# NOAA Storm Database and severe weather events.

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## Contents

# 1 Introduction

Introduction Storms and other severe weather events can cause both public health and economic problems for communities and municipalities. Many severe events can result in fatalities, injuries, and property damage, and preventing such outcomes to the extent possible is a key concern. This project involves exploring the U.S. National Oceanic and Atmospheric Administration's (NOAA) storm database. This database tracks characteristics of major storms and weather events in the United States, including when and where they occur, as well as estimates of any fatalities, injuries, and property damage.

# 2 Data

The data for this assignment come in the form of a comma-separated-value file compressed via the bzip2 algorithm to reduce its size. It is downloaded from the course web site:

# 3 Assignment

The basic goal of this assignment is to explore the NOAA Storm Database and answer some basic questions about severe weather events. You must use the database to answer the questions below and show the code for your entire analysis. Your analysis can consist of tables, figures, or other summaries. You may use any R package you want to support your analysis.

Two Questions to address

1) Across the United States, which types of events (as indicated in the EVTYPE variable) are most harmful with respect to population health?
2) Across the United States, which types of events have the greatest economic consequences?

# 4 Data Processing

# 5 Read Data

# 6 Events most harmful to population health: fatalities and Injuries

```
event = as.data.frame(storm[, c("EVTYPE" , "FATALITIES", "INJURIES")])
event[,2]<- as.numeric(event[,2])
event[,3]<- as.numeric(event[,3])
colclass <- lapply(event, class)
colclass
```

```
## $EVTYPE
## [1] "character"
##
## $FATALITIES
## [1] "numeric"
##
```

```
## $INJURIES
## [1] "numeric"
```

```
head(event)
```

| EVTYPE | FATALITIES | INJURIES |
|---|---|---|
| TORNADO | 0 | 15 |
| TORNADO | 0 | 0 |
| TORNADO | 0 | 2 |
| TORNADO | 0 | 2 |
| TORNADO | 0 | 2 |
| TORNADO | 0 | 6 |

```
dim(event)
```

