

Economic and Life-Threatening Events as a result of Storm Activities in the USA

Alan C Bonnici

Monday, August 18, 2014

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.

Assignment

The purpose of this report is to answer the following questions:

1. Across the United States, which types of events are most harmful with respect to population health?
2. Across the United States, which types of events have the greatest economic consequences?

Data

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.

The data used in this analysis was downloaded from <https://d396qusza40orc.cloudfront.net/repdata%2Fdata%2FStormData.csv.bz2>. It was downloaded on **Aug 19 2014 at 14:02:33**.

The data on which this report is based consists of **902,297** observations. The period covered by the data is between **NA** and **NA**.

Across the United States, which types of events are most harmful with respect to population health?

```
data2 <- data[data$INJURIES > 0 | data$FATALITIES>0,c("EVTYPE", "FATALITIES", "INJURIES")]
```

Procedure: a subset of the original data was extracted from the original source. This consisted of only those rows that reported INJURIES or FATALITIES greater than zero. The resulting subset consisted of **21,929** observations.

The Event Type description (*EVTYPE*) was not coded against a fixed list. This meant that there were many items that overlapped and this would confound the results. The original list of reported Event Types in the subset was the following:

```
unique(data2$EVTYPE)
```

```
##      [1] "TORNADO"                "TSTM WIND"
##      [3] "HAIL"                  "ICE STORM/FLASH FLOOD"
##      [5] "WINTER STORM"          "HURRICANE OPAL/HIGH WINDS"
##      [7] "DENSE FOG"             "RIP CURRENT"
##      [9] "THUNDERSTORM WINDS"    "LIGHTNING"
##     [11] "HEAT"                  "HEAVY RAIN"
##     [13] "COLD"                  "FLOODING"
##     [15] "FLASH FLOOD"          "EXTREME COLD"
##     [17] "HIGH WIND"            "MARINE MISHAP"
##     [19] "HIGH WIND/SEAS"       "HIGH SEAS"
##     [21] "HIGH WINDS"           "DUST STORM"
##     [23] "SLEET"                "FLOOD"
##     [25] "THUNDERSTORM WINDS/HAIL" "EXCESSIVE HEAT"
##     [27] "GUSTY WINDS"          "HIGH SURF"
##     [29] "WILD FIRES"           "HIGH"
##     [31] "WINTER STORM HIGH WINDS" "WINTER STORMS"
##     [33] "THUNDERSTORM WIND"    "FLOOD/FLASH FLOOD"
##     [35] "HEAVY SNOW"           "FUNNEL CLOUD"
##     [37] "STRONG WIND"          "DRY MICROBURST WINDS"
##     [39] "DRY MICROBURST"       "THUNDERSTORM WINDSS"
##     [41] "ICE STORM"            "HEAT WAVE"
##     [43] "UNSEASONABLY WARM"    "STRONG WINDS"
##     [45] "BLIZZARD"             "WATERSPOUT TORNADO"
##     [47] "HURRICANE ERIN"       "WATERSPOUT/TORNADO"
##     [49] "WIND"                 "STORM SURGE"
##     [51] "WATERSPOUT"           "HURRICANE OPAL"
##     [53] "TORNADOES, TSTM WIND, HAIL" "TROPICAL STORM"
##     [55] "TROPICAL STORM GORDON" "LIGHTNING INJURY"
##     [57] "LIGHTNING AND THUNDERSTORM WIN" "AVALANCHE"
##     [59] "THUNDERSTORM WINDS 13" "FLASH FLOODING"
##     [61] "SNOW"                 "FREEZING RAIN/SNOW"
##     [63] "THUNDERSNOW"          "RIVER FLOOD"
##     [65] "EXTREME HEAT"         "WINDS"
##     [67] "FREEZING RAIN"        "FOG"
##     [69] "SNOW AND ICE"         "WIND STORM"
##     [71] "ICE"                  "WINTER WEATHER"
##     [73] "URBAN AND SMALL STREAM FLOODIN" "FREEZE"
```

