Weather Events: Health and Economic consequences

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Load required package

Synopsis 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. The project analysis the health impacts - through injuries and fatalities- and economic impacts through crop and property damage of the severe weather events.

DATA PROCESSING

Import Data

```
storm_data <- read.csv("repdata-data-StormData.csv.bz2")
sd_one <- storm_data %>% select(EVTYPE, FATALITIES, INJURIES)
```

Sort data

```
# create new df for injuries and fatalities
#fatalities
sd_fat <- sd_one %>%select(-INJURIES)
fatal <- aggregate (FATALITIES~EVTYPE, sd_fat, sum)
sd_fat_summary <- fatal %>% arrange(desc(FATALITIES))
sd_fat_10 <-sd_fat_summary %>% top_n(10)
```

```
## Selecting by FATALITIES
```

```
#injuries
sd_inj <- sd_one %>% select(-FATALITIES)
injuries <- aggregate (INJURIES~EVTYPE, sd_inj, sum)
sd_inj_summary <- injuries %>% arrange(desc(INJURIES))
sd_inj_10 <-sd_inj_summary %>% top_n(10)
```

```
## Selecting by INJURIES
```

```
sd_inj_10
```

```
##               EVTYPE INJURIES
## 1            TORNADO    91346
## 2          TSTM WIND     6957
```

```
## 3              FLOOD     6789
## 4      EXCESSIVE HEAT     6525
## 5          LIGHTNING     5230
## 6               HEAT     2100
## 7          ICE STORM     1975
## 8        FLASH FLOOD     1777
## 9  THUNDERSTORM WIND     1488
## 10              HAIL     1361
```

```
sd_fat_10
```

```
##            EVTYPE FATALITIES
## 1          TORNADO       5633
## 2  EXCESSIVE HEAT       1903
## 3     FLASH FLOOD        978
## 4            HEAT        937
## 5       LIGHTNING        816
## 6       TSTM WIND        504
## 7           FLOOD        470
## 8     RIP CURRENT        368
## 9       HIGH WIND        248
## 10      AVALANCHE        224
```

Economic data

```
#economic damages tidyying and data manipulation
key <- c("", "+", "-", "?", 0:9, "h", "H", "k", "K", "m", "M", "b", "B");
econ_factor <- c(rep(0,4), 0:9, 2, 2, 3, 3, 6, 6, 9, 9)
multiplier <- data.frame (key, econ_factor)

storm_data$damage.prop <- storm_data$PROPDMG*10^multiplier[match(storm_data$PROPDMGEXP,multiplier$key),
storm_data$damage.crop <- storm_data$CROPDMG*10^multiplier[match(storm_data$CROPDMGEXP,multiplier$key),
storm_data$damage <- storm_data$damage.prop + storm_data$damage.crop

total_econ_damage <- aggregate (damage~EVTYPE, storm_data, sum);
total_econ_damage$billion <- total_econ_damage$damage / 1e9;
desc_damage <- total_econ_damage %>% arrange(desc(billion))
desc_damage_20 <-desc_damage %>% top_n(20)
```

```
## Selecting by billion
```

```
desc_damage_20
```

```
##                       EVTYPE       damage    billion
## 1                      FLOOD 150319678257 150.319678
## 2          HURRICANE/TYPHOON  71913712800  71.913713
## 3                    TORNADO  57362333946  57.362334
## 4                STORM SURGE  43323541000  43.323541
## 5                       HAIL  18761221986  18.761222
## 6                FLASH FLOOD  18243991078  18.243991
## 7                    DROUGHT  15018672000  15.018672
## 8                  HURRICANE  14610229010  14.610229
```

```
## 9                RIVER FLOOD  10148404500  10.148404
## 10                 ICE STORM   8967041360   8.967041
## 11            TROPICAL STORM   8382236550   8.382237
## 12              WINTER STORM   6715441251   6.715441
## 13                 HIGH WIND   5908617595   5.908618
## 14                  WILDFIRE   5060586800   5.060587
## 15                 TSTM WIND   5038935845   5.038936
## 16          STORM SURGE/TIDE   4642038000   4.642038
## 17         THUNDERSTORM WIND   3897965522   3.897966
## 18            HURRICANE OPAL   3191846000   3.191846
## 19          WILD/FOREST FIRE   3108626330   3.108626
## 20 HEAVY RAIN/SEVERE WEATHER   2500000000   2.500000
```

