

# ElectionAnalysis

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## Read In Files and Clean

```
votes = read.csv("C:/Users/onest/desktop/2012-and-2016-presidential-elections/votes.csv", header=T)

religion = read.csv("C:/Users/onest/desktop/2012-and-2016-presidential-elections/religion.csv", header=T)
religions = religion[,c(1,43,44,45,46,47,48,49,50,51,52,53,54,55)]
colnames(religions) = c("FIPS", "Total_Pop", "Evangelical", "Protestant", "Historically_Black", "Cathol

votes = merge(x=votes,y=religions,by="FIPS", all.x=T)
```

## Exploratory Analaysis - Maps

### Basics

```
colnames(votes)
```

```
## [1] "FIPS"                 "X.1"                  "X"
## [4] "combined_fips"        "votes_dem_2016"      "votes_gop_2016"
## [7] "total_votes_2016"     "Clinton"              "Trump"
## [10] "diff_2016"            "per_point_diff_2016" "state_abbr"
## [13] "county_name"          "total_votes_2012"    "votes_dem_2012"
## [16] "votes_gop_2012"        "county_fips"         "state_fips"
## [19] "Obama"                "Romney"               "diff_2012"
## [22] "per_point_diff_2012"  "fips"                 "area_name"
## [25] "state_abbreviation"   "population2014"     "population2010"
## [28] "population_change"    "POP010210"          "AGE135214"
## [31] "AGE295214"            "age65plus"           "SEX255214"
## [34] "White"                "Black"                "RHI325214"
## [37] "RHI425214"            "RHI525214"          "RHI625214"
## [40] "Hispanic"              "RHI825214"          "POP715213"
## [43] "POP645213"             "NonEnglish"          "Edu_highschool"
## [46] "Edu_batchelors"        "VET605213"          "LFE305213"
## [49] "HSG010214"             "HSG445213"          "HSG096213"
## [52] "HSG495213"             "HSD410213"          "HSD310213"
## [55] "Income"                "INC110213"           "Poverty"
## [58] "BZA010213"              "BZA110213"           "BZA115213"
## [61] "NES010213"              "SB0001207"           "SB0315207"
```

```

## [64] "SB0115207"          "SB0215207"          "SB0515207"
## [67] "SB0415207"          "SB0015207"          "MAN450207"
## [70] "WTN220207"           "RTN130207"          "RTN131207"
## [73] "AFN120207"           "BPS030214"          "LND110210"
## [76] "Density"              "Clinton_Obama"       "Trump_Romney"
## [79] "Trump_Prediction"     "Clinton_Prediction" "Trump_Deviation"
## [82] "Clinton_Deviation"    "Total_Pop"           "Evangelical"
## [85] "Protestant"            "Historically_Black" "Catholic"
## [88] "Jewish"                "Mormon"               "Islamic"
## [91] "Hindu"                 "Buddhist"             "Orthodox"
## [94] "Jehovas_Witnesses"    "Other_Religion"

```

## Vote Share Plots

```

library("choroplethr")

## Warning: package 'choroplethr' was built under R version 3.3.3
## Loading required package: acs
## Warning: package 'acs' was built under R version 3.3.3
## Loading required package: stringr
## Loading required package: plyr
## Warning: package 'plyr' was built under R version 3.3.3
## Loading required package: XML
## Warning: package 'XML' was built under R version 3.3.3
##
## Attaching package: 'acs'
## The following object is masked from 'package:base':
## 
##      apply
library("choroplethrMaps")

## Warning: package 'choroplethrMaps' was built under R version 3.3.3
library("ggplot2")

## Warning: package 'ggplot2' was built under R version 3.3.3
#Explore total votes per county
total_votes = votes[,c(1,7)]
colnames(total_votes) = c('region','value')

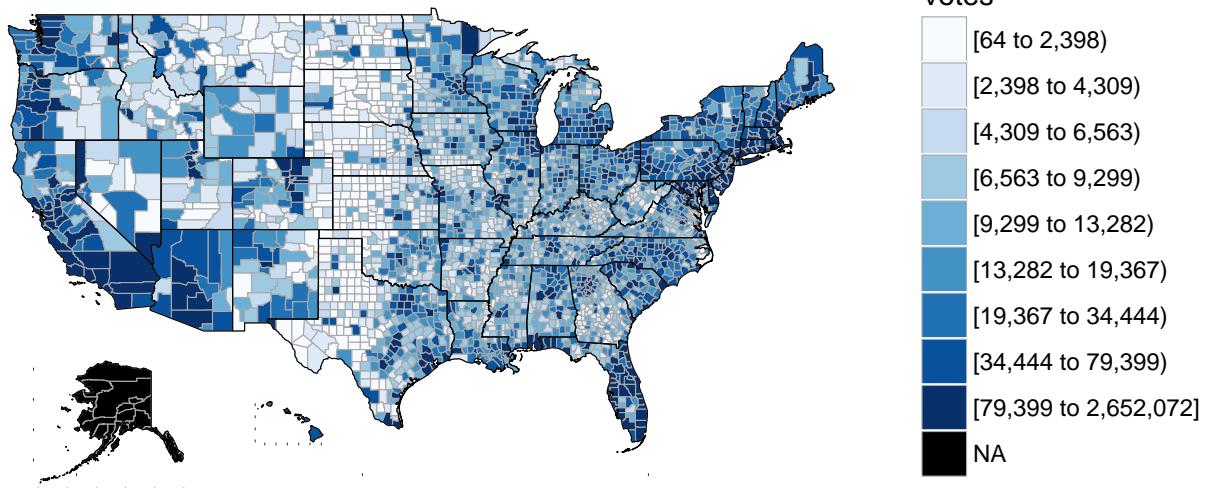
vote_count = county_choropleth(total_votes,
                               legend = "Votes",
                               num_colors = 9,
                               title = "Vote Count by County")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275

```

```
vote_count
```

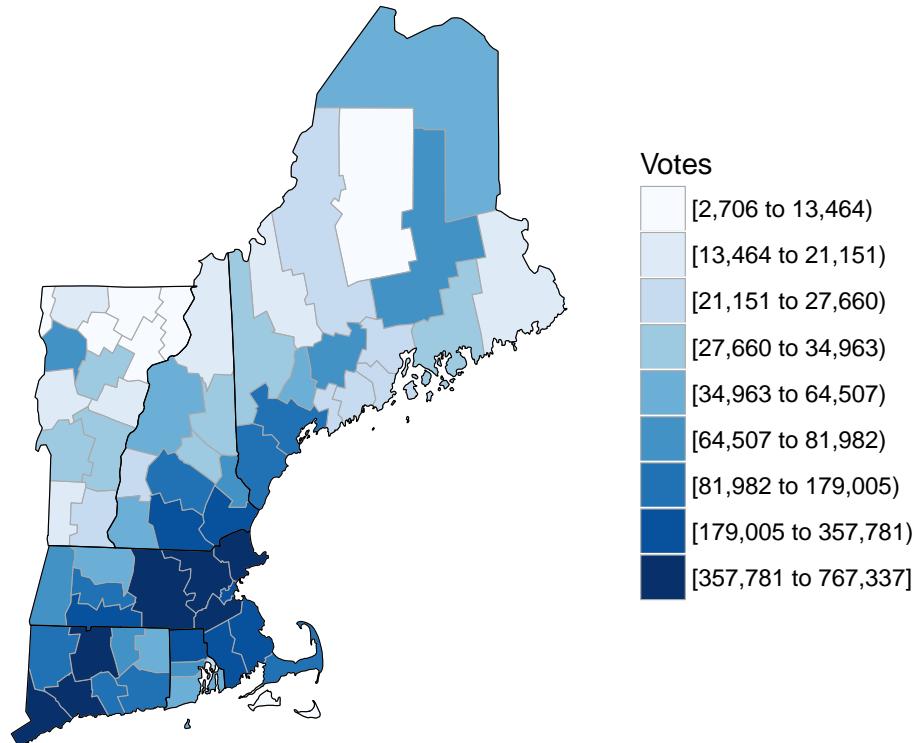
## Vote Count by County



```
#Break down county vote into regions of the US for easier viewing
```

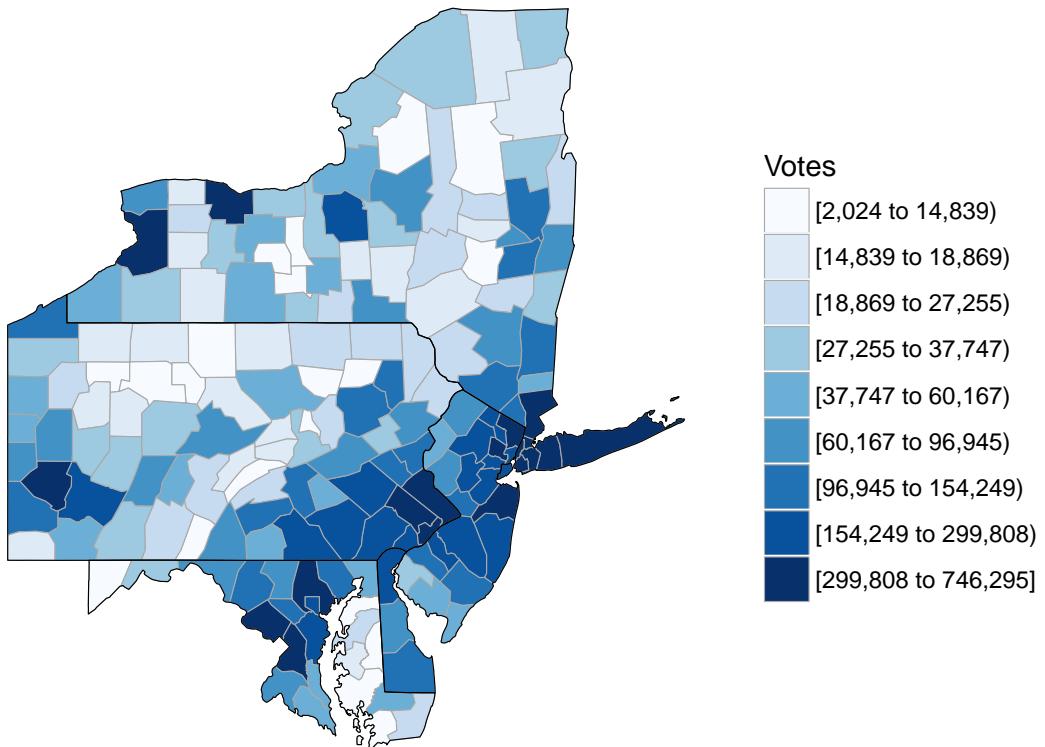
```
##New England Region
vote_count_NE = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - New England",
                                    state_zoom = c("maine", "new hampshire", "vermont", "massachusetts", "connecticut"))
vote_count_NE
```

## Vote Count by County – New England



```
##Mid-Atlantic Region
vote_count_MA = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - Mid-Atlantic",
                                    state_zoom = c("new york", "pennsylvania", "new jersey", "maryland", "delaware")
vote_count_MA
```

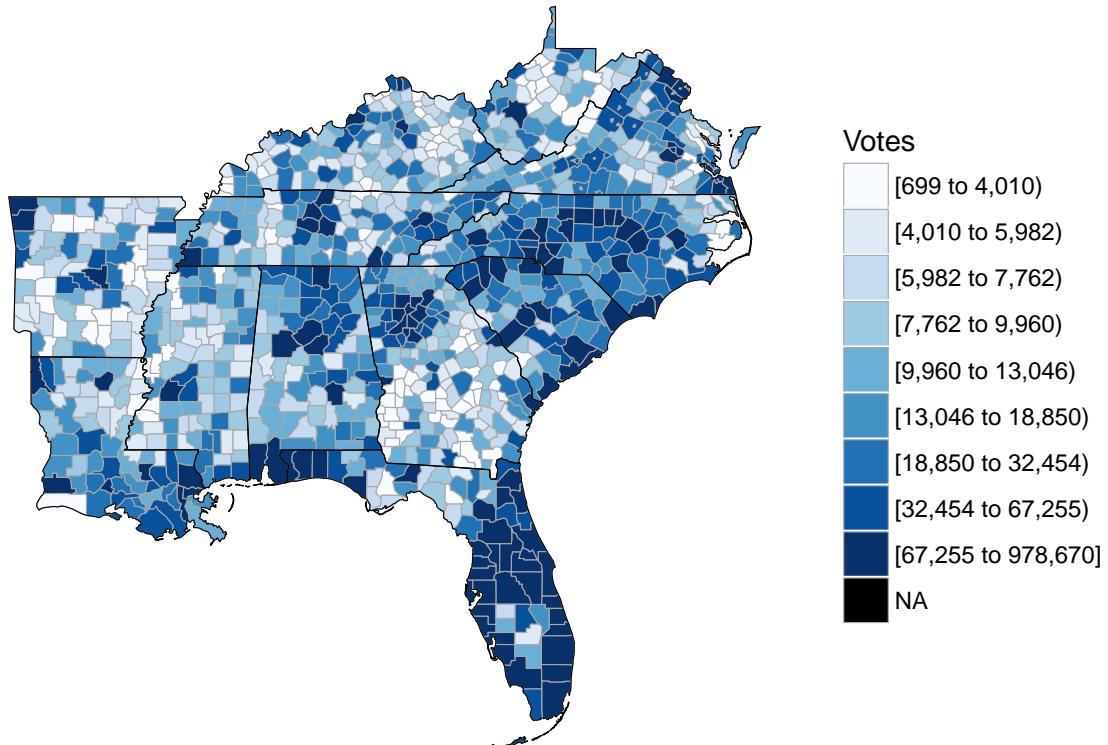
## Vote Count by County – Mid-Atlantic



```
##South East Region
vote_count_SE = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - South East",
                                    state_zoom = c("west virginia","virginia","tennessee","kentucky","north carolina"))

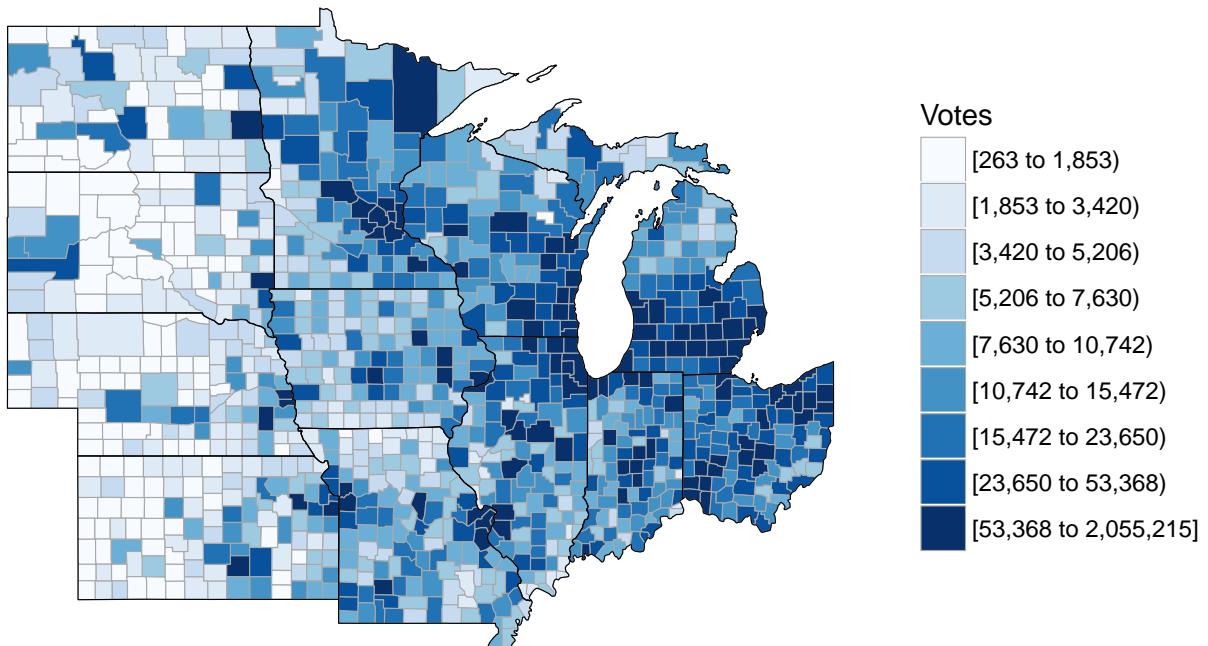
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
vote_count_SE
```

## Vote Count by County – South East



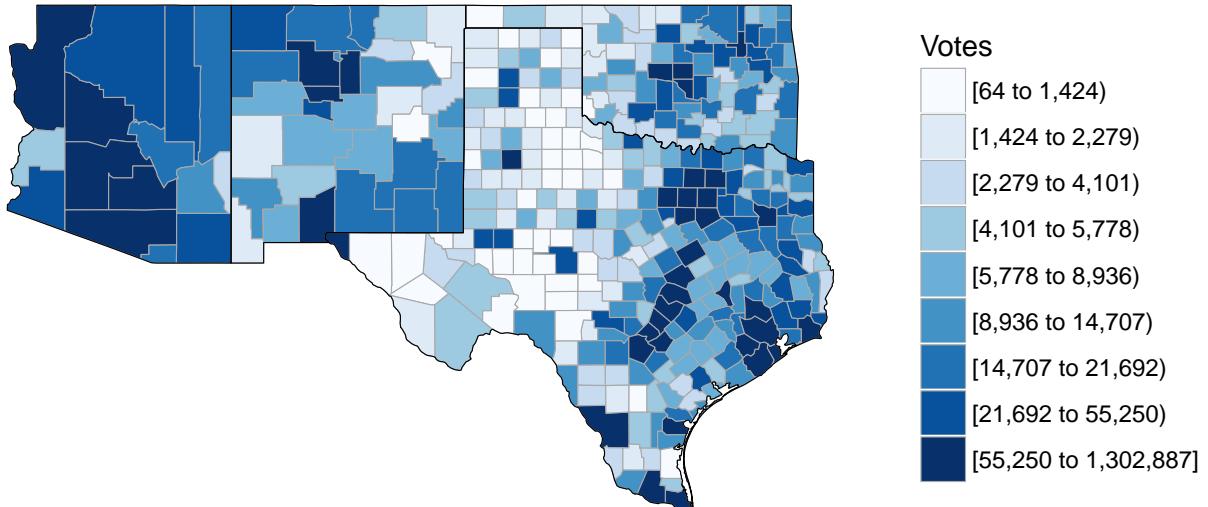
```
##Mid West Region
vote_count_MW = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - Mid-West",
                                    state_zoom = c("ohio","michigan","indiana","illinois","wisconsin","minne
vote_count_MW
```

## Vote Count by County – Mid-West



```
##South West Region
vote_count_SW = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - South West",
                                    state_zoom = c("texas", "oklahoma", "new mexico", "arizona"))
vote_count_SW
```