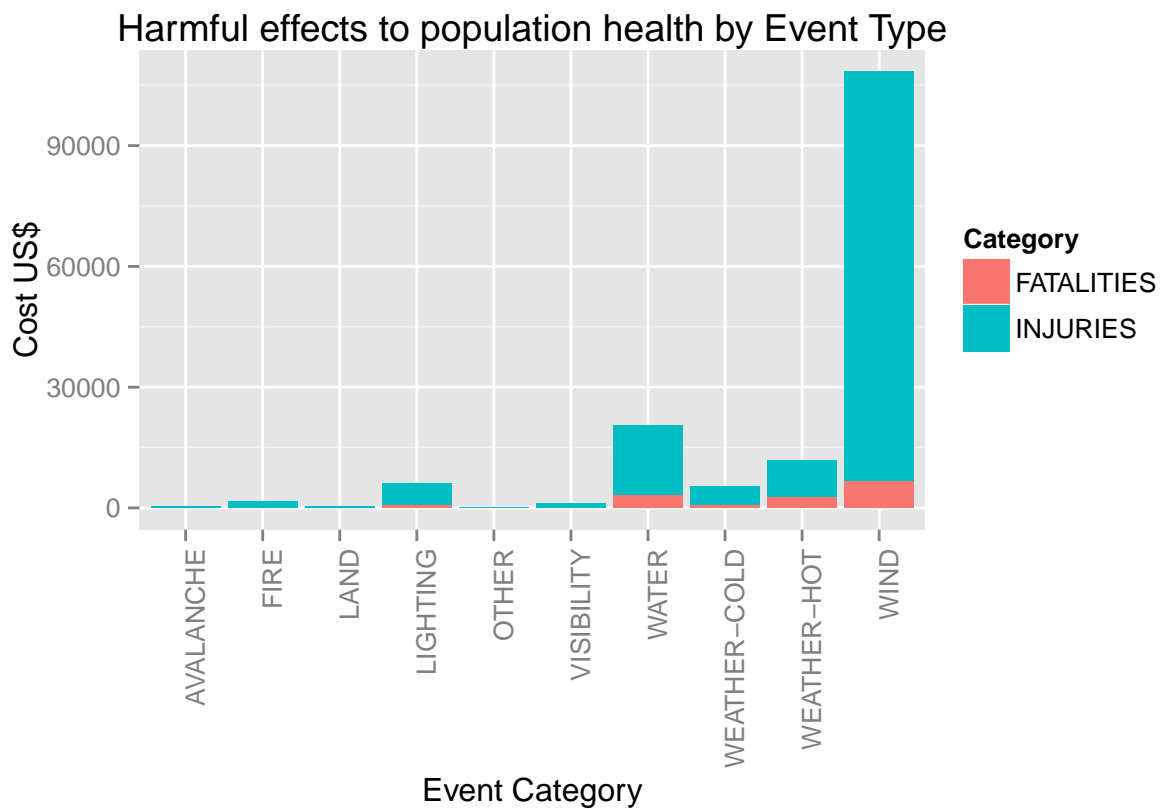
## [75]	"LIGHTNING."	"HURRICANE-GENERATED SWELLS"
## [77]	"THUNDERTORM WINDS"	"COLD WAVE"
## [79]	"TORNADO F3"	"FLOOD/RIVER FLOOD"
## [81]	"GLAZE/ICE STORM"	"AVALANCE"
## [83]	"HEAVY SNOW AND HIGH WINDS"	"RIP CURRENTS/HEAVY SURF"
## [85]	"FOG AND COLD TEMPERATURES"	"DUST DEVIL"
## [87]	"HEAVY SURF"	"ICY ROADS"
## [89]	"RECORD HEAT"	"TORNADO F2"
## [91]	"RIP CURRENTS"	"HURRICANE EMILY"
## [93]	"HURRICANE FELIX"	"THUNDERSTORM"
## [95]	"BLOWING SNOW"	"HIGH WIND/HEAVY SNOW"
## [97]	"RAIN/WIND"	"HEAT WAVE DROUGHT"
## [99]	"HEAVY SNOW/BLIZZARD/AVALANCHE"	"HEAT WAVES"
## [101]	"UNSEASONABLY WARM AND DRY"	"UNSEASONABLY COLD"
## [103]	"RECORD/EXCESSIVE HEAT"	"THUNDERSTORM WIND G52"
## [105]	"HIGH WAVES"	"LOW TEMPERATURE"
## [107]	"HYPOTHERMIA"	"COLD/WINDS"
## [109]	"RECORD COLD"	"SNOW/ BITTER COLD"
## [111]	"HIGH WINDS/COLD"	"COLD WEATHER"
## [113]	"RAPIDLY RISING WATER"	"HEAVY RAINS"
## [115]	"HEAVY SNOW/ICE"	"SNOW/HIGH WINDS"
## [117]	"HIGH WINDS/SNOW"	"FREEZING DRIZZLE"
## [119]	"FLASH FLOOD/FLOOD"	"EXCESSIVE RAINFALL"
## [121]	"THUNDERSTORMW"	"FLASH FLOODING/FLOOD"
## [123]	"GLAZE"	"LANDSLIDE"
## [125]	"HIGH WIND AND SEAS"	"RIVER FLOODING"
## [127]	"MINOR FLOODING"	"DROUGHT/EXCESSIVE HEAT"
## [129]	"HEAVY SEAS"	"FLOOD & HEAVY RAIN"
## [131]	"THUNDERSTORM WINDS"	"HIGH WIND 48"
## [133]	"THUNDERSTORMS WINDS"	"FLASH FLOODS"
## [135]	"URBAN/SML STREAM FLD"	"ROUGH SURF"
## [137]	"WILD/FOREST FIRE"	"MARINE ACCIDENT"
## [139]	"COASTAL STORM"	"HURRICANE"