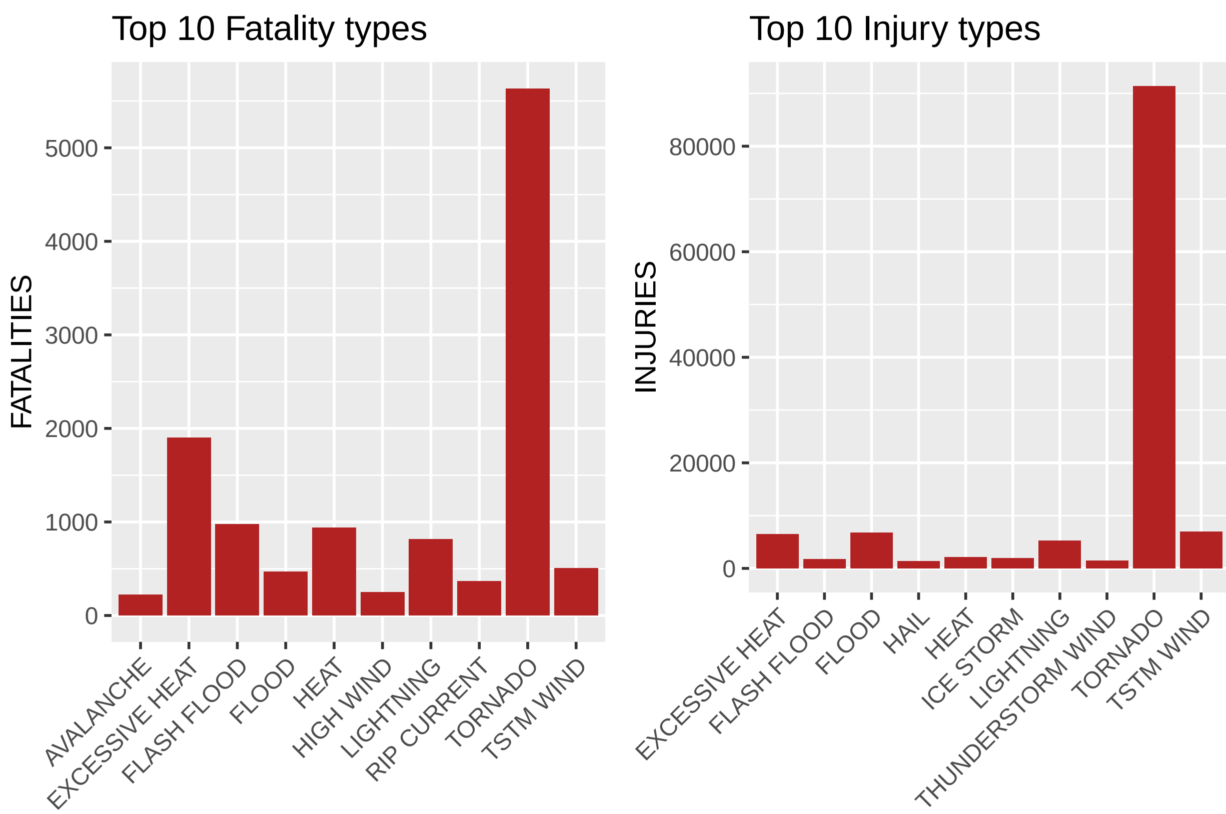
RESULTS

```r
#display graphically using GGPlot
#fatalities bar chart

fat_plot <- ggplot(data = sd_fat_10, mapping =aes(x = EVTYPE, y = FATALITIES))+
  geom_bar(stat = "identity", fill = "firebrick")+
  theme(axis.text.x = element_text(angle = 45, hjust = 1 ))+
  xlab("")+
  scale_y_continuous(breaks = seq(0,6000, by = 1000))+
  ggtitle("Top 10 Fatality types")

#injuries bar chart
inj_plot <- ggplot(data = sd_inj_10, mapping =aes(x = EVTYPE, y = INJURIES))+
  geom_bar(stat = "identity", fill = "firebrick")+
  theme(axis.text.x = element_text(angle = 45, hjust = 1 ))+
  xlab("")+
  scale_y_continuous(breaks = seq(0,100000, by = 20000))+
  ggtitle("Top 10 Injury types")

#display in one pane
dual_plot <- gridExtra::grid.arrange(fat_plot, inj_plot, ncol = 2, nrow = 1)
```