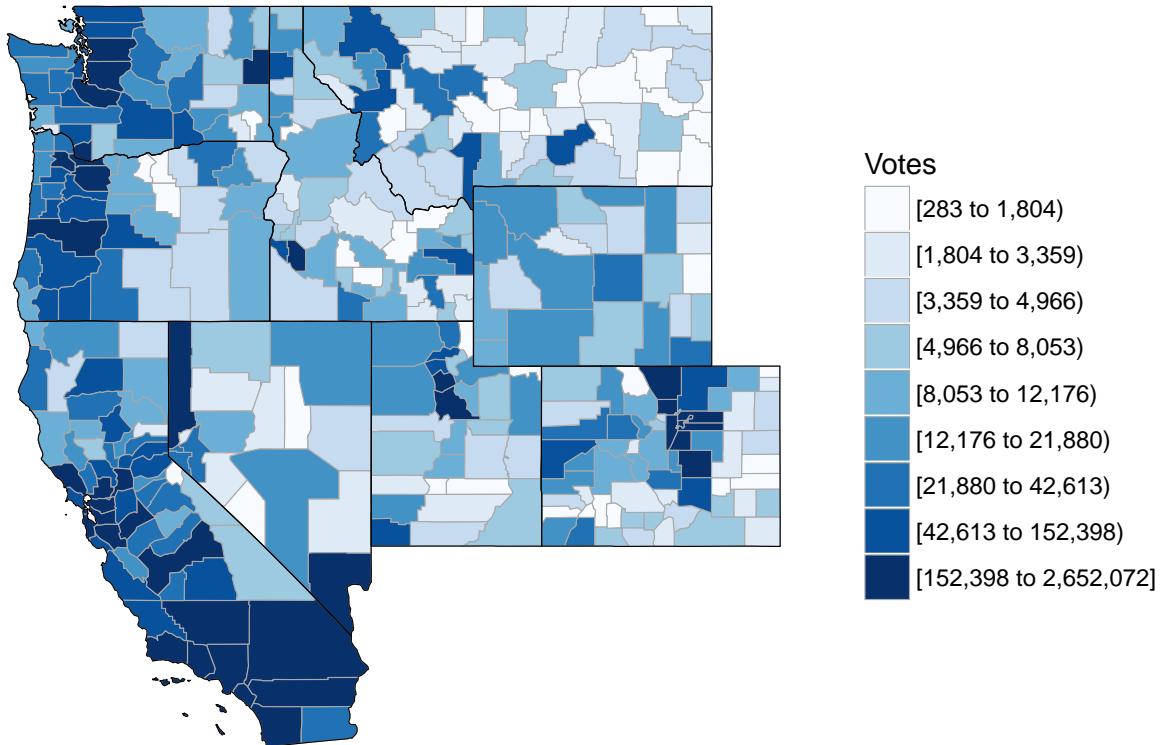
## Vote Count by County – South West



```
##West Region
vote_count_W = county_choropleth(total_votes,
                                    legend = "Votes",
                                    num_colors = 9,
                                    title = "Vote Count by County - West",
                                    state_zoom = c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "colorado", "wyoming", "montana", "idaho", "utah", "nevada", "colorado", "wyoming", "montana", "idaho", "utah", "nevada"))

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
vote_count_W
```

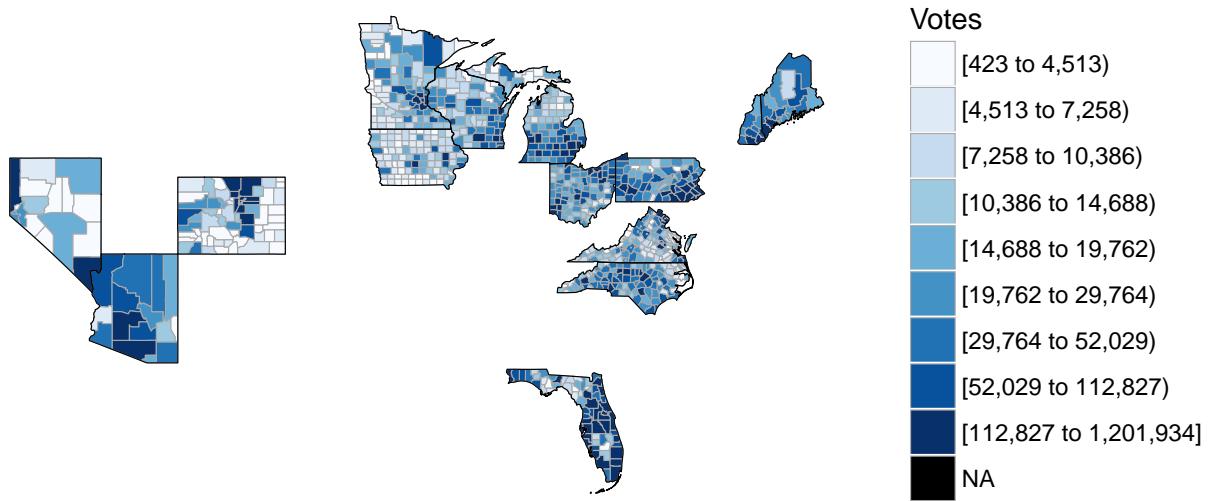
## Vote Count by County – West



```
#Explore Vote Count by Swing States
vote_count_swing = county_choropleth(total_votes,
                                      legend = "Votes",
                                      num_colors = 9,
                                      title = "Vote Count by County - Swing States",
                                      state_zoom = c("new hampshire","pennsylvania","ohio","michigan","no"))

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
vote_count_swing
```

## Vote Count by County – Swing States



### Obama to Clinton (2012 to 2016 Change)

```

votes$change_dem_votes = votes$votes_dem_2016 - votes$votes_dem_2012

dem_votes = votes[,c(1,96)]
dem_votes[,3] = NA
colnames(dem_votes) = c('region','votes','value')

for(i in seq(1:dim(dem_votes)[1])){
  if(dem_votes[i,2] > 0 && dem_votes[i,2] < 1000){
    dem_votes[i,3] = "Gain - Small"
  } else if(dem_votes[i,2] > 1000 && dem_votes[i,2] < 10000){
    dem_votes[i,3] = "Gain - Considerable"
  } else if(dem_votes[i,2] >= 10000){
    dem_votes[i,3] = "Gain - Large"
  } else if(dem_votes[i,2] < 0 && dem_votes[i,2] > -1000) {
    dem_votes[i,3] = "Loss - Small"
  } else if(dem_votes[i,2] < -1000 && dem_votes[i,2] > -10000){
    dem_votes[i,3] = "Loss - Considerable"
  } else if(dem_votes[i,2] < -10000){
    dem_votes[i,3] = "Loss - Large"
  } else{
    dem_votes[i,3] = "Equal"
  }
}

```

```

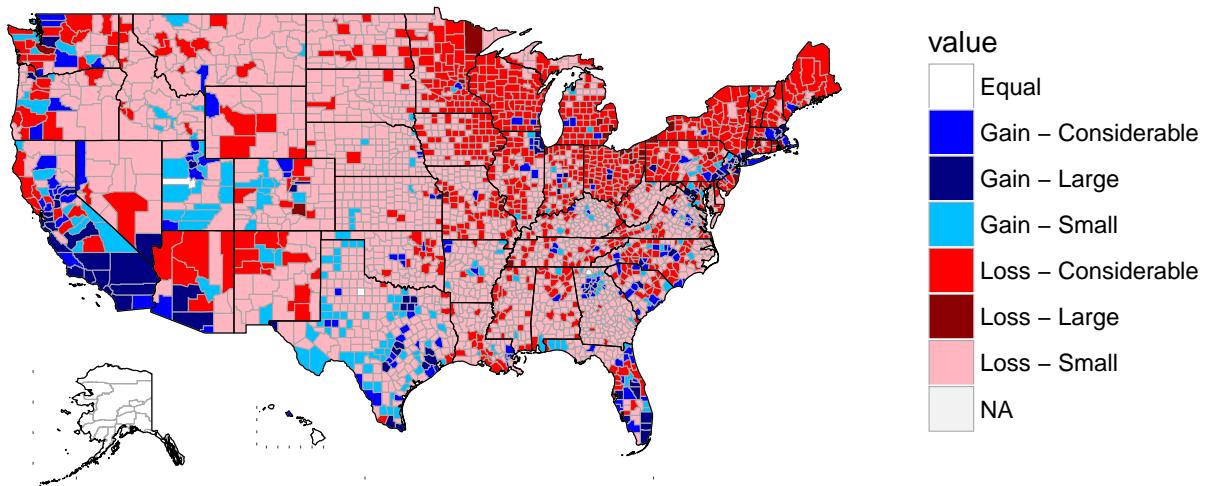
}

c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton where Blue Represents better Clinton Performance"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white", "blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
dem_change_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
dem_change_US

```

## Change from Obama to Clinton where Blue Represents better Clinton Performance



```
#Break down county vote into regions of the US for easier viewing
```

```

##New England Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - New England"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))

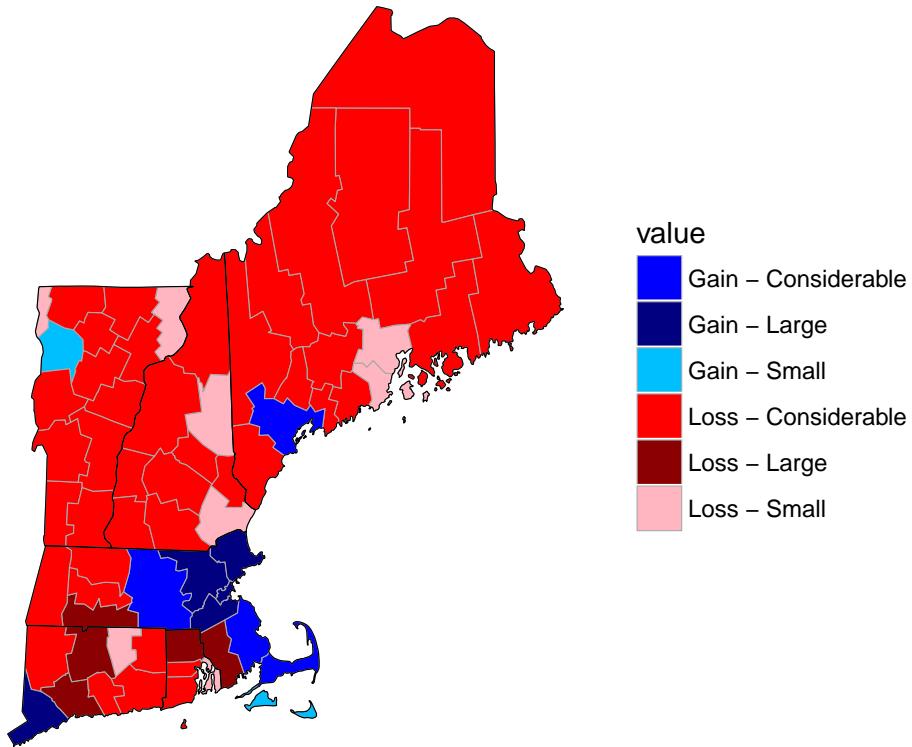
```

```

c$set_zoom(c("maine", "new hampshire", "vermont", "massachusetts", "connecticut", "rhode island"))
dem_change_NE = c$render() +
  theme(legend.position = "right")
dem_change_NE

```

Change from Obama to Clinton (Blue = Better Clinton) – New England

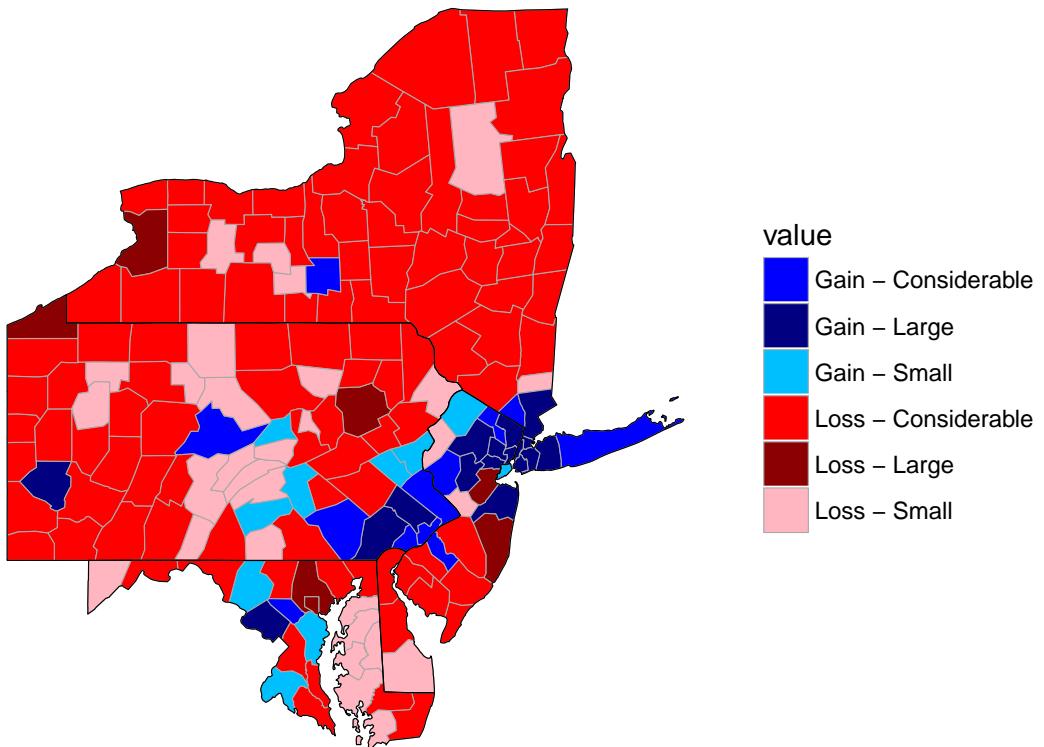


```

##Mid-Atlantic Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Mid-Atlantic"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("new york", "pennsylvania", "new jersey", "maryland", "delaware"))
dem_change_MA = c$render() +
  theme(legend.position = "right")
dem_change_MA

```

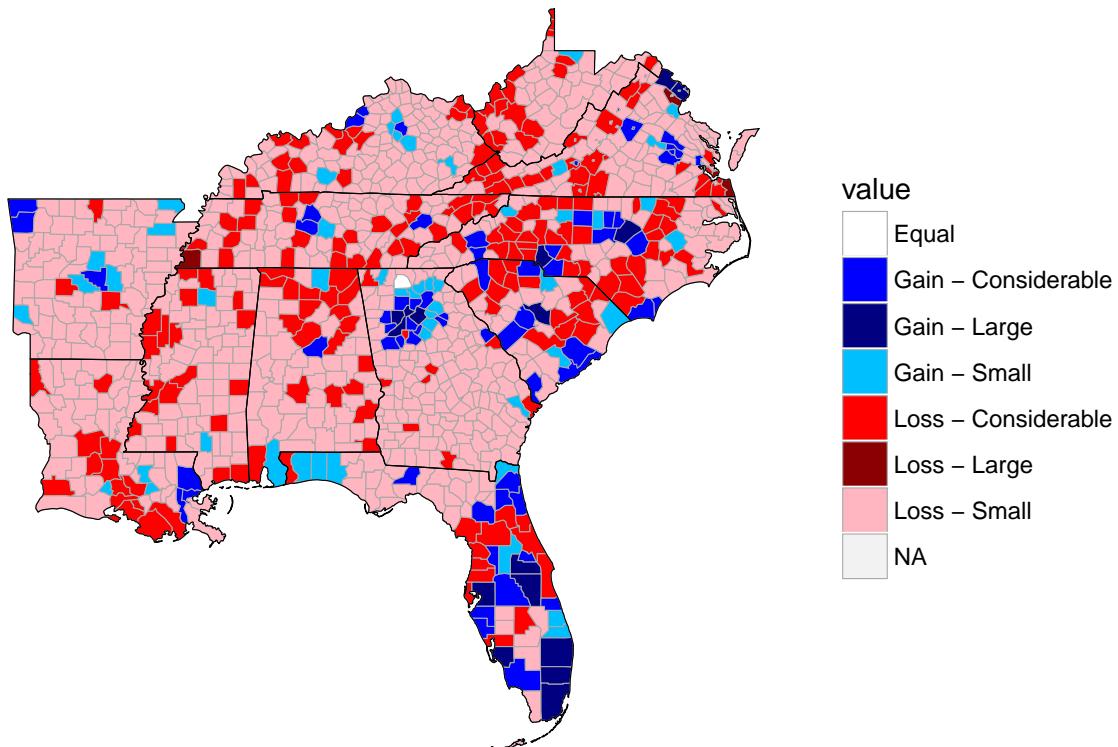
## Change from Obama to Clinton (Blue = Better Clinton) – Mid-Atlantic



```
##South East Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - South East"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white","blue","navy","deepskyblue","red","darkred","lightred"))
c$set_zoom(c("west virginia","virginia","tennessee","kentucky","north carolina","south carolina","georgia"))
dem_change_SE = c$render() +
  theme(legend.position = "right")

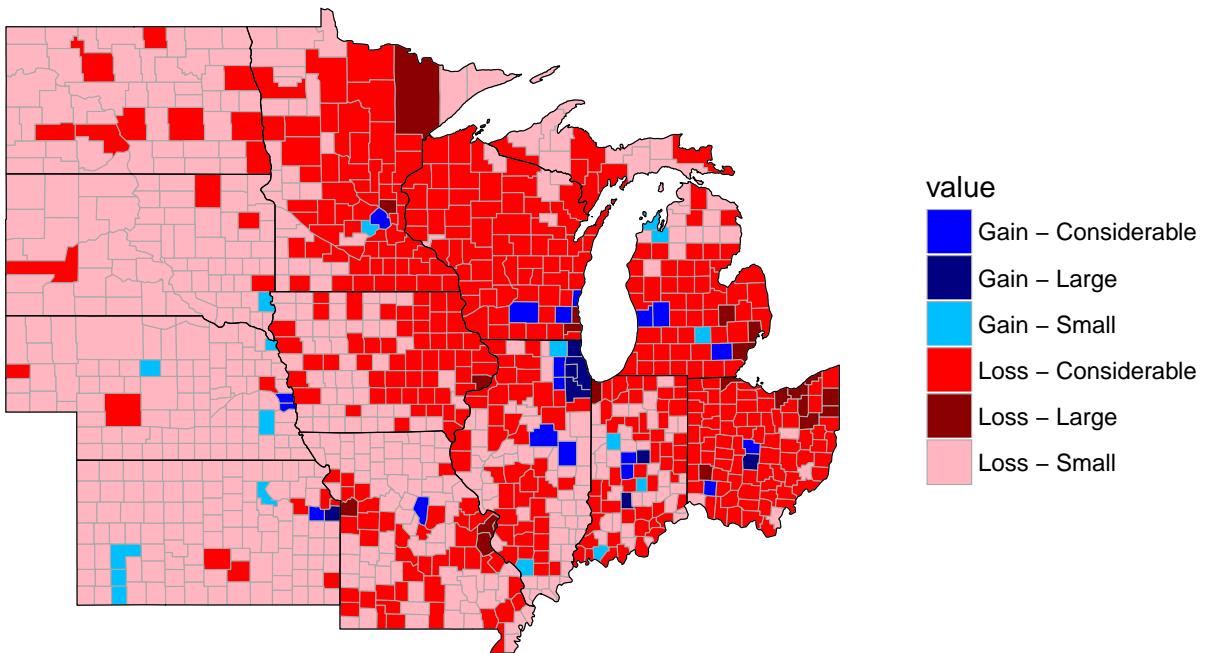
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
dem_change_SE
```