## [141]	"TORRENTIAL RAINFALL"	"HURRICANE EDOUARD"
## [143]	"TIDAL FLOODING"	"EXTENDED COLD"
## [145]	"EXTREME WINDCHILL"	"WHIRLWIND"
## [147]	"HEAVY SNOW SHOWER"	"MIXED PRECIP"
## [149]	"FREEZING SPRAY"	"TSTM WIND/HAIL"
## [151]	"MUDSLIDES"	"MUDSLIDE"
## [153]	"COLD TEMPERATURE"	"COASTAL FLOODING"
## [155]	"COLD AND SNOW"	"RAIN/SNOW"
## [157]	"SNOW SQUALL"	"HYPOTHERMIA/EXPOSURE"
## [159]	"BLACK ICE"	"COASTALSTORM"
## [161]	"FROST"	"SNOW SQUALLS"
## [163]	"HEAVY SURF AND WIND"	"TYPHOON"
## [165]	"LANDSLIDES"	"HIGH SWELLS"
## [167]	"SMALL HAIL"	"COASTAL FLOODING/EROSION"
## [169]	"TSTM WIND (G40)"	"TSTM WIND (G35)"
## [171]	"HYPERTHERMIA/EXPOSURE"	"WINTRY MIX"
## [173]	"GUSTY WIND"	"EXCESSIVE SNOW"
## [175]	"ICE ROADS"	"ROUGH SEAS"
## [177]	"TSTM WIND (G45)"	"NON-SEVERE WIND DAMAGE"
## [179]	"WARM WEATHER"	"THUNDERSTORM WIND (G40)"
## [181]	"HIGH WATER"	"LIGHT SNOW"

```
## [183] "WINTER WEATHER MIX"          "ROGUE WAVE"
## [185] "FALLING SNOW/ICE"           "NON TSTM WIND"
## [187] "OTHER"                      "BRUSH FIRE"
## [189] "HAZARDOUS SURF"            "ICE ON ROAD"
## [191] "DROWNING"                  "EXTREME COLD/WIND CHILL"
## [193] "HURRICANE/TYPHOON"         "WILDFIRE"
## [195] "HEAVY SURF/HIGH SURF"      "WINTER WEATHER/MIX"
## [197] "MARINE TSTM WIND"          "COASTAL FLOOD"
## [199] "DROUGHT"                  "COLD/WIND CHILL"
## [201] "MARINE THUNDERSTORM WIND"   "MARINE STRONG WIND"
## [203] "STORM SURGE/TIDE"          "MARINE HIGH WIND"
## [205] "TSUNAMI"
```