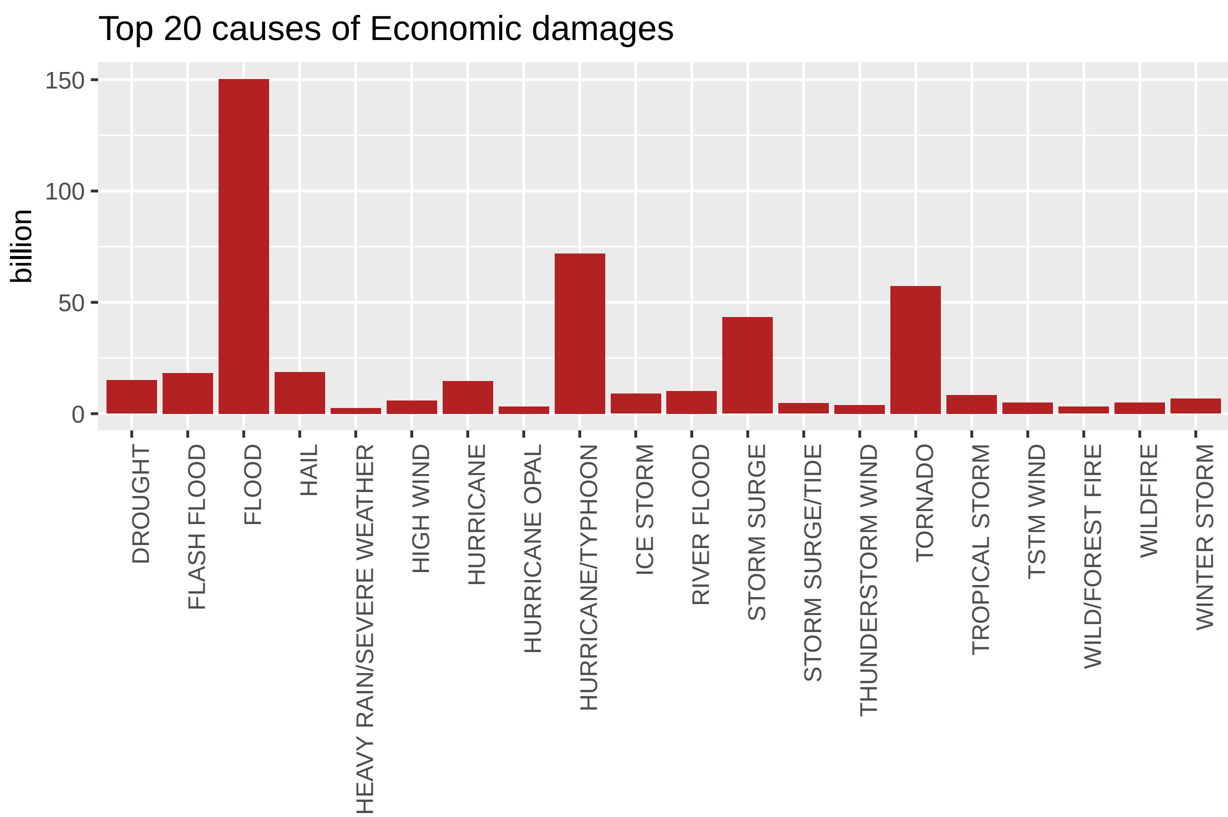

```
dual_plot
```

```
## TableGrob (1 x 2) "arrange": 2 grobs
##   z     cells    name           grob
## 1 1 (1-1,1-1) arrange gtable[layout]
## 2 2 (1-1,2-2) arrange gtable[layout]
```

Display economic graph

```
#display economic damages ggplot
econ_damage_plot <- ggplot(data = desc_damage_20, mapping =aes(x = EVTYPE, y = billion))+
  geom_bar(stat = "identity", fill = "firebrick")+
  theme(axis.text.x = element_text(angle = 90, hjust = 1 ))+
  xlab("")+
  scale_y_continuous()+
  ggtitle("Top 20 causes of Economic damages")

econ_damage_plot
```



The graphs demonstrate Tornados cause the most significant health impacts, whereas floods the most significant economic impacts.