## Change from Obama to Clinton (Blue = Better Clinton) – South East



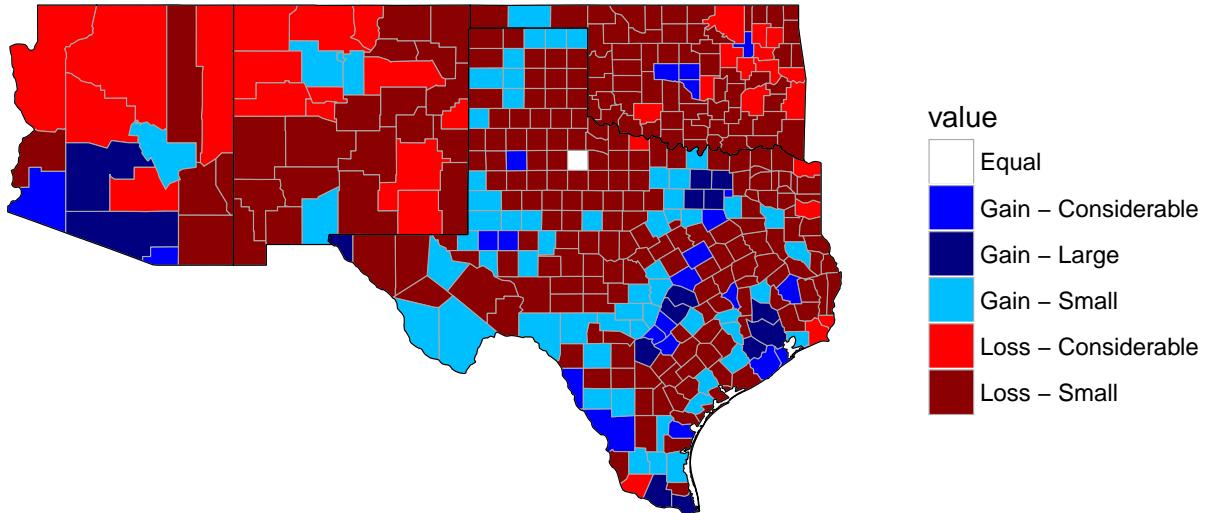
```
##Mid West Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Mid West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue","navy","deepskyblue","red","darkred","lightpink"))
c$set_zoom(c("ohio","michigan","indiana","illinois","wisconsin","minnesota","iowa","missouri","north dakota"))
dem_change_MW = c$render() +
  theme(legend.position = "right")
dem_change_MW
```

## Change from Obama to Clinton (Blue = Better Clinton) – Mid West



```
##South West Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - South West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white","blue","navy","deepskyblue","red","darkred","lightgrey"))
c$set_zoom(c("texas","oklahoma","new mexico","arizona"))
dem_change_SW = c$render() +
  theme(legend.position = "right")
dem_change_SW
```

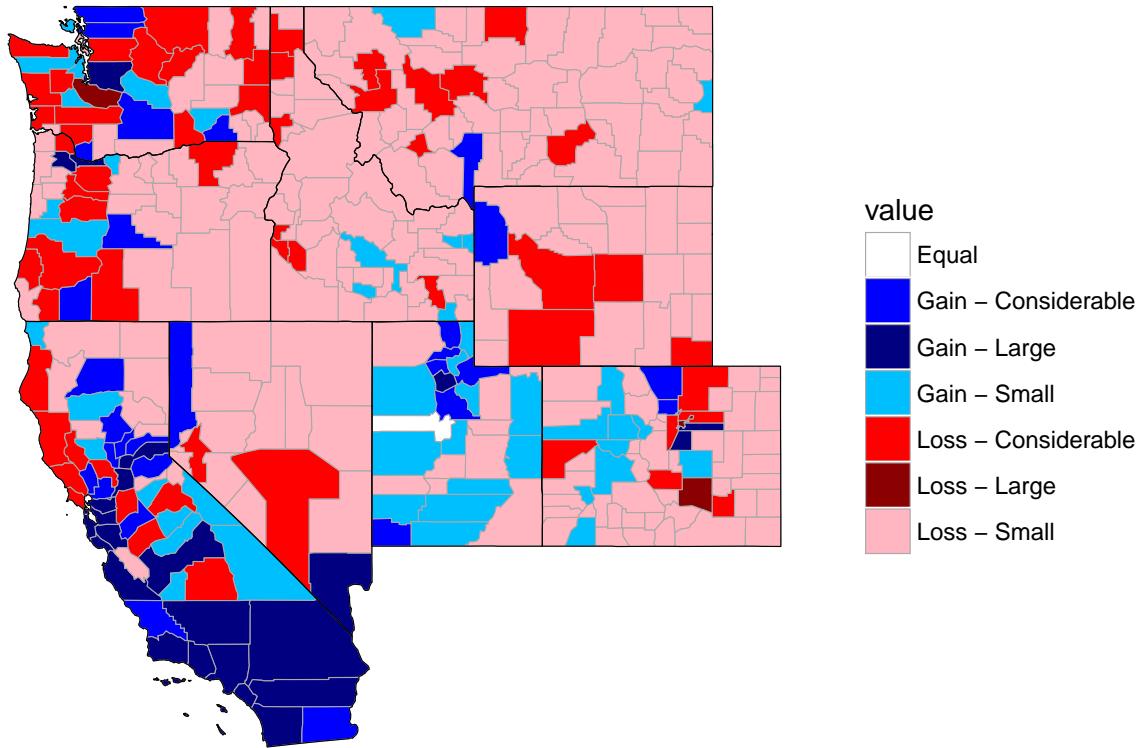
## Change from Obama to Clinton (Blue = Better Clinton) – South West



```
##West Region
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white", "blue", "navy", "deepskyblue", "red", "darkred", "lightblue"))
c$set_zoom(c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "california", "oregon", "washington",
dem_change_W = c$render() +
    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
dem_change_W
```

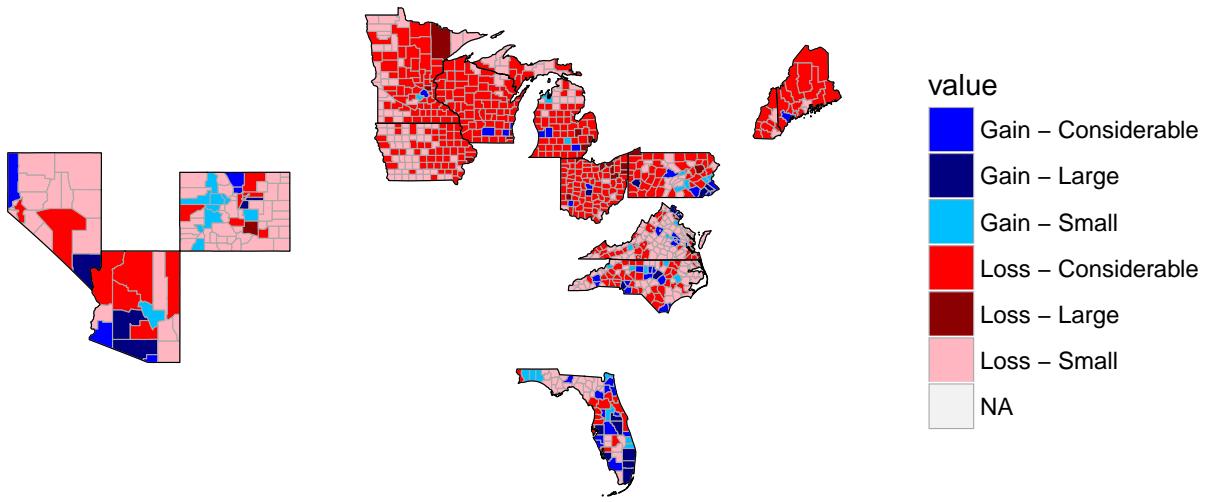
## Change from Obama to Clinton (Blue = Better Clinton) – West



```
#Explore Vote Count by Swing States
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Swing States"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue","navy","deepskyblue","red","darkred","lightpink"))
c$set_zoom(c("new hampshire","pennsylvania","ohio","michigan","north carolina","florida","arizona","iowa"))
dem_change_swing = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
dem_change_swing
```

## Change from Obama to Clinton (Blue = Better Clinton) – Swing States



## Romney to Trump (2012 to 2016 Change)

```

votes$change_rep_votes = votes$votes_gop_2016 - votes$votes_gop_2012

rep_votes = votes[,c(1,97)]
rep_votes[,3] = NA
colnames(rep_votes) = c('region','votes','value')

for(i in seq(1:dim(rep_votes)[1])){
  if(rep_votes[i,2] > 0 && rep_votes[i,2] < 1000){
    rep_votes[i,3] = "Gain - Small"
  } else if(rep_votes[i,2] > 1000 && rep_votes[i,2] < 10000){
    rep_votes[i,3] = "Gain - Considerable"
  } else if(rep_votes[i,2] >= 10000){
    rep_votes[i,3] = "Gain - Large"
  } else if(rep_votes[i,2] < 0 && rep_votes[i,2] > -1000) {
    rep_votes[i,3] = "Loss - Small"
  } else if(rep_votes[i,2] < -1000 && rep_votes[i,2] > -10000){
    rep_votes[i,3] = "Loss - Considerable"
  } else if(rep_votes[i,2] < -10000){
    rep_votes[i,3] = "Loss - Large"
  } else{
    rep_votes[i,3] = "Equal"
  }
}

```

```

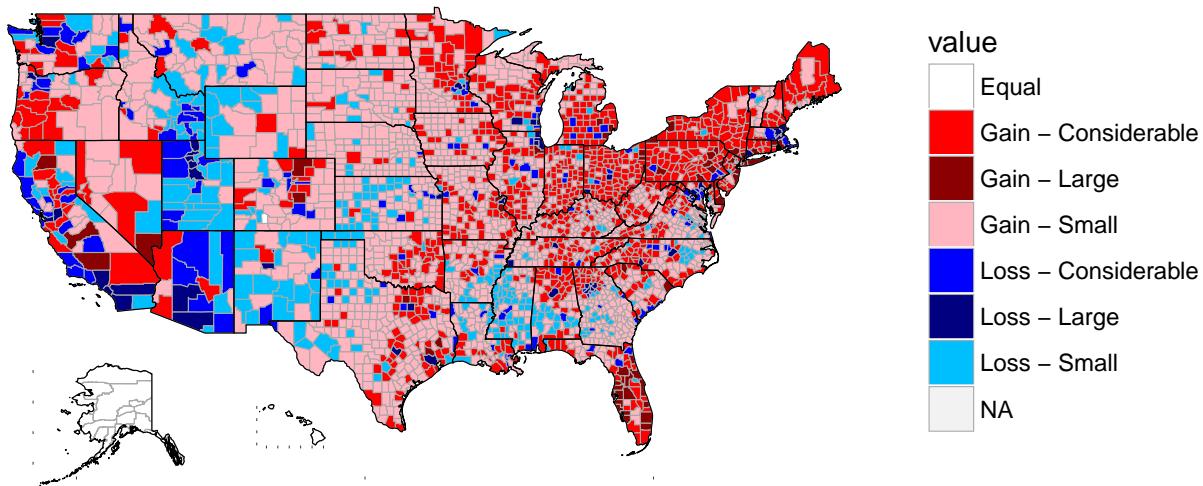
}

c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump where Red Represents better Trump Performance"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white","red","darkred","lightpink","blue","navy","deepskyblue"))
rep_change_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
rep_change_US

```

## Change from Romney to Trump where Red Represents better Trump Performance



```
#Break down county vote into regions of the US for easier viewing
```

```

##New England Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - New England"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red","darkred","lightpink","blue","navy","deepskyblue"))

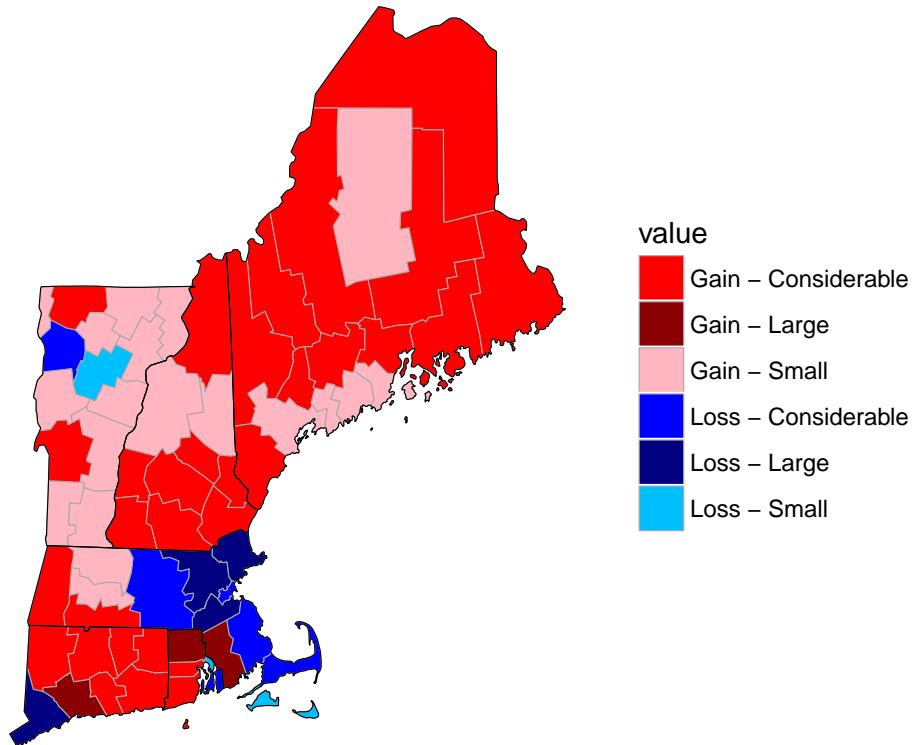
```

```

c$set_zoom(c("maine", "new hampshire", "vermont", "massachusetts", "connecticut", "rhode island"))
rep_change_NE = c$render() +
  theme(legend.position = "right")
rep_change_NE

```

Change from Romney to Trump (Red = Better Trump) – New England

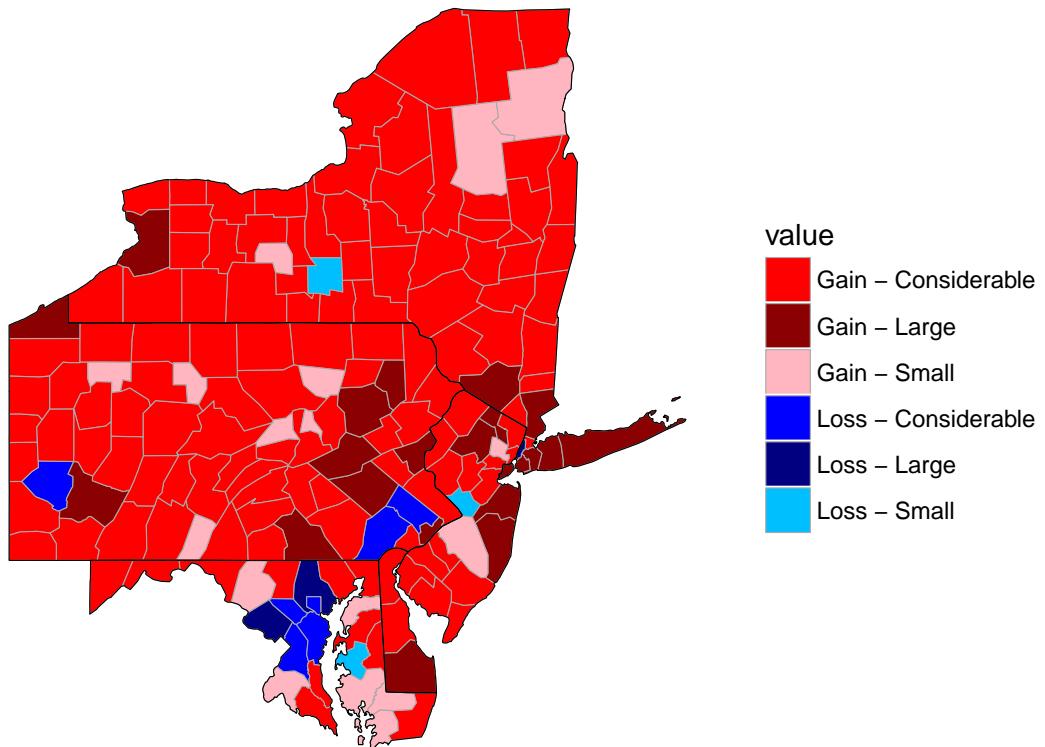


```

##Mid-Atlantic Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) – Mid-Atlantic"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red", "darkred", "lightpink", "blue", "navy", "deepskyblue"))
c$set_zoom(c("new york", "pennsylvania", "new jersey", "maryland", "delaware"))
rep_change_MA = c$render() +
  theme(legend.position = "right")
rep_change_MA