The list was consolidated. For an explanation of the consolidation process look up *Appendix A* of this report. After consolidation the groupings are as follows:

```
data2 <- cleanEVTYPE(data2)
unique(data2$EVTYPE)
```

```
## [1] WIND          WEATHER-COLD WATER      VISIBILITY  LIGHTING
## [6] WEATHER-HOT  FIRE          OTHER      AVALANCHE  LAND
## 10 Levels: AVALANCHE FIRE LAND LIGHTING OTHER VISIBILITY ... WIND
```



From the chart it is clearly visible that the event that costs the most in terms of harmful events to humans are those classified under **WIND**.

The table of the recategorised data is shown hereunder

##	EventType	Amount
## 5	OTHER	228
## 3	LAND	261
## 1	AVALANCHE	396
## 6	VISIBILITY	1156
## 2	FIRE	1698
## 8	WEATHER-COLD	5417
## 4	LIGHTING	6048
## 9	WEATHER-HOT	11793
## 7	WATER	20372
## 10	WIND	108304

Across the United States, which types of events have the greatest economic consequences?

Procedure: a subset of the original data was extracted from the original source. This consisted of only those rows that reported INJURIES or FATALITIES greater than zero. The resulting subset consisted of **245,031** observations.

The Event Type description (*EVTYPE*) was not coded against a fixed list. This meant that there were many items that overlapped and this would confound the results. The original list of reported Event Types in the subset was the following:

```
unique(data3$EVTYPE)
```

```
## [1] "TORNADO"
## [3] "HURRICANE OPAL/HIGH WINDS"
## [5] "HURRICANE ERIN"
## [7] "HEAVY RAIN"
## [9] "THUNDERSTORM WIND"
## [11] "HAIL"
## [13] "FLASH FLOODING"
## [15] "TORNADO FO"
## [17] "THUNDERSTORM WINDS/HAIL"
## [19] "WIND"
## [21] "LIGHTNING AND HEAVY RAIN"
## [23] "HEAVY RAIN/LIGHTNING"
## [25] "FLOODING"
## [27] "HEAT"
## [29] "BREAKUP FLOODING"
## [31] "FREEZE"
## [33] "HIGH WINDS HEAVY RAINS"
## [35] "HIGH TIDES"
## [37] "HIGH WINDS/HEAVY RAIN"
## [39] "COASTAL FLOOD"
## [41] "RECORD RAINFALL"
## [43] "HEAVY SNOW/WIND"
## [45] "APACHE COUNTY"
## [47] "DUST STORM"
## [49] "TSTM WIND"
## [51] "GUSTY WINDS"
## [53] "HEAVY SURF COASTAL FLOODING"
## [55] "WINTER STORM HIGH WINDS"
## [57] "MUDSLIDES"
## [59] "SEVERE THUNDERSTORM"
## [61] "SEVERE THUNDERSTORM WINDS"
## [63] "FLOOD/FLASH FLOOD"
## [65] "THUNDERSTORMS"
## [67] "WINDS"
## [69] "HIGH SURF"
## [71] "STRONG WIND"
## [73] "FLASH FLOOD/"
## [75] "EXTREME COLD"
## [77] "MICROBURST WINDS"
## [79] "BLIZZARD"
## [81] "WATERSPOUT TORNADO"
"WINTER STORM"
"THUNDERSTORM WINDS"
"HURRICANE OPAL"
"LIGHTNING"
"DENSE FOG"
"THUNDERSTORM WINS"
"FLASH FLOOD"
"THUNDERSTORM WINDS LIGHTNING"
"HIGH WINDS"
"HEAVY RAINS"
"THUNDERSTORM WINDS HAIL"
"FLASH FLOODING/THUNDERSTORM WI"
"WATERSPOUT"
"LIGHTNING/HEAVY RAIN"
"HIGH WIND"
"RIVER FLOOD"
"AVALANCHE"
"HIGH WIND/SEAS"
"HIGH SEAS"
"SEVERE TURBULENCE"
"HEAVY SNOW"
"FLOOD"
"DUST DEVIL"
"ICE STORM"
"THUNDERSTORM WINDS/FUNNEL CLOU"
"FLOODING/HEAVY RAIN"
"WILD FIRES"
"WINTER STORMS"
"RAINSTORM"
"SEVERE THUNDERSTORMS"
"THUNDERSTORMS WINDS"
"FLOOD/RAIN/WINDS"
"FLASH FLOOD WINDS"
"FUNNEL CLOUD"
"HIGH WIND DAMAGE"
"HEAVY SNOWPACK"
"HEAVY SURF"
"URBAN FLOOD"
"COASTAL FLOODING"
"WATERSPOUT/TORNADO"
"STORM SURGE"
```