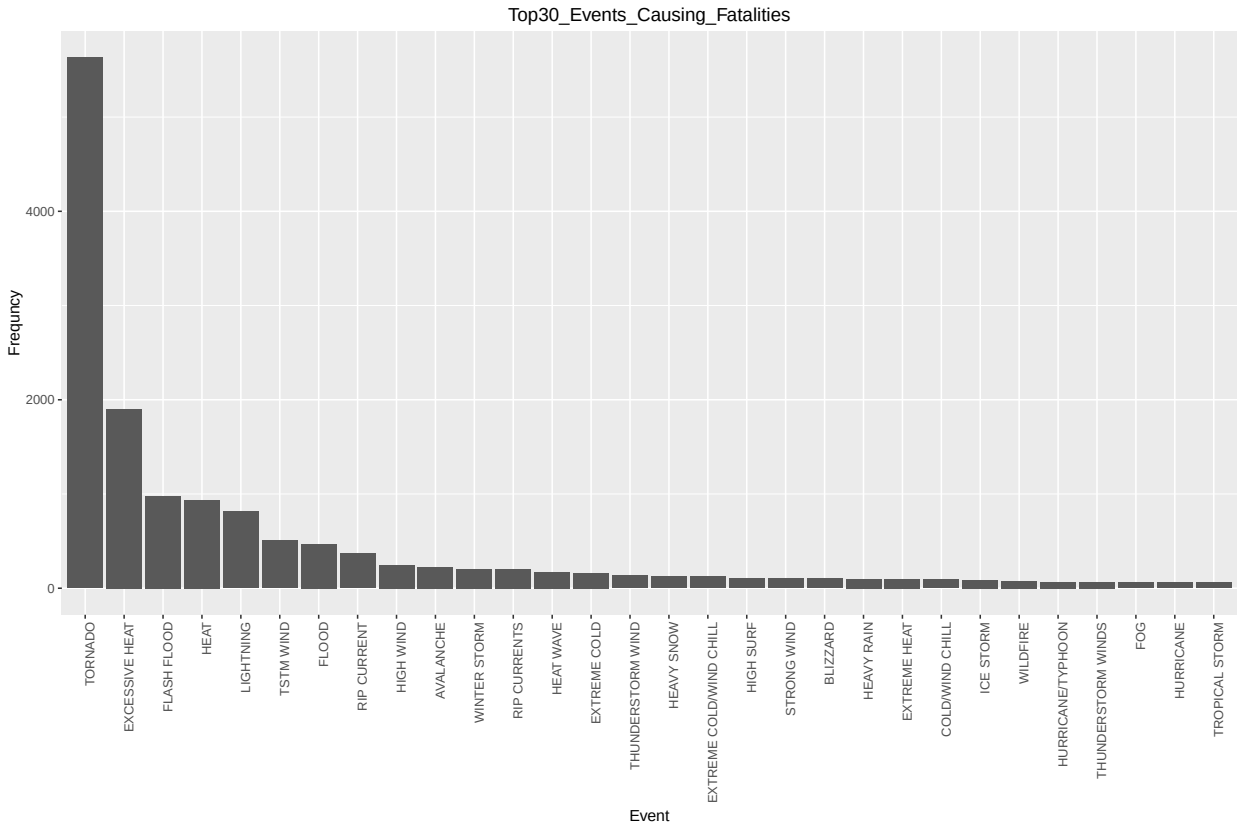
```
## [1] 902297      3
```

## 6.1 Events Causing Fatalities

```
event_agg <- aggregate(x=event[,2], by=list(event[,1]), FUN=sum, na.rm=TRUE)
names(event_agg)[1] <- colnames(event[1])
names(event_agg)[2] <- colnames(event[2])

event_order<- event_agg[order(event_agg[,2], decreasing = TRUE),]
Top30 <- event_order[1:30,]
rownames(Top30) <- NULL
eve_counts <- Top30[,2]
eve_list <- c(Top30[,1])
eve_name <- Top30[,1]

g <- ggplot(Top30, aes(x = reorder(eve_list, -eve_counts), y = eve_counts)) +
        geom_bar(stat = "identity") +
        ggtitle("Top30_Events_Causing_Fatalities") +
        labs(x="Event",y="Frequncy") +
        theme(axis.text.x = element_text(angle = 90, hjust = 1))
print(g)
```