```

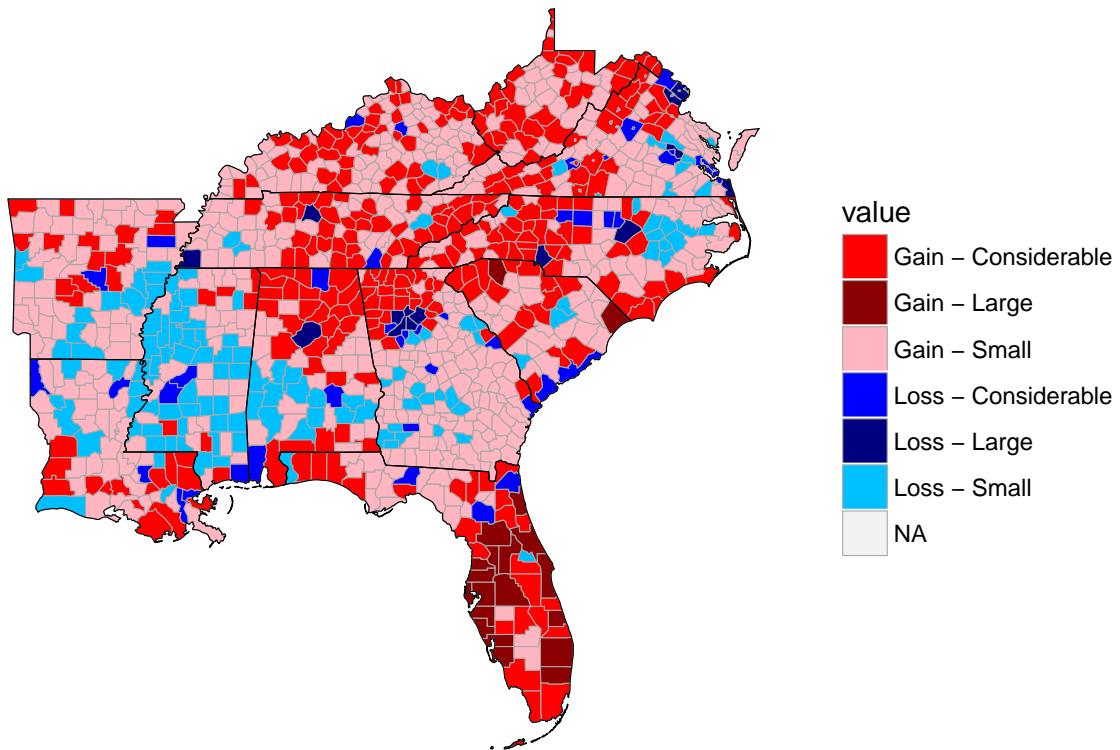
## Change from Romney to Trump (Red = Better Trump) – Mid-Atlantic



```
##South East Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - South East"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red","darkred","lightpink","blue","navy","deepskyblue"))
c$set_zoom(c("west virginia","virginia","tennessee","kentucky","north carolina","south carolina","georg
rep_change_SE = c$render() +
  theme(legend.position = "right")

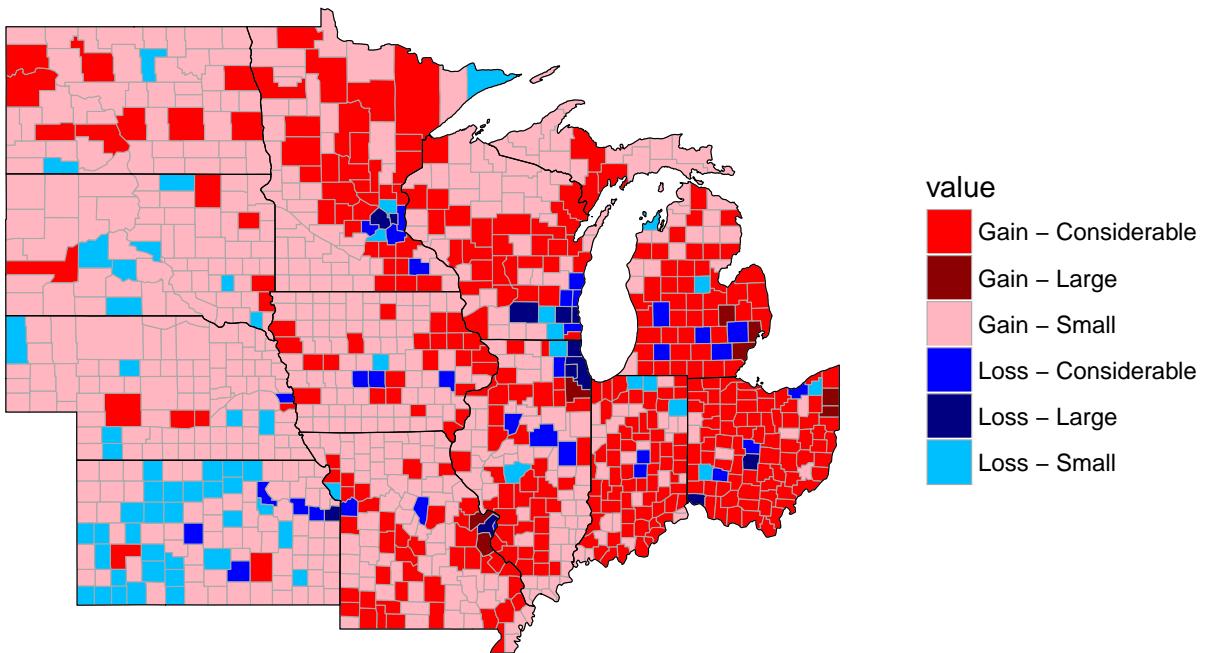
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
rep_change_SE
```

## Change from Romney to Trump (Red = Better Trump) – South East



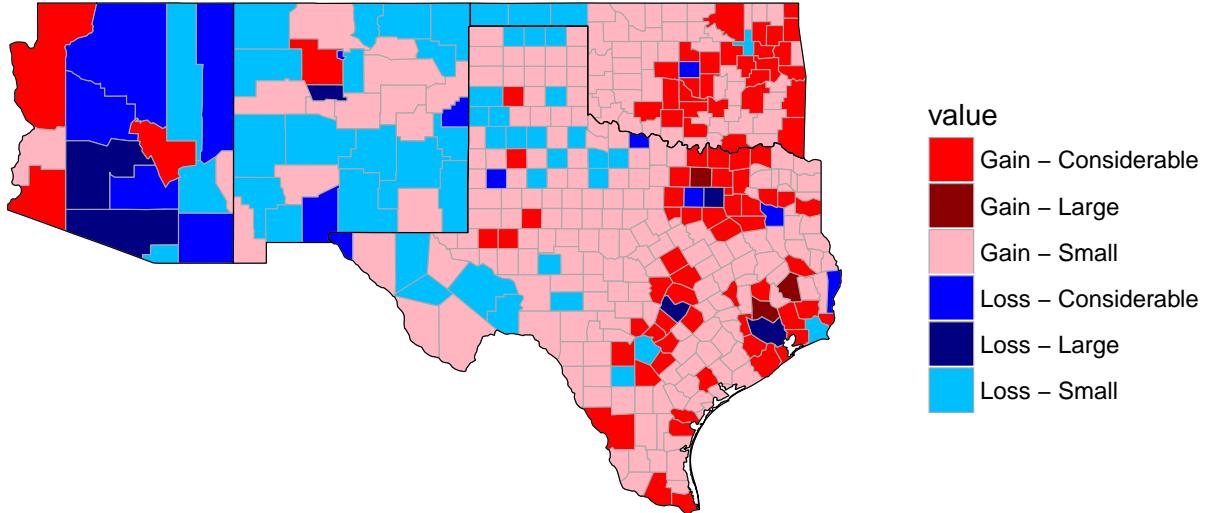
```
##Mid West Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - Mid West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red","darkred","lightpink","blue","navy","deepskyblue"))
c$set_zoom(c("ohio","michigan","indiana","illinois","wisconsin","minnesota","iowa","missouri","north dakota"))
rep_change_MW = c$render() +
  theme(legend.position = "right")
rep_change_MW
```

## Change from Romney to Trump (Red = Better Trump) – Mid West



```
##South West Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - South West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red","darkred","lightpink","blue","navy","deepskyblue"))
c$set_zoom(c("texas","oklahoma","new mexico","arizona"))
rep_change_SW = c$render() +
  theme(legend.position = "right")
rep_change_SW
```

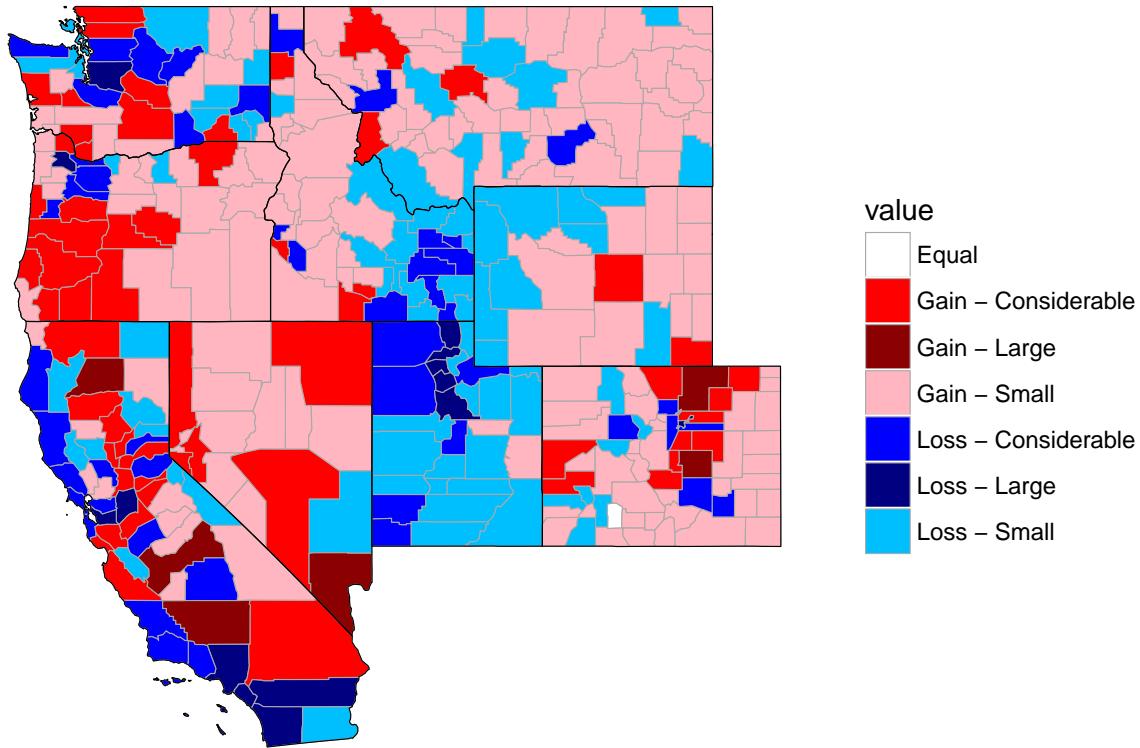
## Change from Romney to Trump (Red = Better Trump) – South West



```
##West Region
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white", "red", "darkred", "lightpink", "blue", "navy", "deepskyblue"))
c$set_zoom(c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "california", "oregon", "washington",
rep_change_W = c$render() +
    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
rep_change_W
```

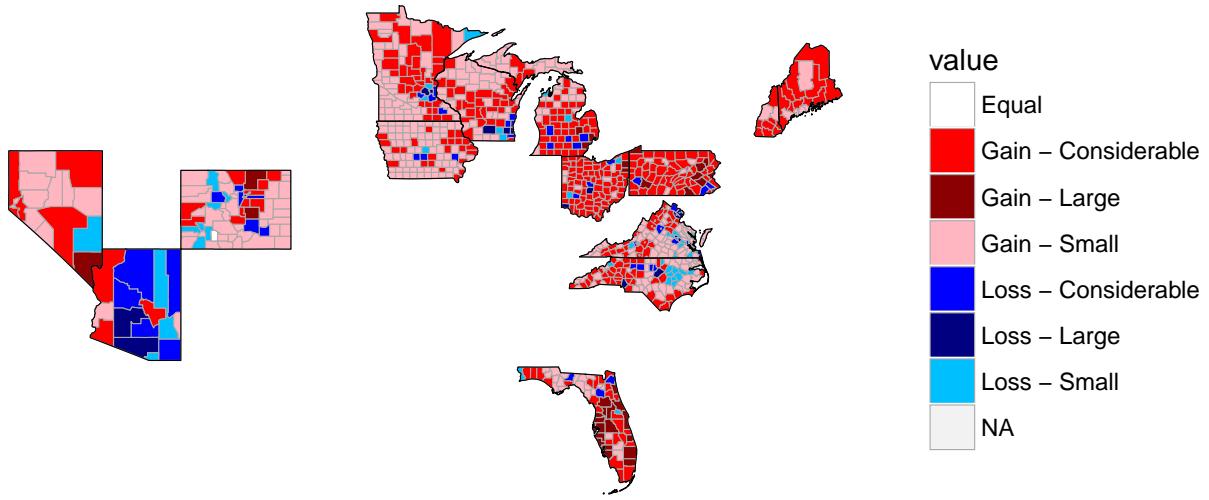
## Change from Romney to Trump (Red = Better Trump) – West



```
#Explore Vote Count by Swing States
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - Swing States"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("white","red","darkred","lightpink","blue","navy","deepskyblue"))
c$set_zoom(c("new hampshire","pennsylvania","ohio","michigan","north carolina","florida","arizona","iowa"))
rep_change_swing = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
rep_change_swing
```

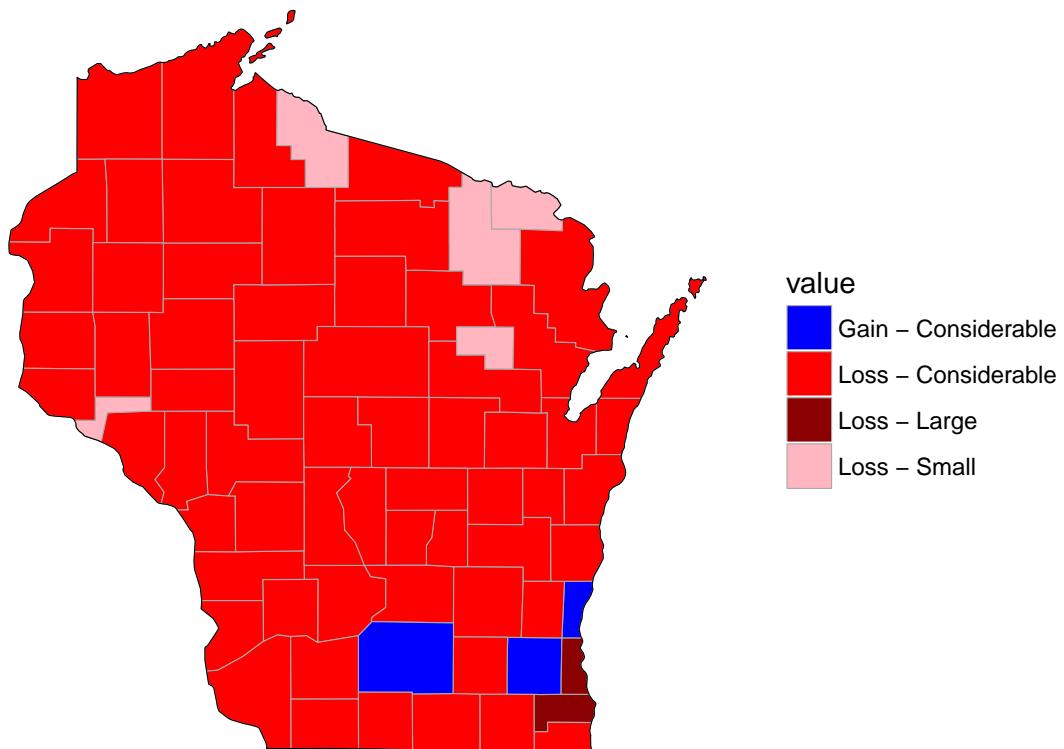
## Change from Romney to Trump (Red = Better Trump) – Swing States



### Examine Wisconsin

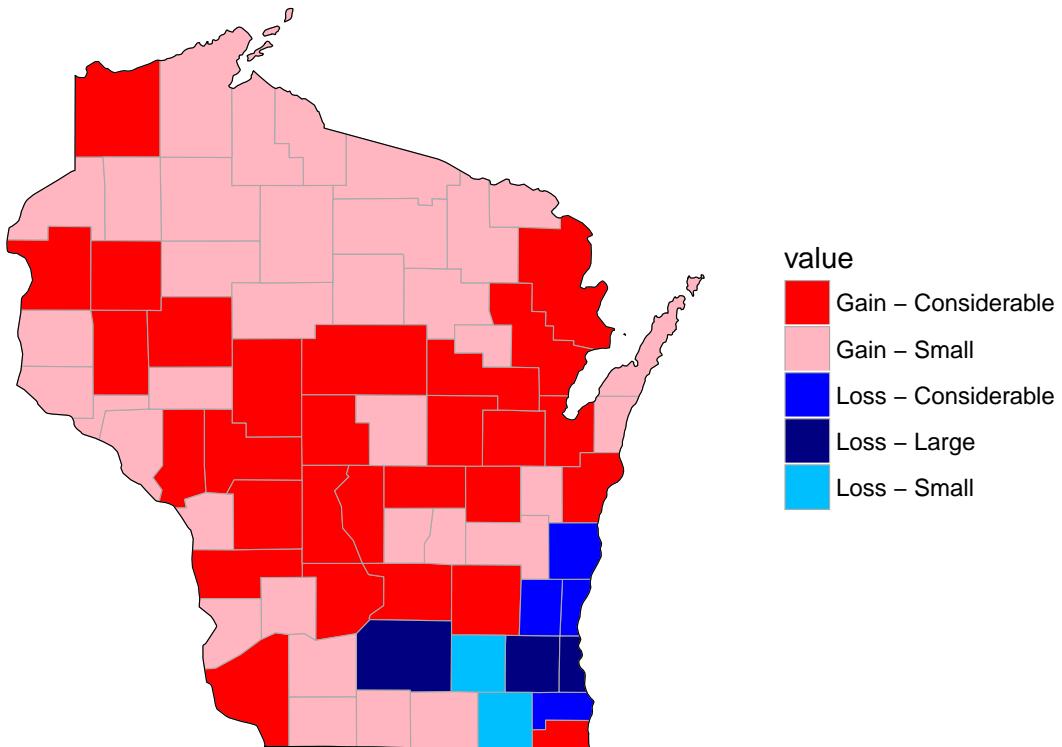
```
#Clinton
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Wisconsin"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(4)
c$ggplot_scale = scale_fill_manual(values = c("blue","red","darkred","lightpink"))
c$set_zoom("wisconsin")
dem_change_WI = c$render() +
  theme(legend.position = "right")
dem_change_WI
```

## Change from Obama to Clinton (Blue = Better Clinton) – Wisconsin



```
#Trump
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) – Wisconsin"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("red","lightpink","blue","navy","deepskyblue"))
c$set_zoom("wisconsin")
rep_change_WI = c$render() +
  theme(legend.position = "right")
rep_change_WI
```