## [83]	"URBAN/SMALL STREAM FLOOD"	"WATERSPOUT-"
## [85]	"TORNADOES, TSTM WIND, HAIL"	"TROPICAL STORM ALBERTO"
## [87]	"TROPICAL STORM"	"TROPICAL STORM GORDON"
## [89]	"TROPICAL STORM JERRY"	"LIGHTNING THUNDERSTORM WINDS"
## [91]	"URBAN FLOODING"	"MINOR FLOODING"
## [93]	"WATERSPOUT-TORNADO"	"THUNDERSTORM WINDSS"
## [95]	"FLASH FLOODS"	"THUNDERSTORM WINDS53"
## [97]	"WILDFIRE"	"DAMAGING FREEZE"
## [99]	"THUNDERSTORM WINDS 13"	"HURRICANE"
## [101]	"SNOW"	"LIGNTNING"
## [103]	"FROST"	"HIGH WINDS/"
## [105]	"THUNDERSNOW"	"FLOODS"
## [107]	"COOL AND WET"	"HEAVY RAIN/SNOW"
## [109]	"GLAZE ICE"	"HEAT WAVE"
## [111]	"MUD SLIDE"	"HIGH WINDS"
## [113]	"RURAL FLOOD"	"MUD SLIDES"
## [115]	"DROUGHT"	"COLD AND WET CONDITIONS"
## [117]	"EXCESSIVE WETNESS"	"SLEET/ICE STORM"
## [119]	"GUSTNADO"	"FREEZING RAIN/SNOW"
## [121]	"FREEZING RAIN"	"SNOW AND HEAVY SNOW"
## [123]	"GROUND BLIZZARD"	"EXTREME WIND CHILL"
## [125]	"MAJOR FLOOD"	"SNOW/HEAVY SNOW"
## [127]	"FREEZING RAIN/SLEET"	"ICE JAM FLOODING"
## [129]	"COLD AIR TORNADO"	"WIND DAMAGE"
## [131]	"TSTM WIND 55"	"SMALL STREAM FLOOD"
## [133]	"THUNDERTORM WINDS"	"HAIL/WINDS"
## [135]	"SNOW AND ICE"	"WIND STORM"
## [137]	"GRASS FIRES"	"LAKE FLOOD"
## [139]	"HAIL/WIND"	"WIND/HAIL"
## [141]	"SNOW AND ICE STORM"	"THUNDERSTORM WINDS"
## [143]	"DROUGHT/EXCESSIVE HEAT"	"THUNDERSTORMS WIND"
## [145]	"TUNDERSTORM WIND"	"THUNDERSTORM WIND/LIGHTNING"
## [147]	"HEAVY RAIN/SEVERE WEATHER"	"THUNDERSTORM"
## [149]	"WATERSPOUT/ TORNADO"	"HURRICANE-GENERATED SWELLS"
## [151]	"RIVER AND STREAM FLOOD"	"HIGH WINDS/COASTAL FLOOD"
## [153]	"RAIN"	"RIVER FLOODING"
## [155]	"EXCESSIVE HEAT"	"ICE FLOES"
## [157]	"THUNDERSTORM WIND G50"	"LIGHTNING FIRE"
## [159]	"HEAVY LAKE SNOW"	"RECORD COLD"
## [161]	"HEAVY SNOW/FREEZING RAIN"	"DUST DEVIL WATERSPOUT"
## [163]	"TORNADO F3"	"TORNDAO"
## [165]	"FLOOD/RIVER FLOOD"	"MUD SLIDES URBAN FLOODING"
## [167]	"TORNADO F1"	"GLAZE"
## [169]	"HEAVY SNOW/WINTER STORM"	"MICROBURST"
## [171]	"STRONG WINDS"	"BLIZZARD/WINTER STORM"
## [173]	"DUST STORM/HIGH WINDS"	"ICE JAM"
## [175]	"FOREST FIRES"	"FROST\\FREEZE"
## [177]	"THUNDERSTORM WINDS."	"HVY RAIN"
## [179]	"HAIL 150"	"HAIL 075"
## [181]	"HAIL 100"	"THUNDERSTORM WIND G55"
## [183]	"HAIL 125"	"THUNDERSTORM WIND G60"
## [185]	"THUNDERSTORM WINDS G60"	"HARD FREEZE"
## [187]	"HAIL 200"	"HEAVY SNOW/HIGH WINDS & FLOOD"
## [189]	"HEAVY RAIN AND FLOOD"	"URBAN AND SMALL"