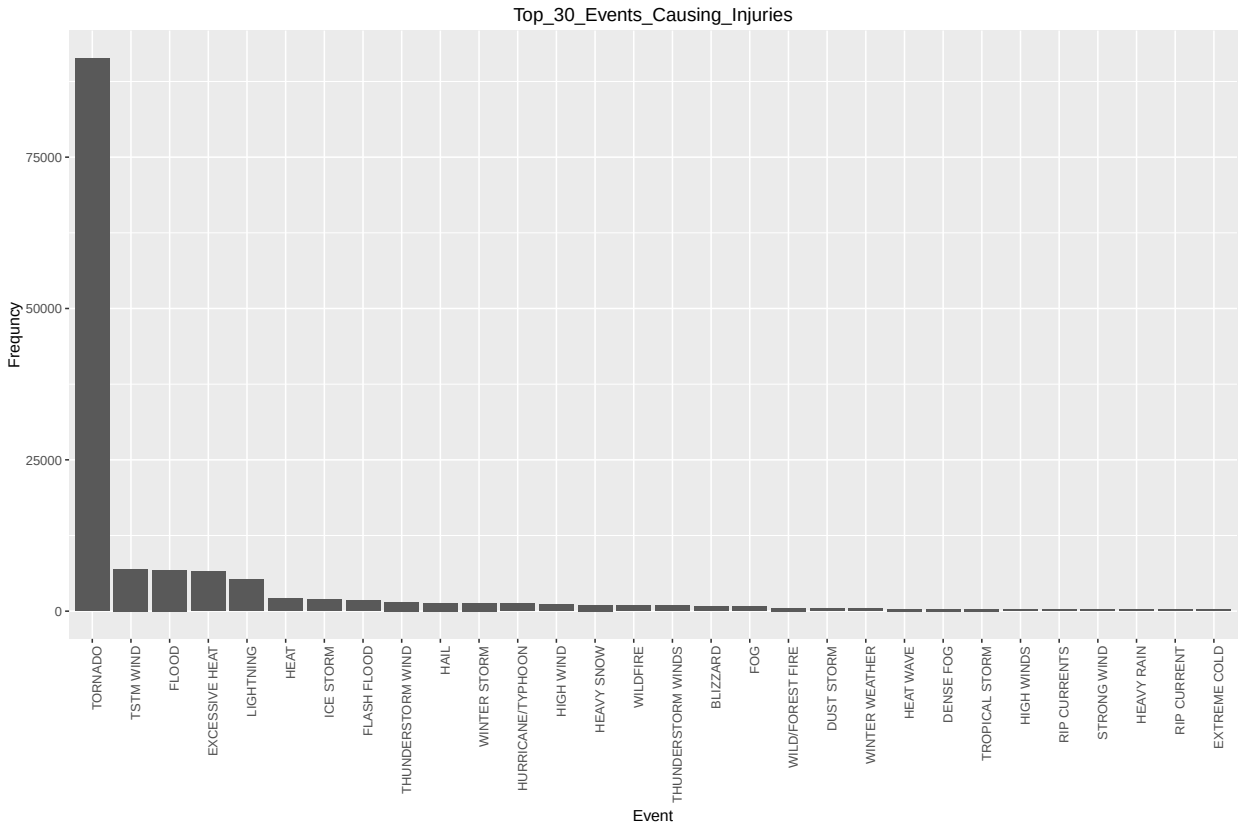

```
png(file = "Top_30_Events_Causing_Fatalities.png", width=8,height=6, units = 'in', res = 300)

tb <- knitr::kable(Top30, digits = 5, caption = "Top_30_Events_Causing_Fatalities", col.names = c("Even
print(tb)
```

```
##
##
## Table: Top_30_Events_Causing_Fatalities
##
## Events                      Fatalities
## ------------------------  -----------
## TORNADO                          5633
## EXCESSIVE HEAT                   1903
## FLASH FLOOD                       978
## HEAT                              937
## LIGHTNING                         816
## TSTM WIND                         504
## FLOOD                             470
## RIP CURRENT                       368
## HIGH WIND                         248
## AVALANCHE                         224
## WINTER STORM                      206
## RIP CURRENTS                      204
## HEAT WAVE                         172
## EXTREME COLD                      162
## THUNDERSTORM WIND                 133
```

```
## HEAVY SNOW                    127
## EXTREME COLD/WIND CHILL       125
## HIGH SURF                     104
## STRONG WIND                   103
## BLIZZARD                      101
## HEAVY RAIN                     98
## EXTREME HEAT                   96
## COLD/WIND CHILL                95
## ICE STORM                      89
## WILDFIRE                       75
## HURRICANE/TYPHOON              64
## THUNDERSTORM WINDS             64
## FOG                            62
## HURRICANE                      61
## TROPICAL STORM                 58
```

## 6.2 Events Causing Injuries




```
##
##
## Table: Top_30_Events_Causing_Injuries
##
## Events                Injuries
## -------------------  ---------
## TORNADO                  91346
```

```
## TSTM WIND                6957
## FLOOD                    6789
## EXCESSIVE HEAT           6525
## LIGHTNING                5230
## HEAT                     2100
## ICE STORM                1975
## FLASH FLOOD              1777
## THUNDERSTORM WIND        1488
## HAIL                     1361
## WINTER STORM             1321
## HURRICANE/TYPHOON        1275
## HIGH WIND                1137
## HEAVY SNOW               1021
## WILDFIRE                  911
## THUNDERSTORM WINDS        908
## BLIZZARD                  805
## FOG                       734
## WILD/FOREST FIRE          545
## DUST STORM                440
## WINTER WEATHER            398
## HEAT WAVE                 379
## DENSE FOG                 342
## TROPICAL STORM            340
## HIGH WINDS                302
## RIP CURRENTS              297
## STRONG WIND               280
## HEAVY RAIN                251
## RIP CURRENT               232
## EXTREME COLD              231
```

