Weather events and their health and economic consequences

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There are various weather events that befall communities and municipalities in the United States every year. These include storms, rains, flooding, etc. Such events can result in fatalities, property damage and injuries. And preventing such outcomes is a real cause of concern for local policy makers.

The following report adresses two fundamental issues:

- Which events are particularly harmful with regard to people's health?
- Which events have the greatest economic consequences?

The analysis is based on an in-depth exploration of the NOAA (the U.S. National Oceanic and Atmospheric Administration) Storm Database.

Data processing

```
library(plyr)

## Warning: package 'plyr' was built under R version 3.1.2

library(dplyr)

## Warning: package 'dplyr' was built under R version 3.1.2

##
## Attaching package: 'dplyr'
##
## The following objects are masked from 'package:plyr':
##
##     arrange, count, desc, failwith, id, mutate, rename, summarise,
##     summarize
##
## The following object is masked from 'package:stats':
##
##     filter
##
## The following objects are masked from 'package:base':
```

```
##
##     intersect, setdiff, setequal, union

library(reshape2)

## Warning: package 'reshape2' was built under R version 3.1.2

library(ggplot2)

## Warning: package 'ggplot2' was built under R version 3.1.2

library(R.utils)

## Warning: package 'R.utils' was built under R version 3.1.2

## Loading required package: R.oo

## Warning: package 'R.oo' was built under R version 3.1.2

## Loading required package: R.methodsS3

## Warning: package 'R.methodsS3' was built under R version 3.1.2

## R.methodsS3 v1.6.1 (2014-01-04) successfully loaded. See ?R.methodsS3 fo
r help.
## R.oo v1.18.0 (2014-02-22) successfully loaded. See ?R.oo for help.
##
## Attaching package: 'R.oo'
##
## The following objects are masked from 'package:methods':
##
##     getClasses, getMethods
##
## The following objects are masked from 'package:base':
##
##     attach, detach, gc, load, save
##
## R.utils v1.34.0 (2014-10-07) successfully loaded. See ?R.utils for help.
##
## Attaching package: 'R.utils'
##
## The following object is masked from 'package:utils':
##
##     timestamp
##
## The following objects are masked from 'package:base':
##
##     cat, commandArgs, getOption, inherits, isOpen, parse, warnings
```

Downloading data

```
cache=TRUE
if (!file.exists("StormData.csv.bz2"))
download.file("http://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2", destfile="~/StormData")
if(!file.exists("StormData.csv"))
  bunzip2("StormData.csv.bz2", overwrite=FALSE, remove=FALSE)
```

Reading the .csv file

```
StormData <- read.csv("~/repdata_data_StormData.csv.bz2")
dim(StormData)
```

```
## [1] 902297     37
```

```
head(StormData, n=2)
```

```
##   STATE__           BGN_DATE BGN_TIME TIME_ZONE COUNTY COUNTYNAME STATE
## 1       1 4/18/1950 0:00:00     0130       CST     97     MOBILE    AL
## 2       1 4/18/1950 0:00:00     0145       CST      3    BALDWIN    AL
##    EVTYPE BGN_RANGE BGN_AZI BGN_LOCATI END_DATE END_TIME COUNTY_END
## 1 TORNADO         0                                               0
## 2 TORNADO         0                                               0
##   COUNTYENDN END_RANGE END_AZI END_LOCATI LENGTH WIDTH F MAG FATALITIES
## 1         NA         0                      14   100 3   0          0
## 2         NA         0                       2   150 2   0          0
##   INJURIES PROPDMG PROPDMGEXP CROPDMG CROPDMGEXP WFO STATEOFFIC ZONENAME
S
## 1       15    25.0          K       0
## 2        0     2.5          K       0
##   LATITUDE LONGITUDE LATITUDE_E LONGITUDE_ REMARKS REFNUM
## 1     3040      8812       3051       8806              1
## 2     3042      8755          0          0              2
```

The dataset contains 902297 observations and 37 variables.