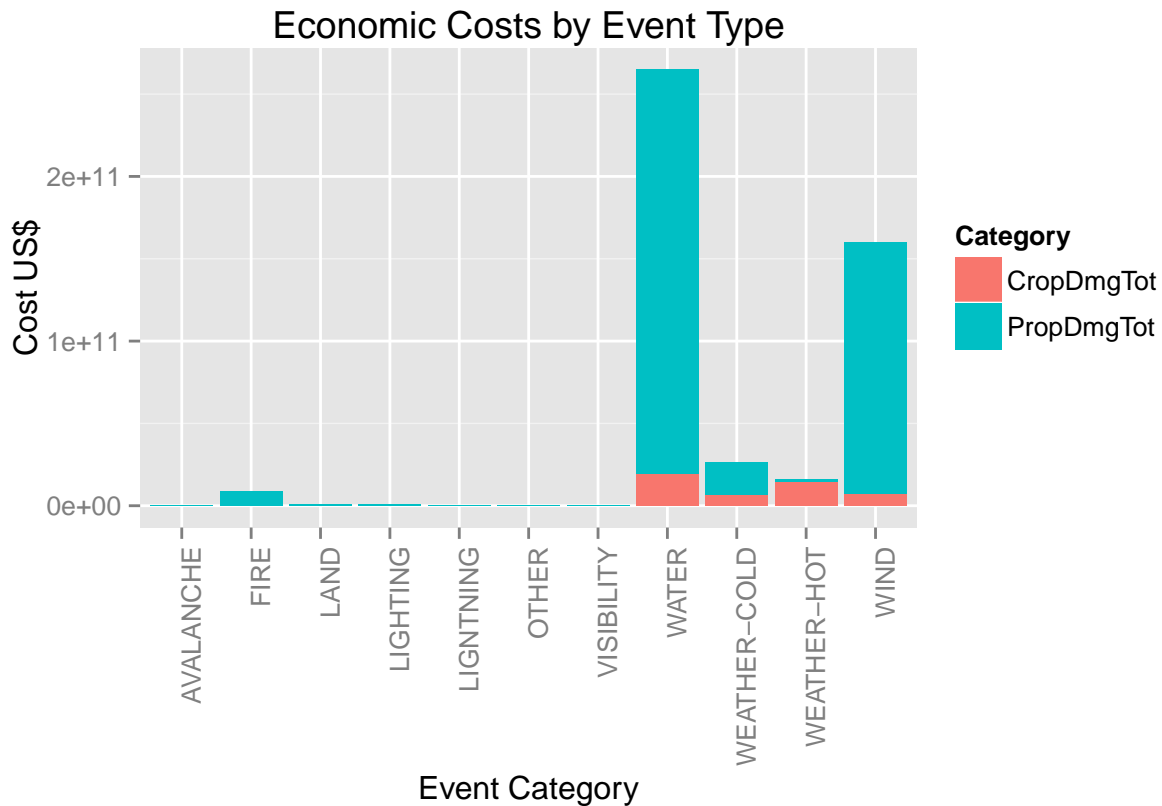
## [191] "WILDFIRES"	"SNOW/COLD"
## [193] "FLASH FLOOD FROM ICE JAMS"	"TSTM WIND G58"
## [195] "MUDSLIDE"	"HEAVY SNOW SQUALLS"
## [197] "SNOW SQUALL"	"SNOW/ICE STORM"
## [199] "HEAVY SNOW/SQUALLS"	"HEAVY SNOW-SQUALLS"
## [201] "ICE"	"HEAVY MIX"
## [203] "SNOW FREEZING RAIN"	"SNOW/SLEET"
## [205] "SNOW/FREEZING RAIN"	"SNOW SQUALLS"
## [207] "SNOW/SLEET/FREEZING RAIN"	"RECORD SNOW"
## [209] "HAIL 0.75"	"THUNDERSTORM WIND 65MPH"
## [211] "THUNDERSTORM WIND/ TREES"	"THUNDERSTORM WIND/AWNING"
## [213] "THUNDERSTORM WIND 98 MPH"	"THUNDERSTORM WIND TREES"
## [215] "TORNADO F2"	"HURRICANE EMILY"
## [217] "COASTAL SURGE"	"HURRICANE GORDON"
## [219] "HURRICANE FELIX"	"THUNDERSTORM WIND 60 MPH"
## [221] "THUNDERSTORM WINDS 63 MPH"	"THUNDERSTORM WIND/ TREE"
## [223] "THUNDERSTORM DAMAGE TO"	"THUNDERSTORM WIND 65 MPH"
## [225] "FLASH FLOOD - HEAVY RAIN"	"THUNDERSTORM WIND."
## [227] "FLASH FLOOD/ STREET"	"HEAVY SNOW/BLIZZARD"
## [229] "THUNDERSTORM HAIL"	"THUNDERSTORM WINDSHAIL"
## [231] "LIGHTNING WAUSEON"	"THUDERSTORM WINDS"
## [233] "EXTREME HEAT"	"ICE AND SNOW"
## [235] "STORM FORCE WINDS"	"HEAVY SNOW/ICE"
## [237] "LIGHTING"	"HIGH WIND/HEAVY SNOW"
## [239] "THUNDERSTORM WINDS AND"	"HEAVY PRECIPITATION"
## [241] "HIGH WIND/BLIZZARD"	"TSTM WIND DAMAGE"
## [243] "FLOOD FLASH"	"SNOW/ICE"
## [245] "HAIL 75"	"HEAT WAVE DROUGHT"
## [247] "HEAVY SNOW/BLIZZARD/AVALANCHE"	"ICY ROADS"
## [249] "FLASH FLOOD/FLOOD"	"FLOOD/FLASH"
## [251] "HEAVY RAINS/FLOODING"	"THUNDERESTORM WINDS"
## [253] "THUNDERSTORM WINDS/FLOODING"	"THUNDEERSTORM WINDS"
## [255] "THUNERSTORM WINDS"	"HIGH WINDS/COLD"
## [257] "SNOW/ BITTER COLD"	"WILD/FOREST FIRE"
## [259] "FOG"	"ICE/STRONG WINDS"
## [261] "SNOW/HIGH WINDS"	"HIGH WINDS/SNOW"
## [263] "SNOWMELT FLOODING"	"HEAVY SNOW AND STRONG WINDS"
## [265] "SNOW ACCUMULATION"	"SNOW/ ICE"
## [267] "SNOW/BLOWING SNOW"	"TORNADOES"
## [269] "THUNDERSTORM WIND/HAIL"	"FREEZING DRIZZLE"
## [271] "HAIL 175"	"FLASH FLOODING/FLOOD"
## [273] "HAIL 275"	"HAIL 450"
## [275] "DRY MICROBURST"	"THUNDERSTORMW"
## [277] "HAILSTORM"	"TSTM WINDS"
## [279] "TSTMW"	"TSTM WIND 65)"
## [281] "TROPICAL STORM DEAN"	"THUNDERSTORM WINDS/ FLOOD"
## [283] "LANDSLIDE"	"HIGH WIND AND SEAS"
## [285] "THUNDERSTORMWINDS"	"WILD/FOREST FIRES"
## [287] "HAIL DAMAGE"	"FLOOD & HEAVY RAIN"
## [289] "?"	"THUNDERSTROM WIND"
## [291] "FLOOD/FLASHFLOOD"	"HIGH WATER"
## [293] "HIGH WIND 48"	"LANDSLIDES"
## [295] "URBAN/SMALL STREAM"	"BRUSH FIRE"
## [297] "HEAVY SHOWER"	"HEAVY SWELLS"