# 7 Events have the greatest economic consequences

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

```
## $EVTYPE
## [1] "character"
##
## $PROPDMG
## [1] "numeric"
##
## $PROPDMGEXP
## [1] "character"
```

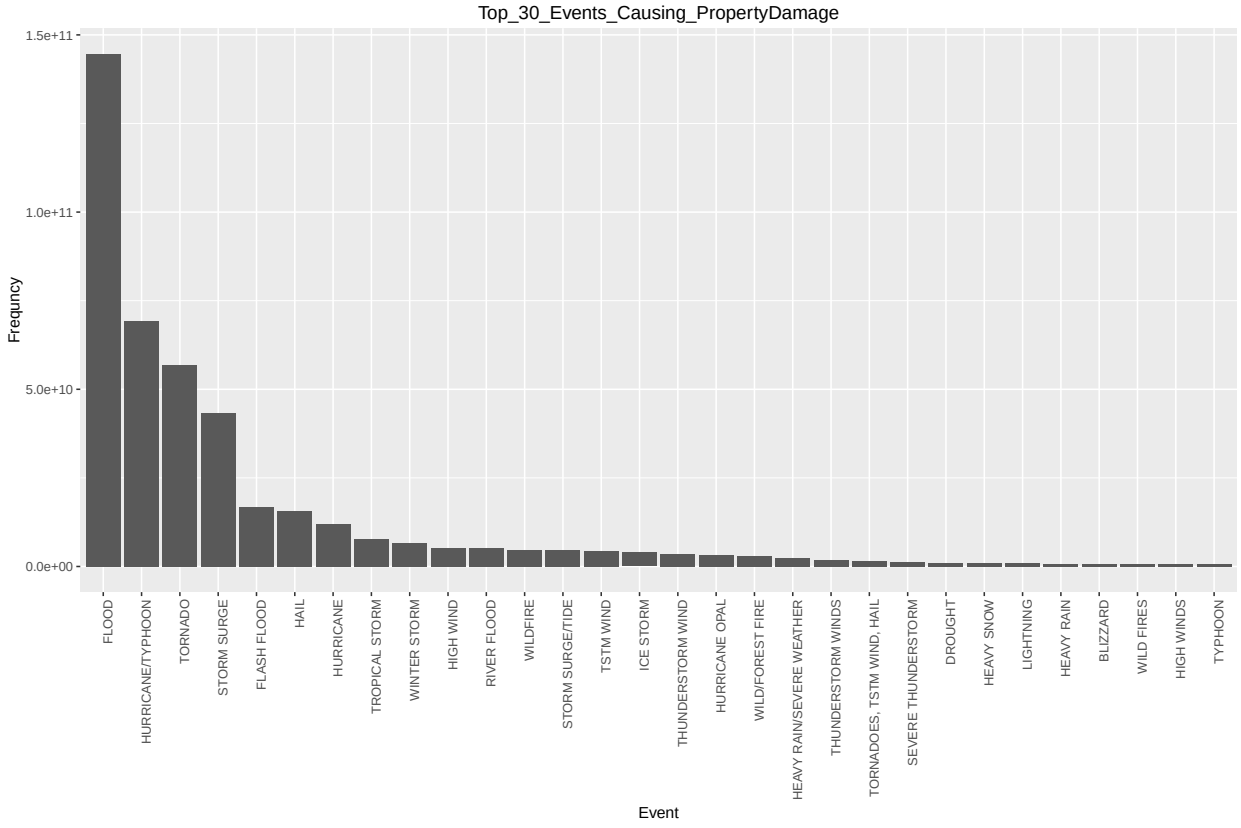
## 7.1 Events causing Property Damage

```
## $EVTYPE
## [1] "character"
##
## $PROPDMG
## [1] "numeric"
##
```

```
## $PROPDMGEXP
## [1] "character"
```

| EVTYPE | PROPDMG | PROPDMGEXP |
|---|---|---|
| TORNADO | 150.0 | K |
| TORNADO | 50.0 | K |
| TORNADO | 5.0 | K |
| TORNADO | 37.0 | K |
| TORNADO | 0.0 | K |
| TORNADO | 0.5 | K |

```
## [1] 902297      3
```