## Change from Romney to Trump (Red = Better Trump) – Wisconsin

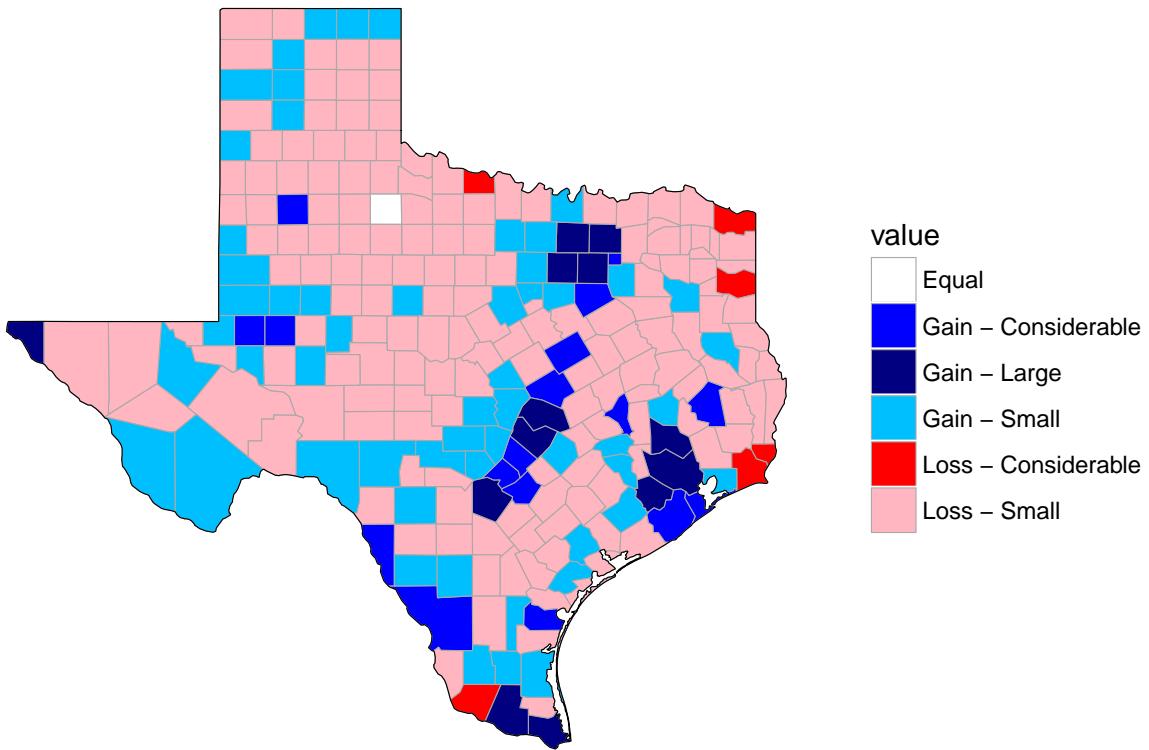


#Appear to be more significant losses for Clinton than gains for Trump

### Examine Texas

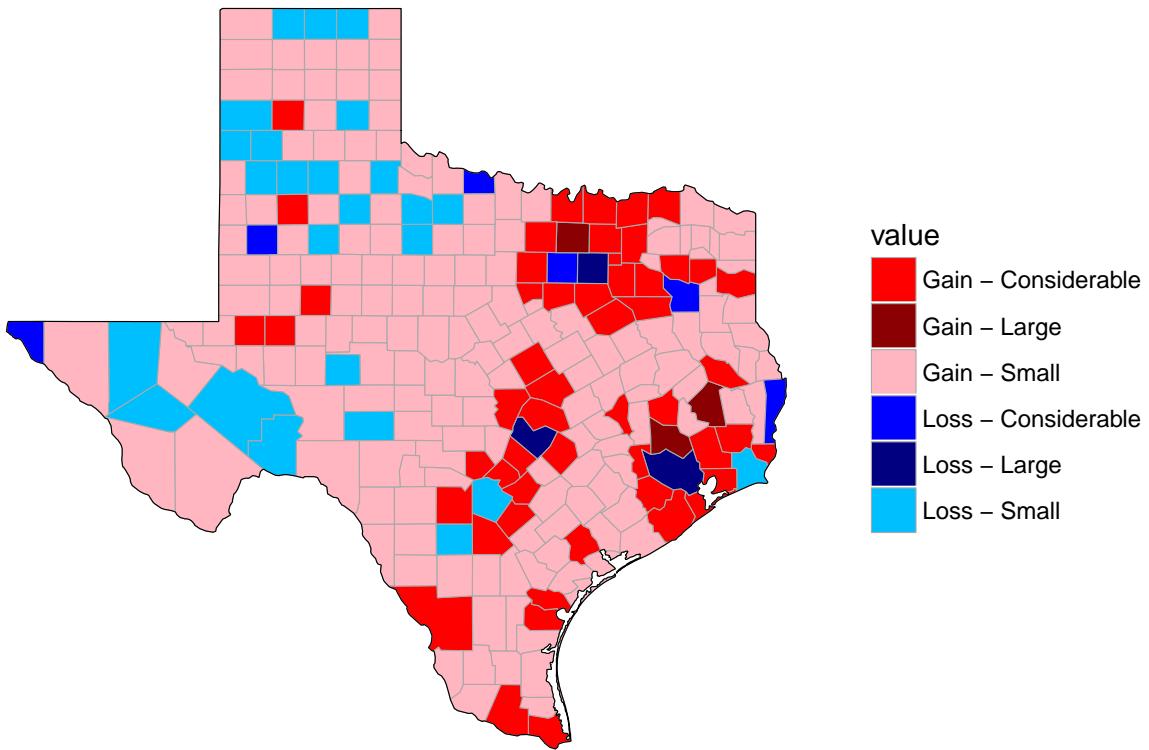
```
#Clinton
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Texas"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("white","blue","navy","deepskyblue","red","lightpink"))
c$set_zoom("texas")
dem_change_TX = c$render() +
  theme(legend.position = "right")
dem_change_TX
```

## Change from Obama to Clinton (Blue = Better Clinton) – Texas



```
#Trump
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) – Texas"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("red","darkred", "lightpink","blue","navy","deepskyblue"))
c$set_zoom("texas")
rep_change_TX = c$render() +
  theme(legend.position = "right")
rep_change_TX
```

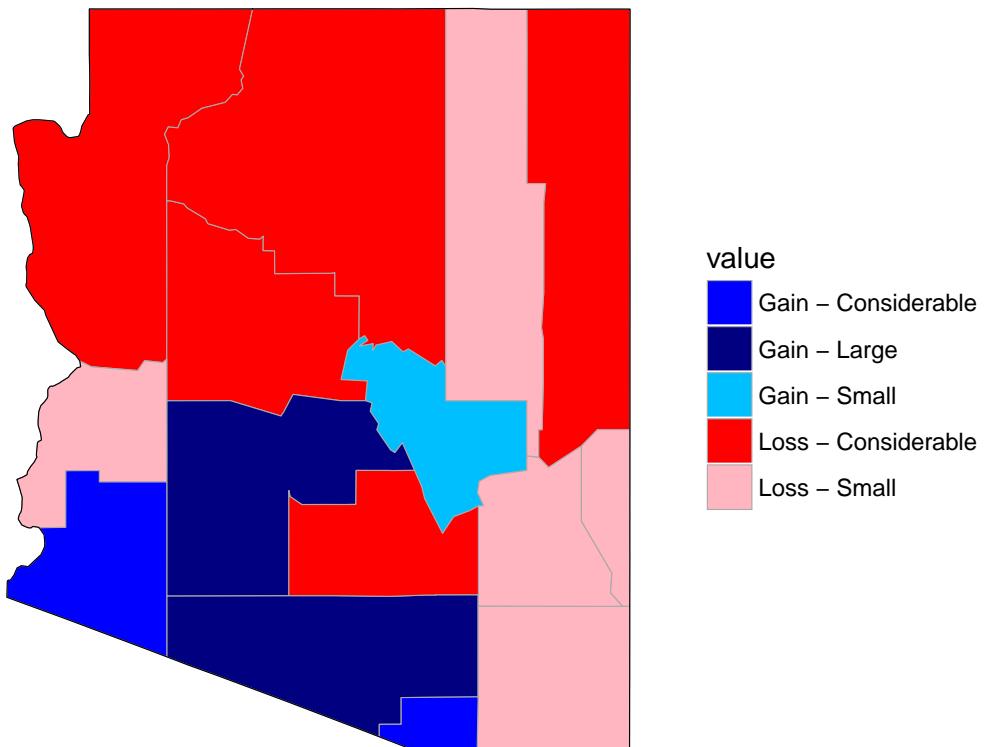
## Change from Romney to Trump (Red = Better Trump) – Texas



### Examine Arizona

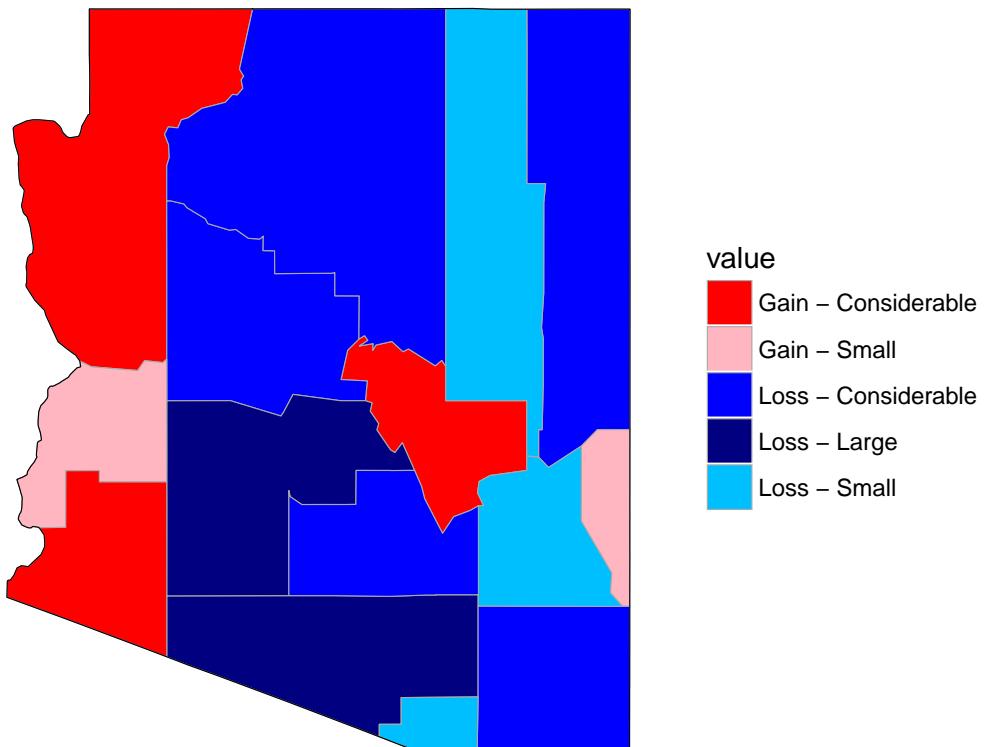
```
#Clinton
c = CountyChoropleth$new(dem_votes)
c$title = "Change from Obama to Clinton (Blue = Better Clinton) - Arizona"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "lightpink"))
c$set_zoom("arizona")
dem_change_AZ = c$render() +
  theme(legend.position = "right")
dem_change_AZ
```

## Change from Obama to Clinton (Blue = Better Clinton) – Arizona



```
#Trump
c = CountyChoropleth$new(rep_votes)
c$title = "Change from Romney to Trump (Red = Better Trump) - Arizona"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("red","lightpink","blue","navy","deepskyblue"))
c$set_zoom("arizona")
rep_change_AZ = c$render() +
  theme(legend.position = "right")
rep_change_AZ
```

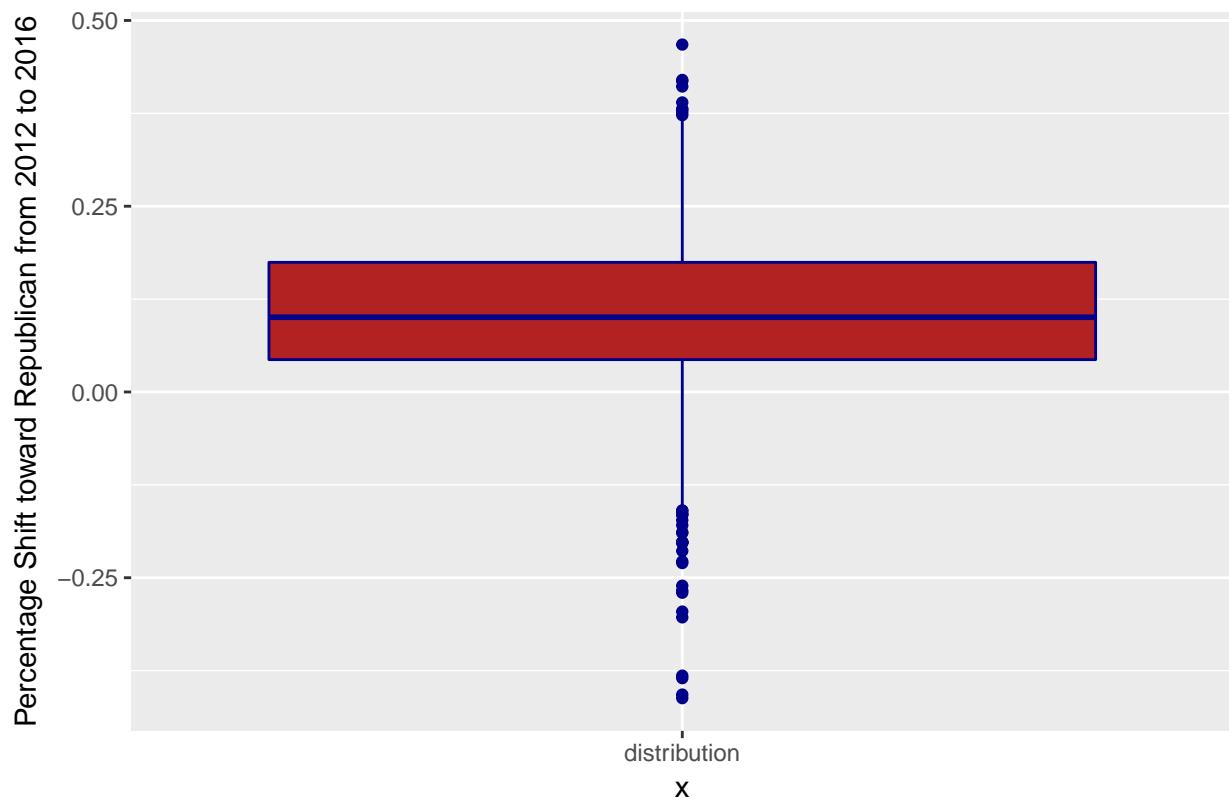
## Change from Romney to Trump (Red = Better Trump) – Arizona



### Percentage Shift from 2012

```
votes$per_shift = votes$Trump_Romney - votes$Clinton_Obama  
  
shift = votes[,c(1,98)]  
  
summary(shift$per_shift)  
  
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.  
## -0.41210  0.04355  0.10060  0.10620  0.17450  0.46760  
ggplot(shift,aes(x="distribution",y=per_shift)) + geom_boxplot(fill = "firebrick", colour = "darkblue")
```

## County Shifts toward Republican from 2012 to 2016



```

shift[,3] = NA
colnames(shift) = c('region', 'shift', 'value')

for(i in seq(1:dim(shift)[1])){
  if(shift[i,2] > 0 && shift[i,2] < .05){
    shift[i,3] = "GOP - Small (<5%)"
  } else if(shift[i,2] > .05 && shift[i,2] < .10){
    shift[i,3] = "GOP - Considerable (<10%)"
  } else if(shift[i,2] >= .10){
    shift[i,3] = "GOP - Large (>10%)"
  } else if(shift[i,2] < 0 && shift[i,2] > -.05) {
    shift[i,3] = "Dem - Small (<5%)"
  } else if(shift[i,2] < -.05 && shift[i,2] > -.10){
    shift[i,3] = "Dem - Considerable (<10%)"
  } else if(shift[i,2] < -.10){
    shift[i,3] = "Dem - Large (>10%)"
  } else{
    shift[i,3] = "Equal"
  }
}

#Entire country
c = CountyChoropleth$new(shift)
c$title = "Shift from 2012 to 2016 by County Percentage"
c$add_state_outline = TRUE
c$legend = "Change in Votes"

```

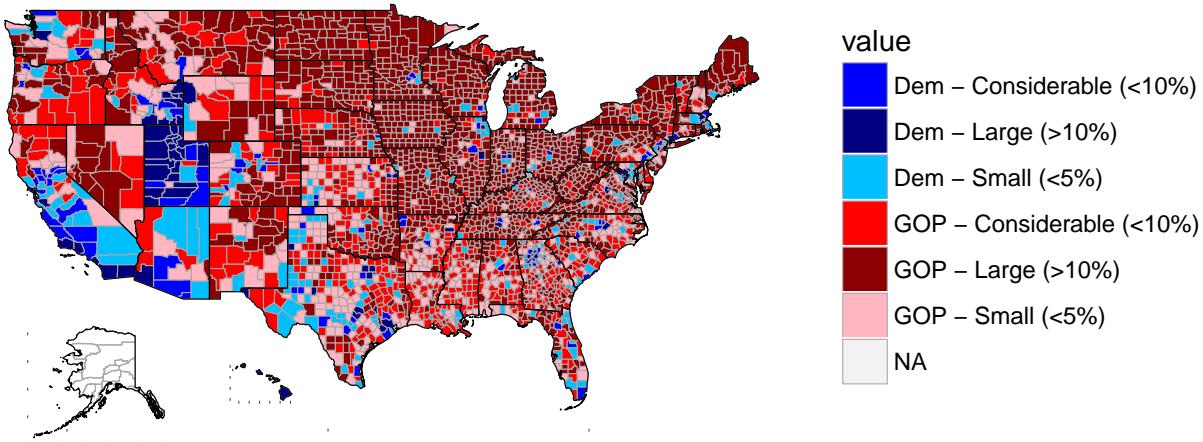
```

c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
per_change_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
per_change_US