## [299] "URBAN SMALL"	"URBAN FLOODS"
## [301] "FLASH FLOOD/LANDSLIDE"	"HEAVY RAIN/SMALL STREAM URBAN"
## [303] "FLASH FLOOD LANDSLIDES"	"TSTM WIND/HAIL"
## [305] "OTHER"	"ICE JAM FLOOD (MINOR"
## [307] "URBAN/SML STREAM FLD"	"ROUGH SURF"
## [309] "MARINE ACCIDENT"	"EROSION/CSTL FLOOD"
## [311] "BEACH EROSION"	"HEAVY RAIN/HIGH SURF"
## [313] "UNSEASONABLE COLD"	"EARLY FROST"
## [315] "WINTRY MIX"	"LANDSLUMP"
## [317] "COASTAL STORM"	"TIDAL FLOODING"
## [319] "EXTREME WINDCHILL"	"EXTENDED COLD"
## [321] "WHIRLWIND"	"HEAVY SNOW SHOWER"
## [323] "LIGHT SNOW"	"DOWNBURST"
## [325] "LIGHT SNOWFALL"	"GUSTY WIND/RAIN"
## [327] "GUSTY WIND/HVY RAIN"	"TSTM WIND (G45)"
## [329] "GUSTY WIND"	"TSTM WIND 40"
## [331] "TSTM WIND 45"	"TSTM WIND (41)"
## [333] "TSTM WIND (G40)"	"FROST/FREEZE"
## [335] "COLD"	"AGRICULTURAL FREEZE"
## [337] "WINTER WEATHER"	"LAKE EFFECT SNOW"
## [339] "MIXED PRECIPITATION"	"DAM BREAK"
## [341] "BLOWING SNOW"	"GRADIENT WIND"
## [343] "UNSEASONABLY COLD"	"TSTM WIND AND LIGHTNING"
## [345] "WET MICROBURST"	"TYPHOON"
## [347] "HIGH SWELLS"	"SMALL HAIL"
## [349] "UNSEASONAL RAIN"	"COASTAL FLOODING/EROSION"
## [351] " TSTM WIND (G45)"	"TSTM WIND (G45)"
## [353] "HIGH WIND (G40)"	"TSTM WIND (G35)"
## [355] "COASTAL EROSION"	"UNSEASONABLY WARM"
## [357] "SEICHE"	"COASTAL FLOODING/EROSION"
## [359] "ROCK SLIDE"	"GUSTY WIND/HAIL"
## [361] " TSTM WIND"	"LANDSPOUT"
## [363] "EXCESSIVE SNOW"	"FLOOD/FLASH/FLOOD"
## [365] "WIND AND WAVE"	"LIGHT FREEZING RAIN"
## [367] "ICE ROADS"	"RIP CURRENTS"
## [369] "TSTM WIND G45"	"NON-SEVERE WIND DAMAGE"
## [371] " FLASH FLOOD"	"LATE SEASON SNOW"
## [373] "NON-TSTM WIND"	"BLOWING DUST"
## [375] "VOLCANIC ASH"	" HIGH SURF ADVISORY"
## [377] "WINTER WEATHER MIX"	"MARINE TSTM WIND"
## [379] "HURRICANE/TYPHOON"	"WINTER WEATHER/MIX"
## [381] "ASTRONOMICAL HIGH TIDE"	"EXTREME COLD/WIND CHILL"
## [383] "HEAVY SURF/HIGH SURF"	"TROPICAL DEPRESSION"
## [385] "LAKE-EFFECT SNOW"	"MARINE HIGH WIND"
## [387] "TSUNAMI"	"STORM SURGE/TIDE"
## [389] "LAKESHORE FLOOD"	"MARINE STRONG WIND"
## [391] "MARINE THUNDERSTORM WIND"	"COLD/WIND CHILL"
## [393] "ASTRONOMICAL LOW TIDE"	"DENSE SMOKE"
## [395] "MARINE HAIL"	"FREEZING FOG"
## [397] "RIP CURRENT"	