Events with the most health consequences

```
events <-StormData[,"EVTYPE"]
fatal <- StormData[,"FATALITIES"]
injury <- StormData[,"INJURIES"]
fat_injuries <- fatal + injury
```

```
df <- data.frame("event"=events, total=fat_injuries)
popdmg <- aggregate(fat_injuries ~ event, data = df, FUN=sum)
order.popdmg <- order(popdmg$fat_injuries,decreasing=TRUE)
main_fatal <- head(popdmg[order.popdmg, ],10)
colnames(main_fatal) <- c("Event", "Total Number of Fatalities/Injuries")
```

Weather events with the most economic consequences

```
prop <- StormData[,"PROPDMG"]
crop <- StormData[,"CROPDMG"]
prop_crop <- prop + crop
df2 <- data.frame("event"=events, "total"=prop_crop)
econdmg <- aggregate(prop_crop ~ event, data = df2, FUN=sum)
order.econdmg <- order(econdmg$prop_crop,decreasing=TRUE)
econ_pbs <- head(econdmg[order.econdmg, ],10)
```

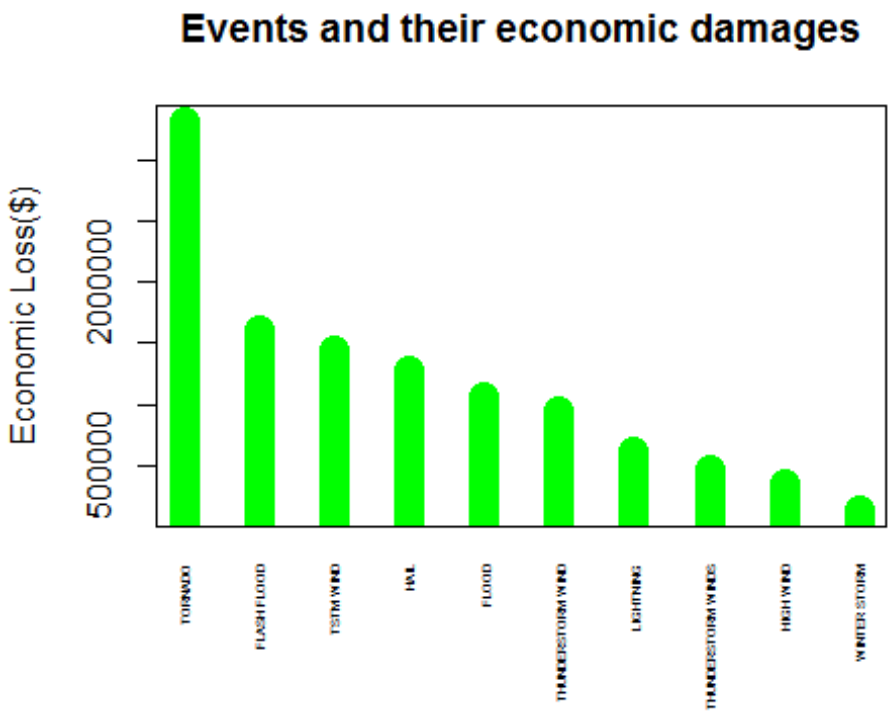
Results

```
print(main_fatal,row.names=FALSE)
```

```
##              Event Total Number of Fatalities/Injuries
##            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
```

This data frame shows the ten weather events with the most health consequences.

```
plot(econ_pbs[,2], xaxt="n", type="h", col="green",lwd=15, main="Events and
 their economic damages", xlab="", ylab="Economic Loss($)")
axis(1, at=1:10, labels=econ_pbs[,1], las=2,cex.axis=0.4, tick=FALSE)
```


Events and their economic damages
Economic Loss($)
500000
2000000
TORNADO
FLASH FLOOD
TSTM WIND
HAIL
FLOOD
LIGHTNING
HIGH WIND
WINTER STORM