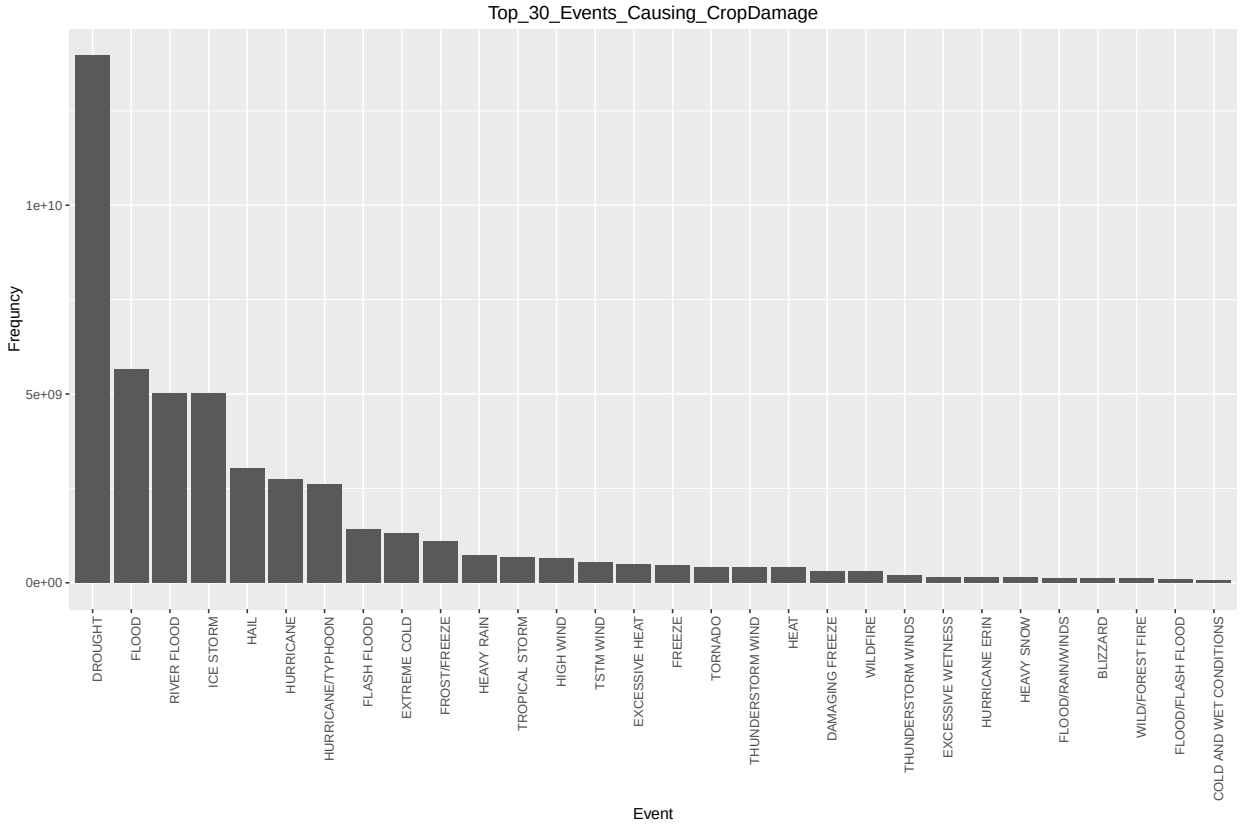

```
##
##
## Table: Top_30_Events_Causing_PropertyDamage
##
## Events                      PropDmg
## ------------------------  --------
## TORNADO                       5633
## EXCESSIVE HEAT                1903
## FLASH FLOOD                    978
## HEAT                           937
```

```
## LIGHTNING                      816
## TSTM WIND                      504
## FLOOD                          470
## RIP CURRENT                    368
## HIGH WIND                      248
## AVALANCHE                      224
## WINTER STORM                   206
## RIP CURRENTS                   204
## HEAT WAVE                      172
## EXTREME COLD                   162
## THUNDERSTORM WIND              133
## HEAVY SNOW                     127
## EXTREME COLD/WIND CHILL        125
## HIGH SURF                      104
## STRONG WIND                    103
## BLIZZARD                       101
## HEAVY RAIN                      98
## EXTREME HEAT                    96
## COLD/WIND CHILL                 95
## ICE STORM                       89
## WILDFIRE                        75
## HURRICANE/TYPHOON               64
## THUNDERSTORM WINDS              64
## FOG                             62
## HURRICANE                       61
## TROPICAL STORM                  58
```