```

## Shift from 2012 to 2016 by County Percentage



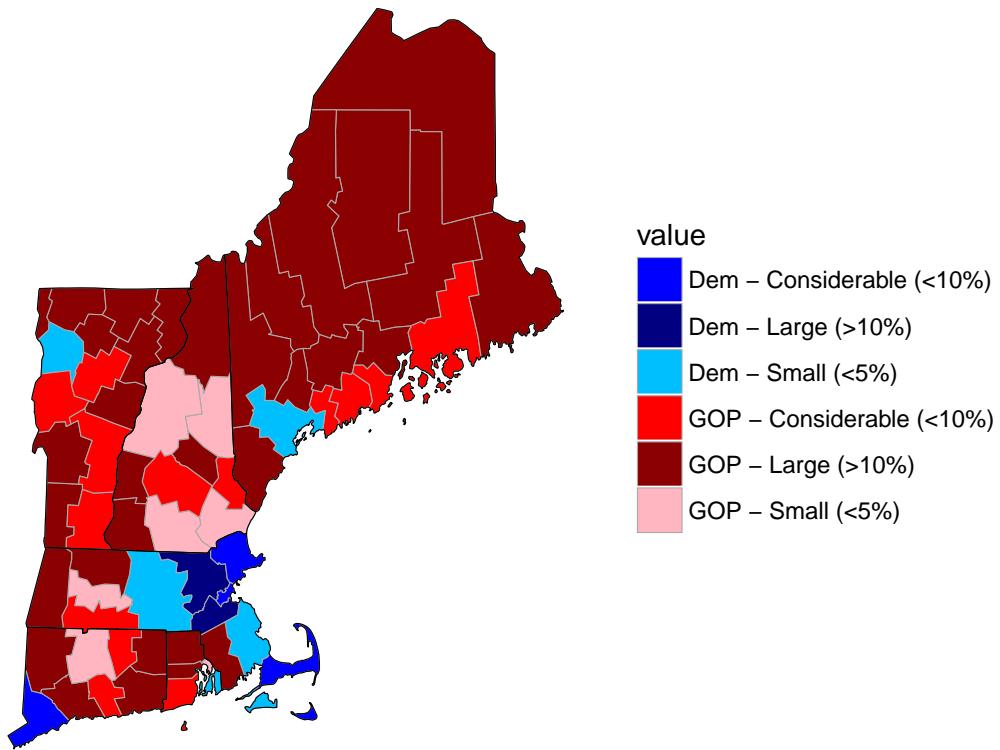
```
#Break down county vote into regions of the US for easier viewing
```

```

##New England Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - New England"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("maine", "new hampshire", "vermont", "massachusetts", "connecticut", "rhode island"))
per_change_NE = c$render() +
  theme(legend.position = "right")
per_change_NE

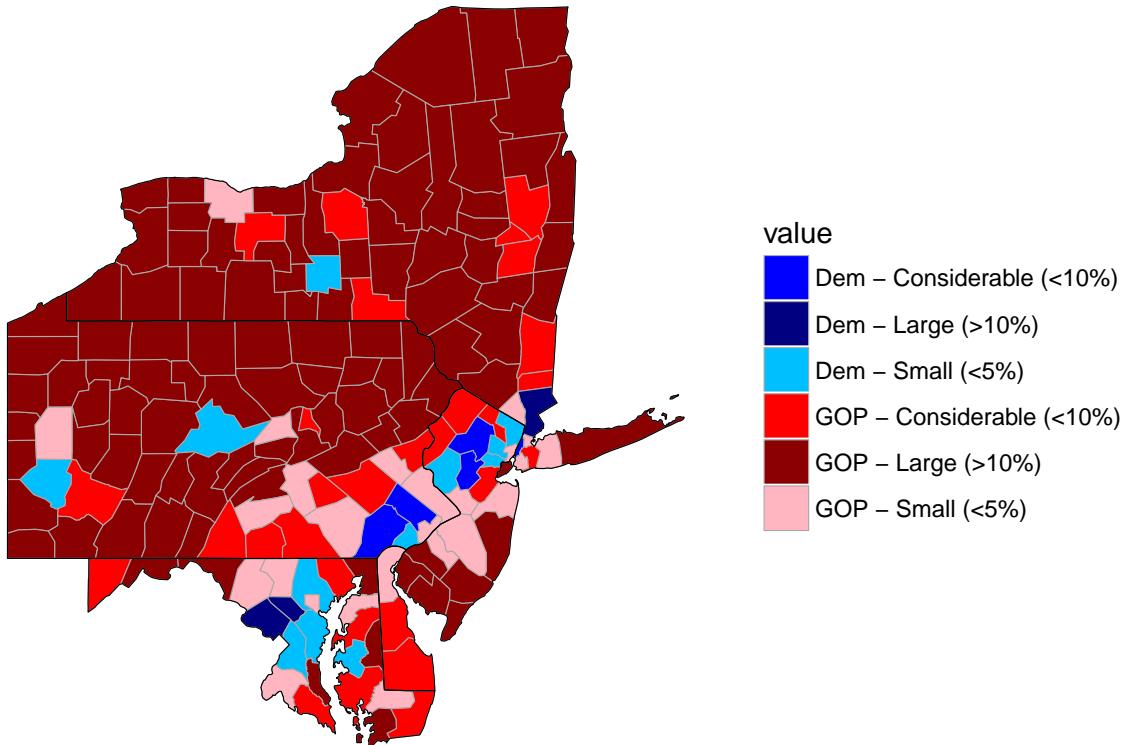
```

## Percentage Shift from 2012 to 2016 – New England



```
##Mid-Atlantic Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - Mid-Atlantic"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("new york", "pennsylvania", "new jersey", "maryland", "delaware"))
per_change_MA = c$render() +
  theme(legend.position = "right")
per_change_MA
```

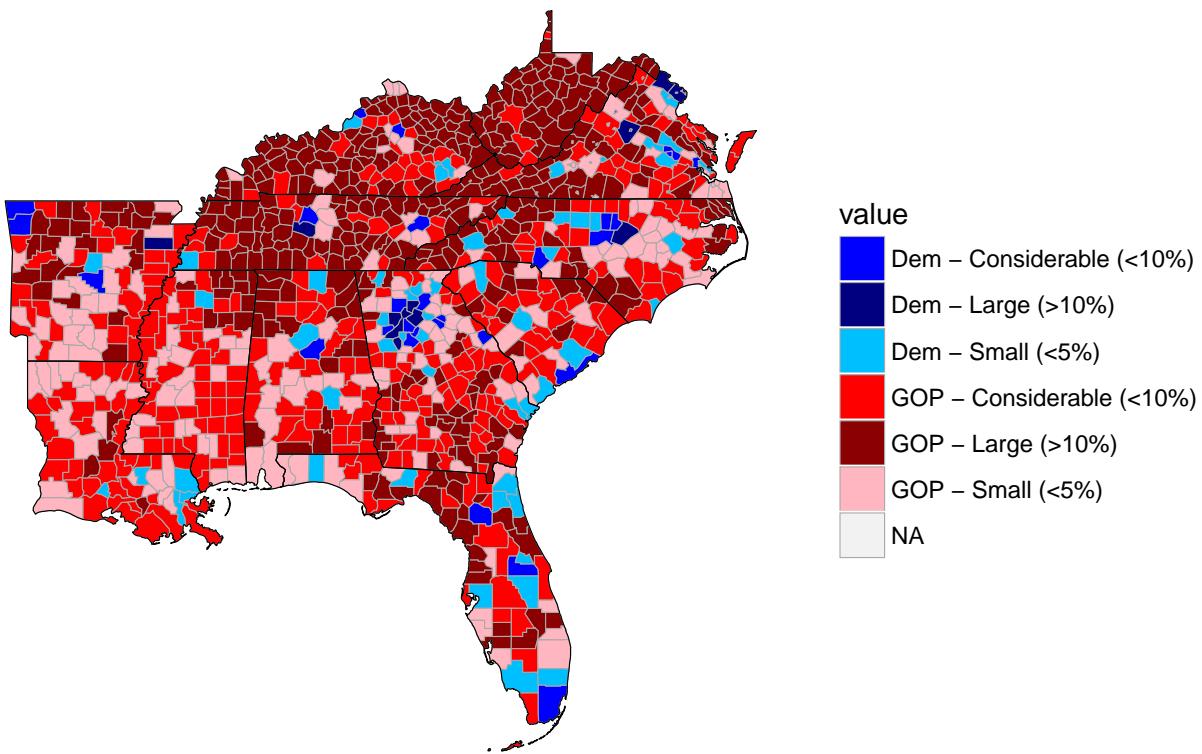
## Percentage Shift from 2012 to 2016 – Mid-Atlantic



```
##South East Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - South East"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue","navy","deepskyblue","red","darkred","lightpink"))
c$set_zoom(c("west virginia","virginia","tennessee","kentucky","north carolina","south carolina","georg
per_change_SE = c$render() +
  theme(legend.position = "right")

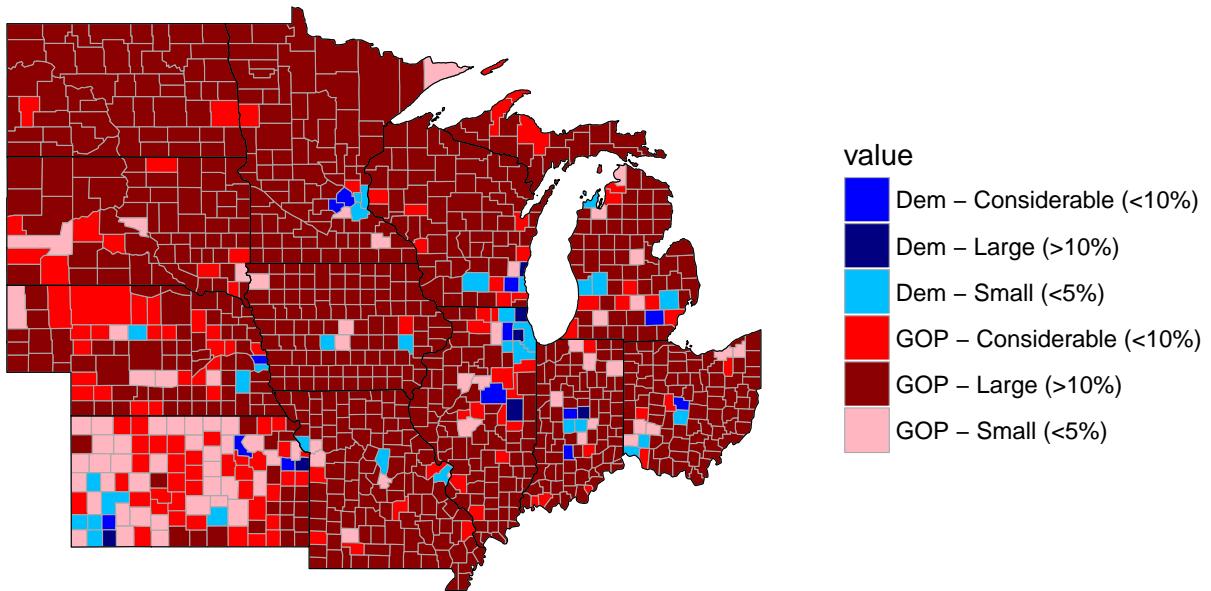
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
per_change_SE
```

## Percentage Shift from 2012 to 2016 – South East



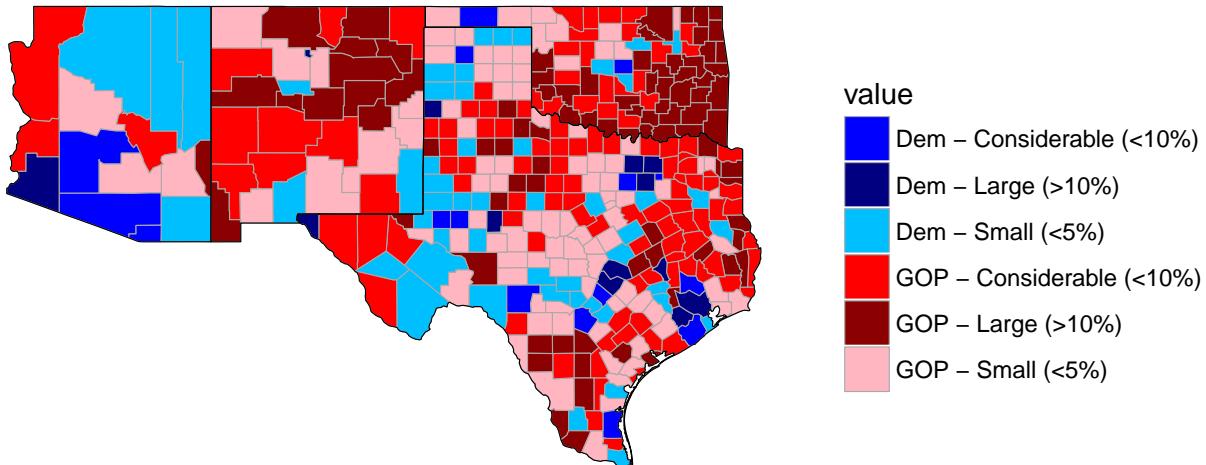
```
##Mid West Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - Mid West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue","navy","deepskyblue","red","darkred","lightpink"))
c$set_zoom(c("ohio","michigan","indiana","illinois","wisconsin","minnesota","iowa","missouri","north dakota"))
per_change_MW = c$render() +
  theme(legend.position = "right")
per_change_MW
```

## Percentage Shift from 2012 to 2016 – Mid West



```
##South West Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - South West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("texas", "oklahoma", "new mexico", "arizona"))
per_change_SW = c$render() +
  theme(legend.position = "right")
per_change_SW
```

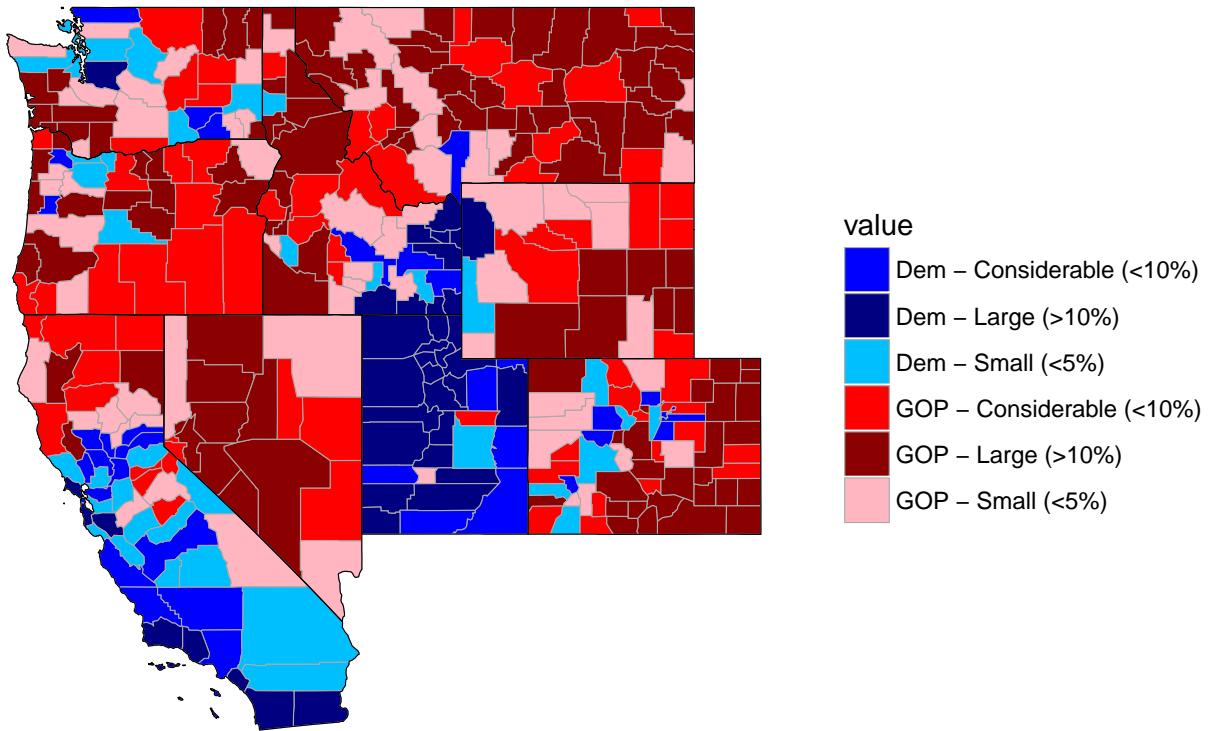
## Percentage Shift from 2012 to 2016 – South West



```
##West Region
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "california", "oregon", "washington",
per_change_W = c$render() +
    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
per_change_W
```

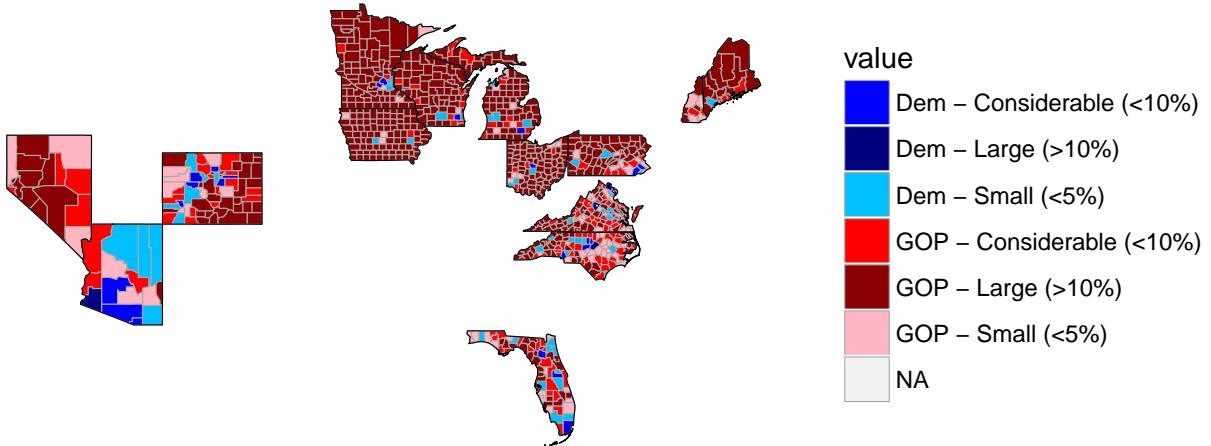
## Percentage Shift from 2012 to 2016 – West



```
#Explore Vote Count by Swing States
c = CountyChoropleth$new(shift)
c$title = "Percentage Shift from 2012 to 2016 - Swing States"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("blue", "navy", "deepskyblue", "red", "darkred", "lightpink"))
c$set_zoom(c("new hampshire", "pennsylvania", "ohio", "michigan", "north carolina", "florida", "arizona", "iowa"))
per_change_swing = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
per_change_swing
```

## Percentage Shift from 2012 to 2016 – Swing States



### Analyze shifts at county level

```
total_shift = merge(x=dem_votes,y=rep_votes,by="region",all=TRUE)
total_shift[,6] = NA
colnames(total_shift) = c("region","dem_votes","dem_gain_loss","rep_votes","rep_gain_loss","value")

for(i in seq(i:dim(total_shift)[1])){
  if(total_shift[i,2] < 0){
    if(total_shift[i,4] < 0){
      total_shift[i,6] = "Dem Loss/GOP Loss"
    } else if(total_shift[i,4] > 0) {
      total_shift[i,6] = "Dem Loss/GOP Gain"
    } else {
      total_shift[i,6] = "Dem Loss/GOP Equal"
    }
  } else if(total_shift[i,2] > 0){
    if(total_shift[i,4] < 0){
      total_shift[i,6] = "Dem Gain/GOP Loss"
    } else if(total_shift[i,4] > 0){
      total_shift[i,6] = "Dem Gain/GOP Gain"
    } else {
      total_shift[i,6] = "Dem Gain/GOP Equal"
    }
  } else {
    total_shift[i,6] = "Dem/GOP Equal"
  }
}
```

```

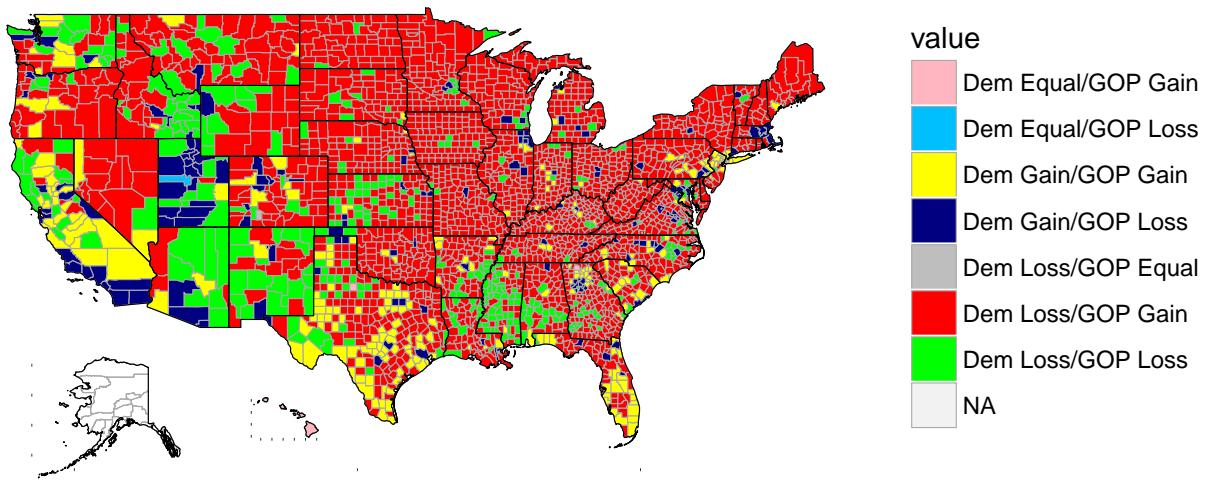
    if(total_shift[i,4] < 0){
      total_shift[i,6] = "Dem Equal/GOP Loss"
    } else if(total_shift[i,4] > 0){
      total_shift[i,6] = "Dem Equal/GOP Gain"
    } else {
      total_shift[i,6] = "Dem Equal/GOP Equal"
    }
  }

#Entire country
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes for Parties"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values = c("lightpink", "deepskyblue","yellow","navy","grey","red","green"))
shift_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
shift_US

