH FLOOD  18244
```

```
eplot <- barplot(economic[1:6, ]$x, main = "Weather Events causing Monetary
Damage",
    xlab = "Weather Event", ylab = "Damage in US Dollars (millions)", col =
"blue",
    ylim = range(economic$x))
axis(1, at = eplot, lab = economic$evtype[1:6], cex.axis = 0.7)
```


Weather Events causing Monetary Damage
Damage in US Dollars (millions)
0
20000
40000
60000
80000
100000
120000
140000
FLOOD
HURRICANE/TYPHOON
TORNADO
STORM SURGE
HAIL
FLASH FLOOD
Weather Event