The list was consolidated. For an explanation of the consolidation process look up *Appendix A* of this report. After consolidation the groupings are as follows:

```
data3 <- cleanEVTYPE(data3)
unique(data3$EVTYPE)
```

```
## [1] WIND          WATER          LIGHTING       VISIBILITY     WEATHER-COLD
## [6] WEATHER-HOT   AVALANCHE      OTHER          FIRE           LAND
## [11] LIGHTNING
## 11 Levels: AVALANCHE FIRE LAND LIGHTING LIGHTNING OTHER ... WIND
```



From the chart it is clearly visible that the event that costs the most in terms of harmful events to humans are those classified under **WATER**.

The table of the recategorised data is shown hereunder

```
##      EventType      Amount
## 5    LIGHTNING 5.000e+03
## 1    AVALANCHE 8.722e+06
## 6      OTHER 9.412e+06
## 7    VISIBILITY 2.293e+07
## 3      LAND 4.929e+08
## 4    LIGHTING 9.426e+08
## 2      FIRE 8.905e+09
## 10 WEATHER-HOT 1.593e+10
## 9 WEATHER-COLD 2.612e+10
## 11      WIND 1.601e+11
## 8      WATER 2.648e+11
```

Reproducible Research

In line with good data sciences practice the code and data from which this report has been generated are available for download by anyone who would like to verify the data and the algorithms used to get to the answers.

This is available at https://github.com/chribonn/RepData_PeerAssessment2.

Appendix A

Below is a table of how the Event Types were consolidated into a smaller group. When an Event Type matched (partially or fully) a term under *srch* it was replaced by the term under *repl*. Case was ignored.

srch

COASTAL SURGE or MIXED PRECIP or SEICHE or DOWNBURST or WETNESS or STREAM or PRECIPITATION or AVAL

ICE or SNOW or BLIZZARD or FREEZ or FROST or HAIL or HYPOTHERMIA or COLD or LOW TEMPERATURE or DUST or WIND or TYPHOON or TORNADO or HURRICANE or FUNNEL or MICROBURST or GUSTNADO or TOR. FOG or DENSE SMOKE

HEAT or WARM or HOT or DROUGHT

FIRE

LIGHTING or LIGHTNING or TSTM or LIGHTING

MUD or LANDSLIDES or EROSION or ROCK SLIDE or VOLCANIC ASH or LANDSLUMP or LANDSLIDE or TSUNA

HIGH or APACHE COUNTY or DAM BREAK or URBAN or GLAZE or HEAVY MIX or COOL AND WET or ?