```

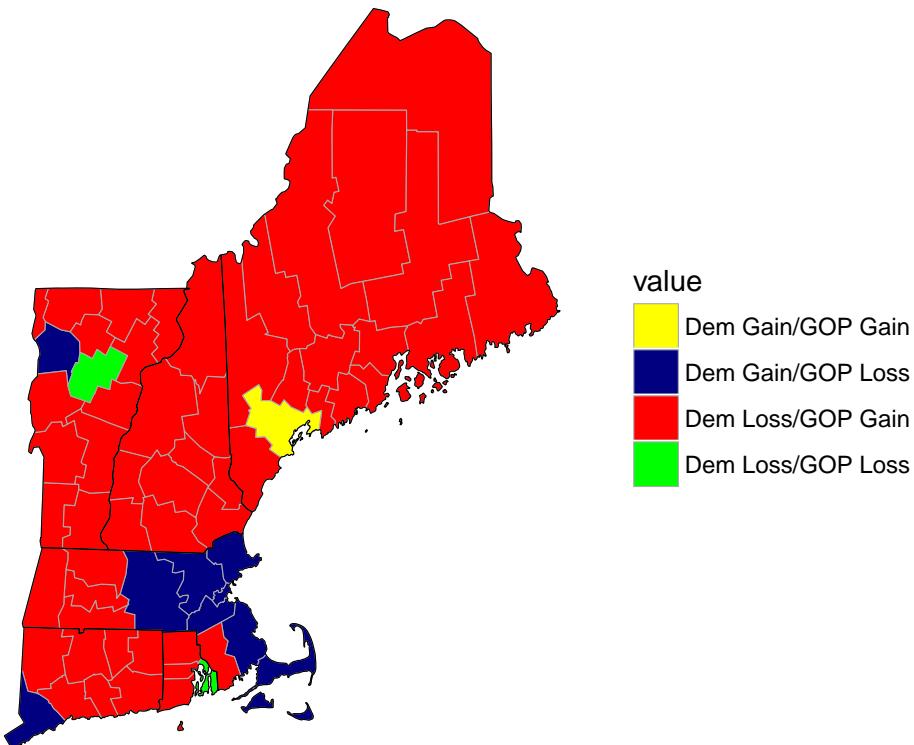
## Shift from 2012 to 2016 by County Total Votes for Parties



```
#Break down county vote into regions of the US for easier viewing

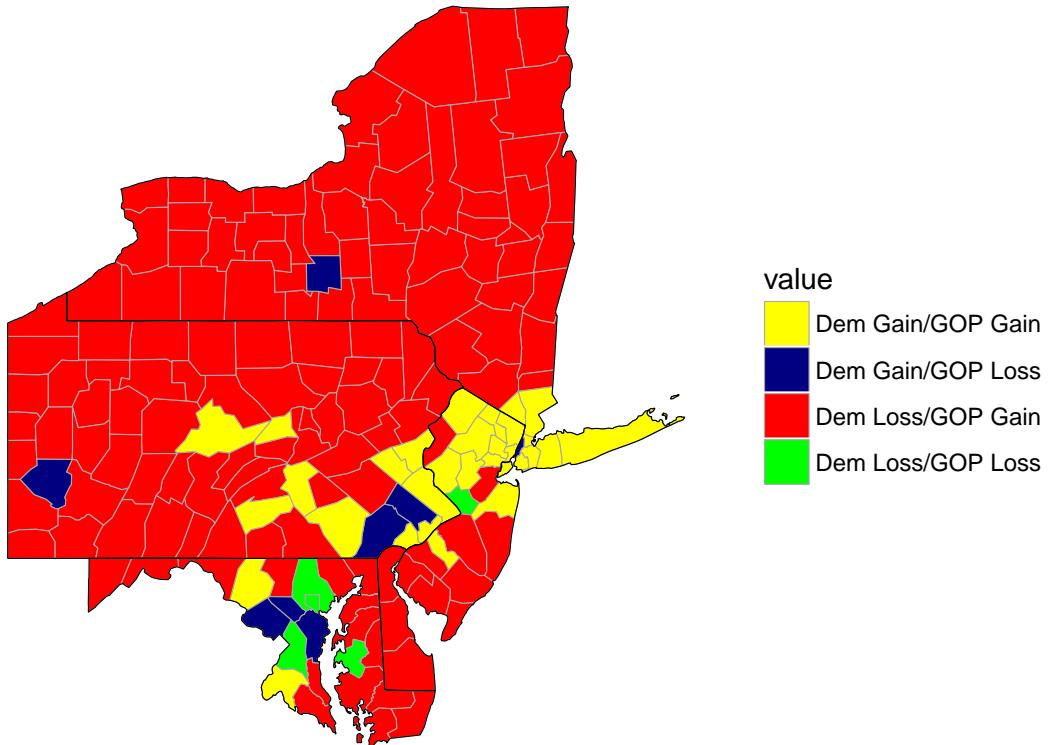
#New England Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - New England"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(4)
c$ggplot_scale = scale_fill_manual(values = c("yellow", "navy", "red", "green"))
c$set_zoom(c("maine", "new hampshire", "vermont", "massachusetts", "connecticut", "rhode island"))
shift_NE = c$render() +
  theme(legend.position = "right")
shift_NE
```

Shift from 2012 to 2016 by County Total Votes – New England



```
##Mid-Atlantic Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - Mid-Atlantic"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(4)
c$ggplot_scale = scale_fill_manual(values = c("yellow", "navy", "red", "green"))
c$set_zoom(c("new york", "pennsylvania", "new jersey", "maryland", "delaware"))
shift_MA = c$render() +
  theme(legend.position = "right")
shift_MA
```

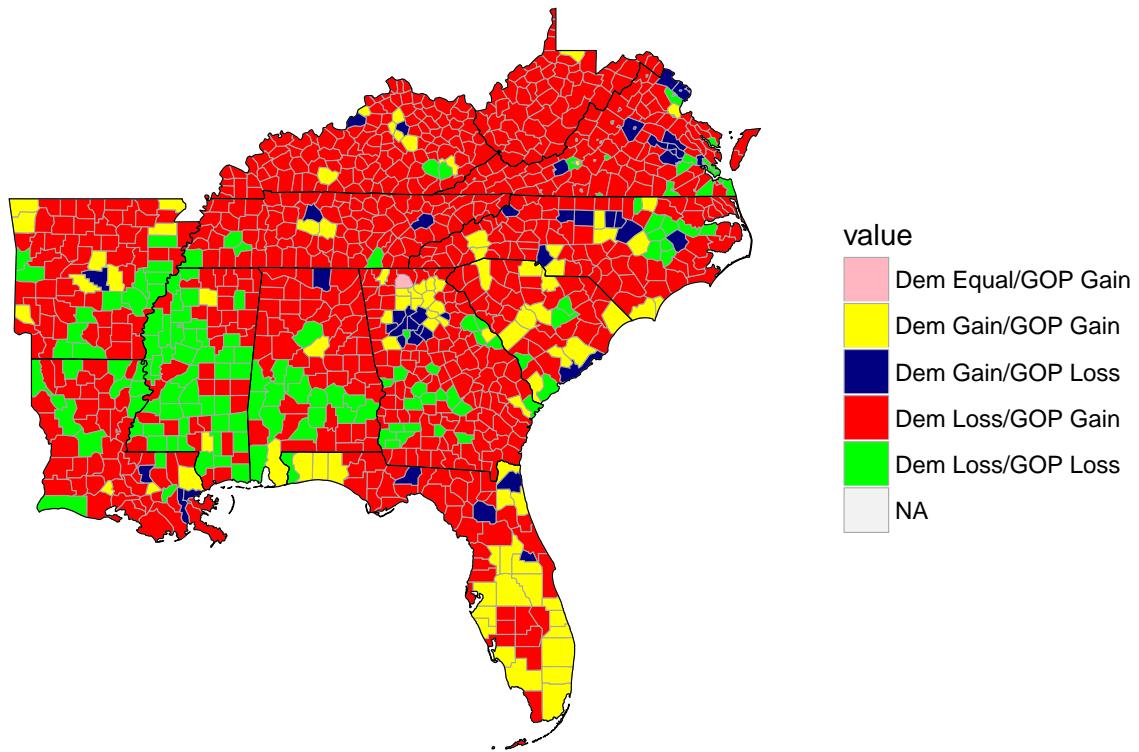
## Shift from 2012 to 2016 by County Total Votes – Mid-Atlantic



```
##South East Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - South East"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("lightpink","yellow","navy","red","green"))
c$set_zoom(c("west virginia","virginia","tennessee","kentucky","north carolina","south carolina","georgia"))
shift_SE = c$render() +
  theme(legend.position = "right")

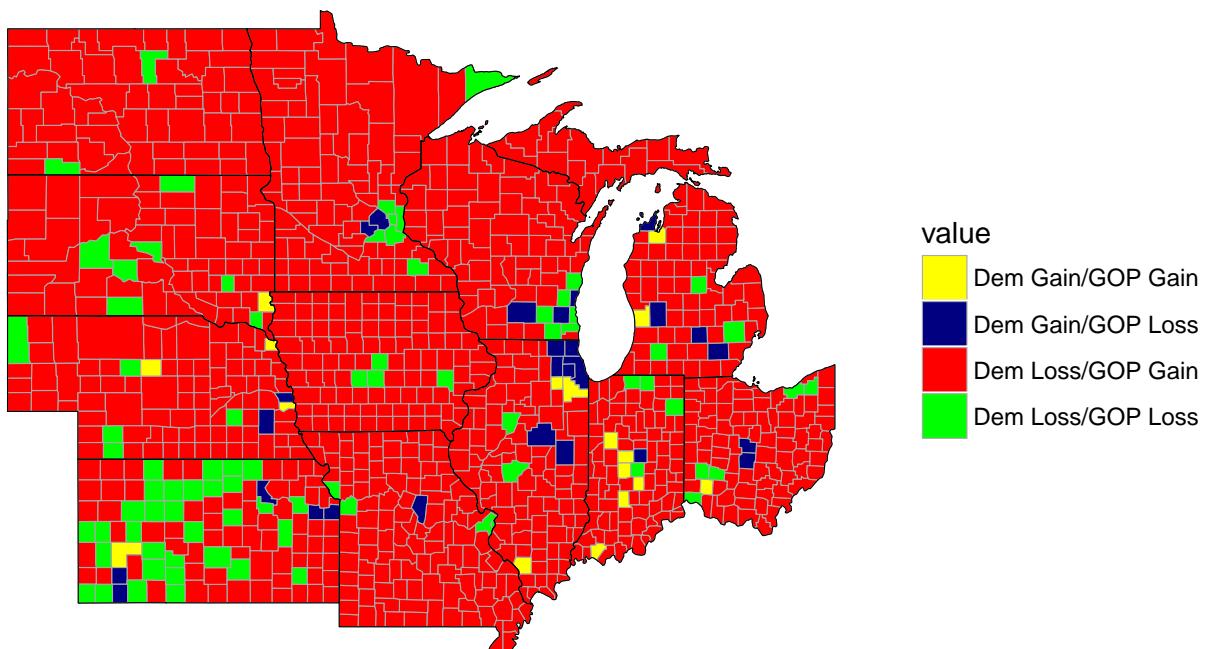
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
shift_SE
```

## Shift from 2012 to 2016 by County Total Votes – South East



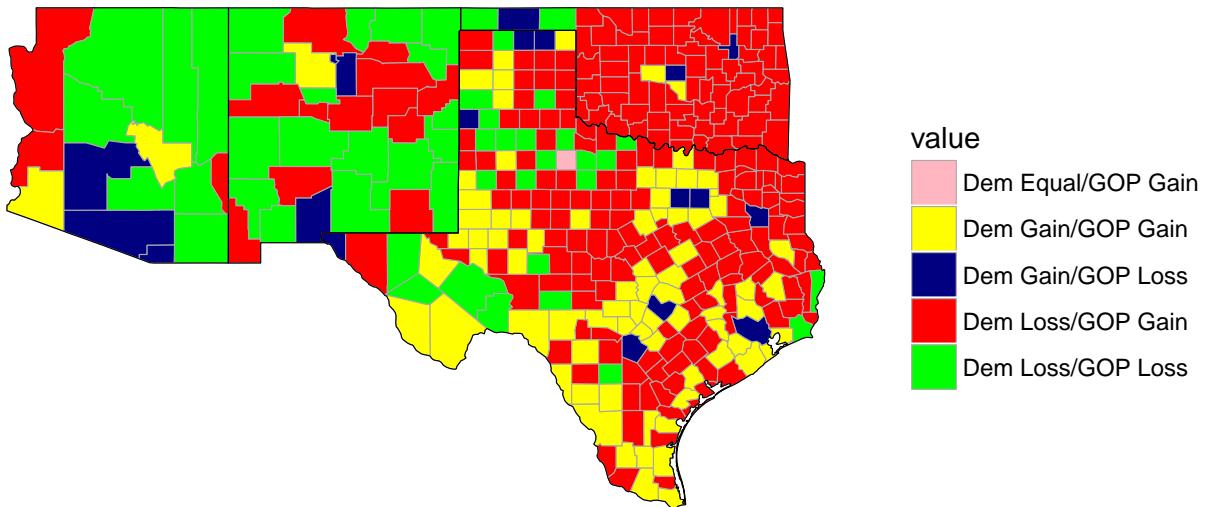
```
##Mid West Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - Mid West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(4)
c$ggplot_scale = scale_fill_manual(values = c("yellow", "navy", "red", "green"))
c$set_zoom(c("ohio", "michigan", "indiana", "illinois", "wisconsin", "minnesota", "iowa", "missouri", "north dakota"))
shift_MW = c$render() +
  theme(legend.position = "right")
shift_MW
```

## Shift from 2012 to 2016 by County Total Votes – Mid West



```
##South West Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - South West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("lightpink","yellow","navy","red","green"))
c$set_zoom(c("texas","oklahoma","new mexico","arizona"))
shift_SW = c$render() +
  theme(legend.position = "right")
shift_SW
```

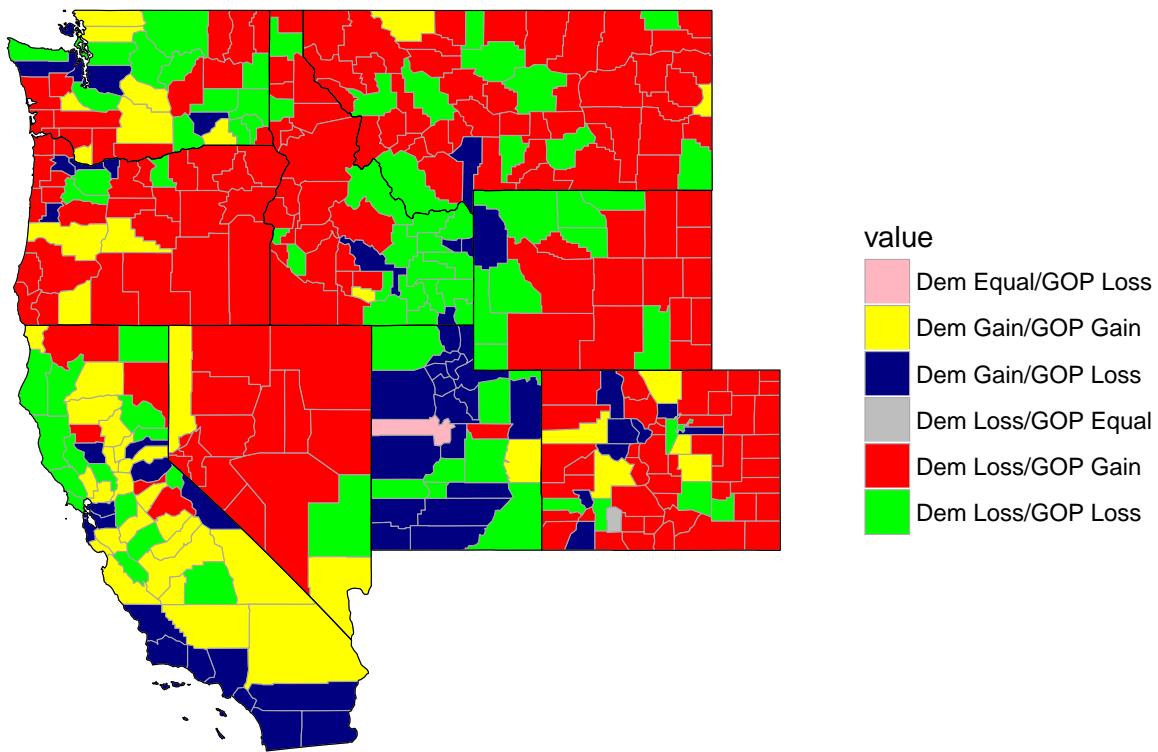
## Shift from 2012 to 2016 by County Total Votes – South West



```
##West Region
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - West"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("lightpink", "yellow", "navy", "grey", "red", "green"))
c$set_zoom(c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "california", "oregon", "washington",
shift_W = c$render() +
    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
shift_W
```