## 7.2 Events Causing CROP DAMAGE

```
## [1] ""  "?" "0" "2" "B" "K" "M"
```

```
## $EVTYPE
## [1] "character"
##
## $CROPDMG
## [1] "numeric"
##
## $CROPDMGEXP
## [1] "character"
```




```
##
##
## Table: Top_30_Events_Causing_CropDamage
##
## Events                       CropDmg
## -------------------------  --------
## TORNADO                         5633
## EXCESSIVE HEAT                  1903
## FLASH FLOOD                      978
## HEAT                             937
## LIGHTNING                        816
## TSTM WIND                        504
## FLOOD                            470
## RIP CURRENT                      368
## HIGH WIND                        248
## AVALANCHE                        224
## WINTER STORM                     206
## RIP CURRENTS                     204
## HEAT WAVE                        172
## EXTREME COLD                     162
## THUNDERSTORM WIND                133
## HEAVY SNOW                       127
## EXTREME COLD/WIND CHILL          125
## HIGH SURF                        104
## STRONG WIND                      103
## BLIZZARD                         101
## HEAVY RAIN                        98
```

```
## EXTREME HEAT                    96
## COLD/WIND CHILL                 95
## ICE STORM                       89
## WILDFIRE                        75
## HURRICANE/TYPHOON               64
## THUNDERSTORM WINDS              64
## FOG                             62
## HURRICANE                       61
## TROPICAL STORM                  58
```

---

## 7.3 System Information

***Time required to process this report:*** *2.637418 mins*

***R session information:***

```
## R version 3.2.3 (2015-12-10)
## Platform: i386-w64-mingw32/i386 (32-bit)
## Running under: Windows 7 (build 7601) Service Pack 1
##
## locale:
## [1] LC_COLLATE=English_United States.1252
## [2] LC_CTYPE=English_United States.1252
## [3] LC_MONETARY=English_United States.1252
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats     graphics  grDevices utils     datasets  methods   base
##
## other attached packages:
## [1] gridExtra_2.0.0 plyr_1.8.3      gplots_2.17.0   printr_0.0.5
## [5] reshape2_1.4.1  ggplot2_2.0.0   dplyr_0.4.3
##
## loaded via a namespace (and not attached):
##  [1] Rcpp_0.12.3        knitr_1.12.3       magrittr_1.5
##  [4] munsell_0.4.3      colorspace_1.2-6   R6_2.1.2
##  [7] highr_0.5.1        stringr_1.0.0      caTools_1.17.1
## [10] tools_3.2.3        parallel_3.2.3     grid_3.2.3
## [13] gtable_0.1.2       KernSmooth_2.23-15 DBI_0.3.1
## [16] htmltools_0.3      gtools_3.5.0       lazyeval_0.1.10
## [19] yaml_2.1.13        assertthat_0.1     digest_0.6.9
## [22] formatR_1.2.1      bitops_1.0-6       evaluate_0.8
## [25] rmarkdown_0.9.2    labeling_0.3       gdata_2.17.0
## [28] stringi_1.0-1      scales_0.3.0
```