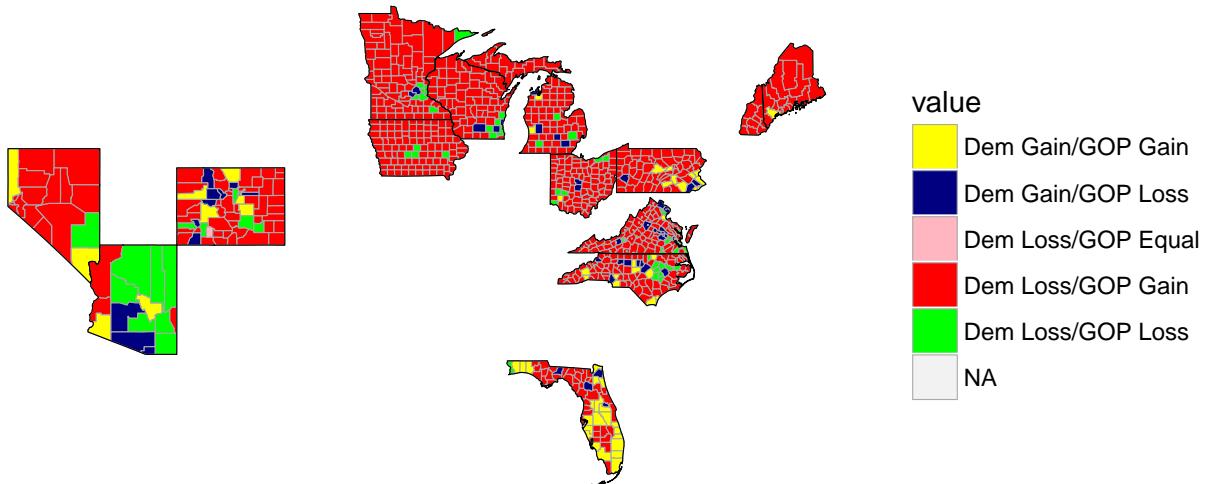
## Shift from 2012 to 2016 by County Total Votes – West



```
#Explore Vote Count by Swing States
c = CountyChoropleth$new(total_shift)
c$title = "Shift from 2012 to 2016 by County Total Votes - Swing States"
c$add_state_outline = TRUE
c$legend = "Change in Votes"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("yellow", "navy", "lightpink", "red", "green"))
c$set_zoom(c("new hampshire", "pennsylvania", "ohio", "michigan", "north carolina", "florida", "arizona", "iowa"))
shift.swing = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
shift.swing
```

## Shift from 2012 to 2016 by County Total Votes – Swing States



## Vote Share at State Level

```
#create empty vector to store the state fips values
state_levels = vector()

#store unique fips in vector
for(i in seq(1:dim(votes)[1])){
  if(!is.element(votes[i,18],state_levels)){
    state_levels = c(state_levels,votes[i,18])
  }
}

#create dataframe, add state_levels to it, rename it to "fips.numeric" in order to join with state.regions
states = data.frame(state_levels)
states[,c(2:9)] = 0
colnames(states)[1] = "fips.numeric"

#read in data, merge, drop duplicate column, and rename columns
data(state.regions)
states = merge(x=states,y=state.regions,by="fips.numeric")
states = states[,c(1:11)]
colnames(states) = c("fips", "dem_votes_2016", "gop_votes_2016", "total_votes_2016", "dem_votes_2012", "gop_votes_2012", "total_votes_2012", "region", "name", "fips.numeric", "lat", "lon")

for(i in seq(1:dim(votes)[1])){
```

```

for(j in seq(1:dim(states)[1])){
  if(votes[i,12] == states[j,11]){
    states[j,2] = states[j,2] + votes[i,5]
    states[j,3] = states[j,3] + votes[i,6]
    states[j,4] = states[j,4] + votes[i,7]
    states[j,5] = states[j,5] + votes[i,15]
    states[j,6] = states[j,6] + votes[i,16]
    states[j,7] = states[j,7] + votes[i,14]
    states[j,8] = states[j,8] + votes[i,27]
    states[j,9] = states[j,9] + votes[i,26]
  }
}
}

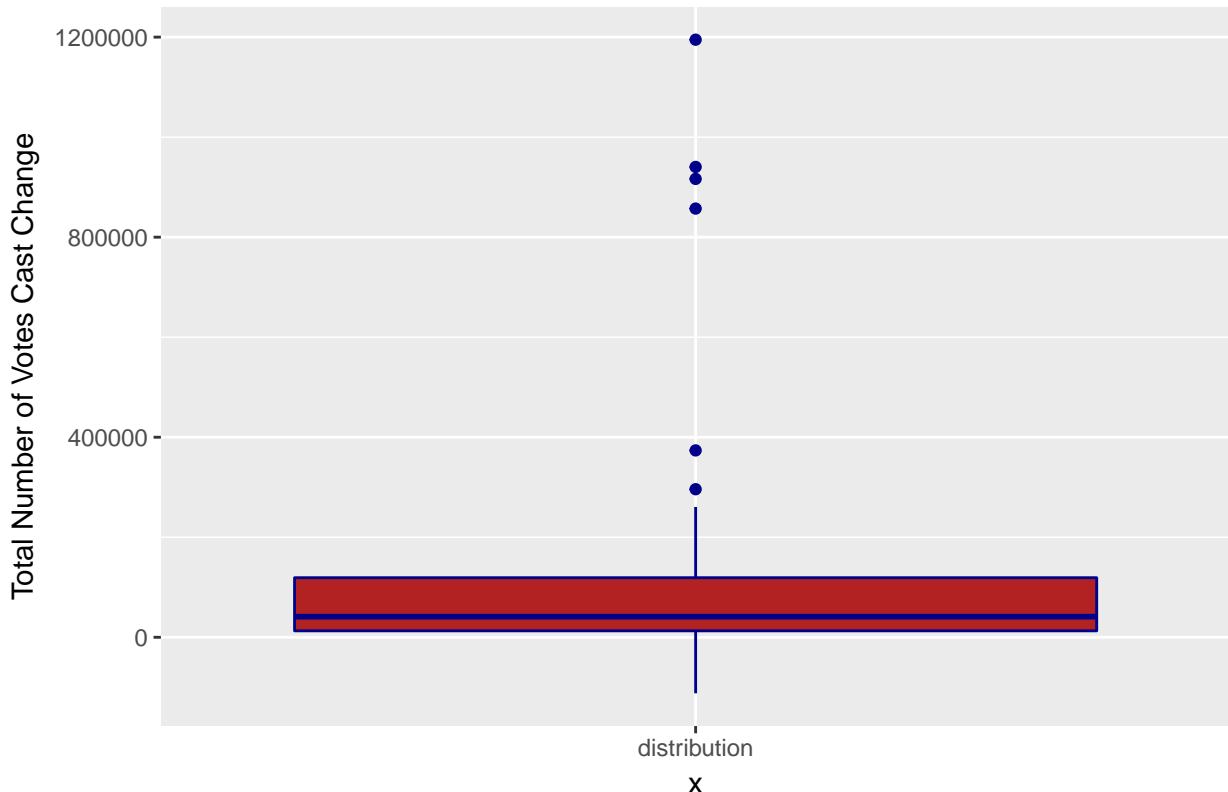
#Plot Voter Participation Changes
states$participation_change = states$total_votes_2016 - states$total_votes_2012

voting_num = states[,c(10,12)]
colnames(voting_num) = c("region","value")

ggplot(voting_num,aes(x="distribution",y=value)) + geom_boxplot(fill = "firebrick", colour = "darkblue")

```

County Shifts in Total Votes Cast from 2012 to 2016



```

c = StateChoropleth$new(voting_num)
c$title = "Shift from 2012 to 2016 by Total Number of Votes Cast"
c$add_state_outline = TRUE
c$legend = "Change in Votes Cast"

```

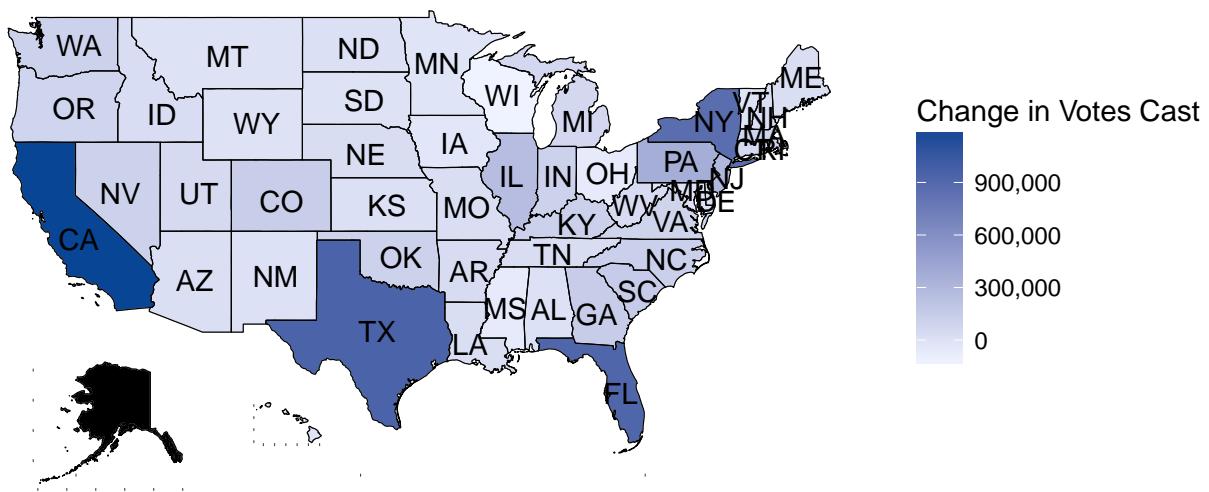
```

c$set_num_colors(1)
vote_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska
vote_US

```

## Shift from 2012 to 2016 by Total Number of Votes Cast



```

states$pop_2012 = states$pop_2010 + (states$pop_2014 - states$pop_2010)

states$pop_2016 = states$pop_2014 + (states$pop_2014 - states$pop_2010)

states$per_vot_change = 100 * ((states$total_votes_2016/states$pop_2016) - (states$total_votes_2012/states$pop_2012))

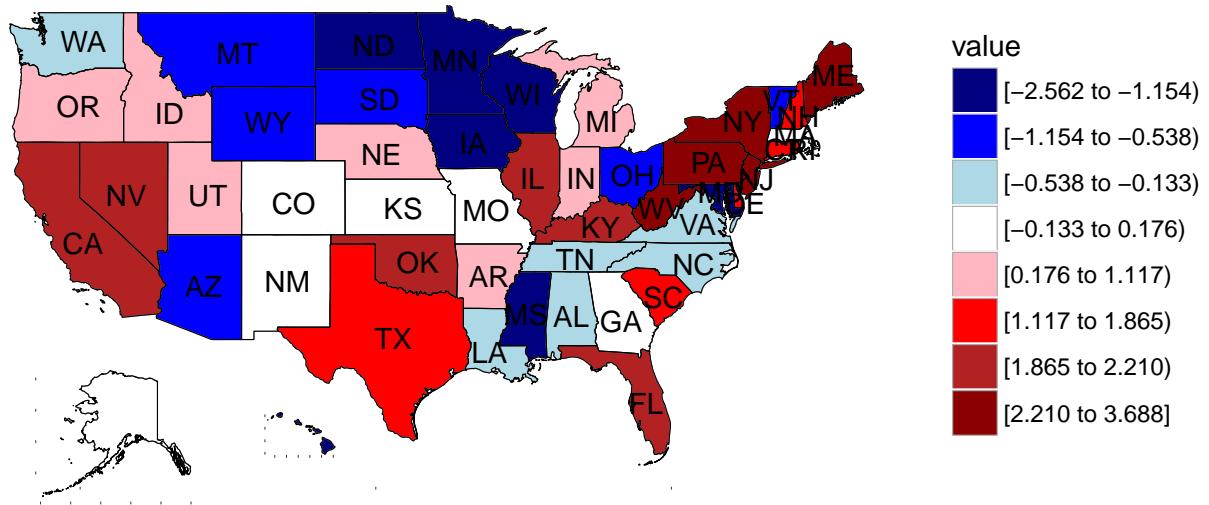
per_vote_num = states[,c(10,15)]
colnames(per_vote_num)= c("region","value")

c = StateChoropleth$new(per_vote_num)
c$title = "Shift in Turnout from 2012 to 2016 by Estimated Population Size"
c$add_state_outline = TRUE
c$legend = "% Change in Votes Cast"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("navy","blue","lightblue","white", "lightpink", "red", "firebrick"))
per_vote_US = c$render() +
  theme(legend.position = "right")

```

```
## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska
per_vote_US
```

## Shift in Turnout from 2012 to 2016 by Estimated Population Size



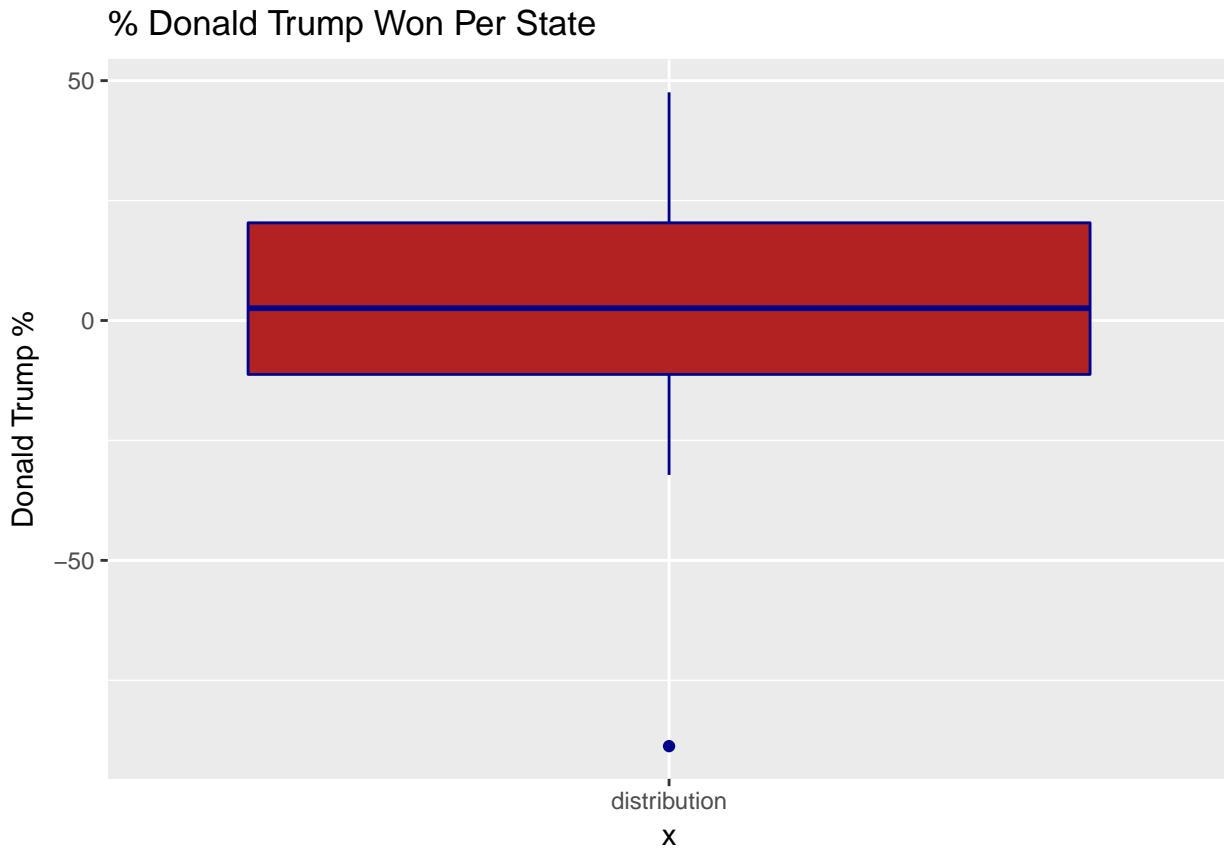
```
#Results
states$DT_per = states$gop_votes_2016/states$total_votes_2016

states$HC_per = states$dem_votes_2016/states$total_votes_2016

states$third = (1 - states$DT_per - states$HC_per) * 100

states$DT_margin = (states$DT_per - states$HC_per) * 100

ggplot(states,aes(x="distribution",y=DT_margin)) + geom_boxplot(fill = "firebrick", colour = "darkblue")
```



```

states$winner = NA

for(i in seq(1:dim(states)[1])){
  if(states[i,19] < -10){
    states[i,20] = "Clinton (>10%)"
  }
  if(states[i,19] > -10 && states[i,19] < -5){
    states[i,20] = "Clinton (5% - 10%)"
  }
  if(states[i,19] > -5 && states[i,19] < -2){
    states[i,20] = "Clinton (2% - 5%)"
  }
  if(states[i,19] > -2 && states[i,19] < 0){
    states[i,20] = "Clinton (<2%)"
  }
  if(states[i,19] > 10){
    states[i,20] = "Trump (>10%)"
  }
  if(states[i,19] < 10 && states[i,19] > 5){
    states[i,20] = "Trump (5% - 10%)"
  }
  if(states[i,19] < 5 && states[i,19] > 2){
    states[i,20] = "Trump (2% - 5%)"
  }
  if(states[i,19] < 2 && states[i,19] > 0){
    states[i,20] = "Trump (<2%)"
  }
}

```

```

    }

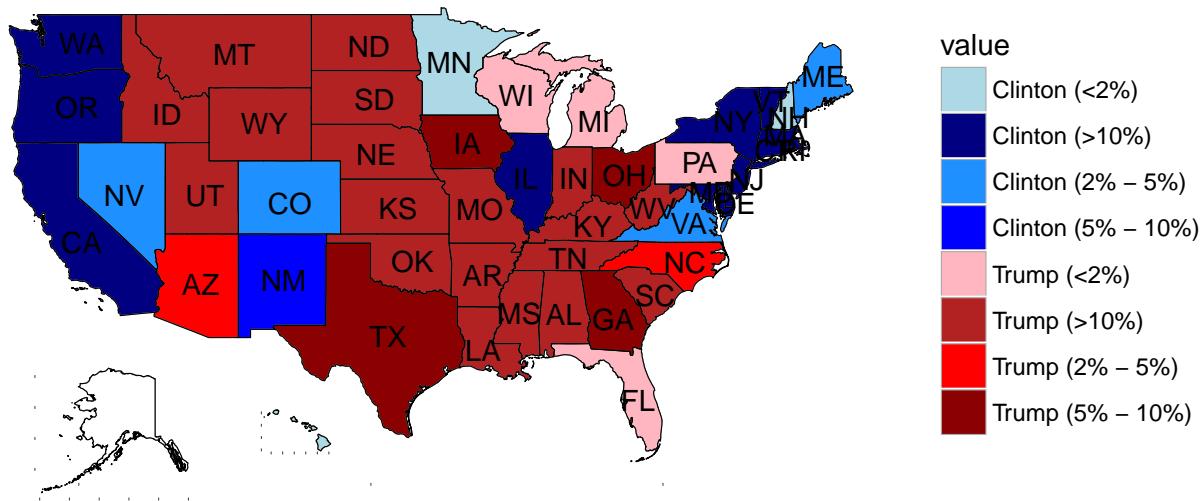
state_winner = states[,c(10,20)]
colnames(state_winner) = c("region","value")

c = StateChoropleth$new(state_winner)
c$title = "2016 State Winner Margin"
c$add_state_outline = TRUE
c$legend = "Win Margin %"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue","navy", "dodgerblue1","blue", "lightpink", "#E63333", "#A52A2A", "#C8512E"))
winner_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska
winner_US

```

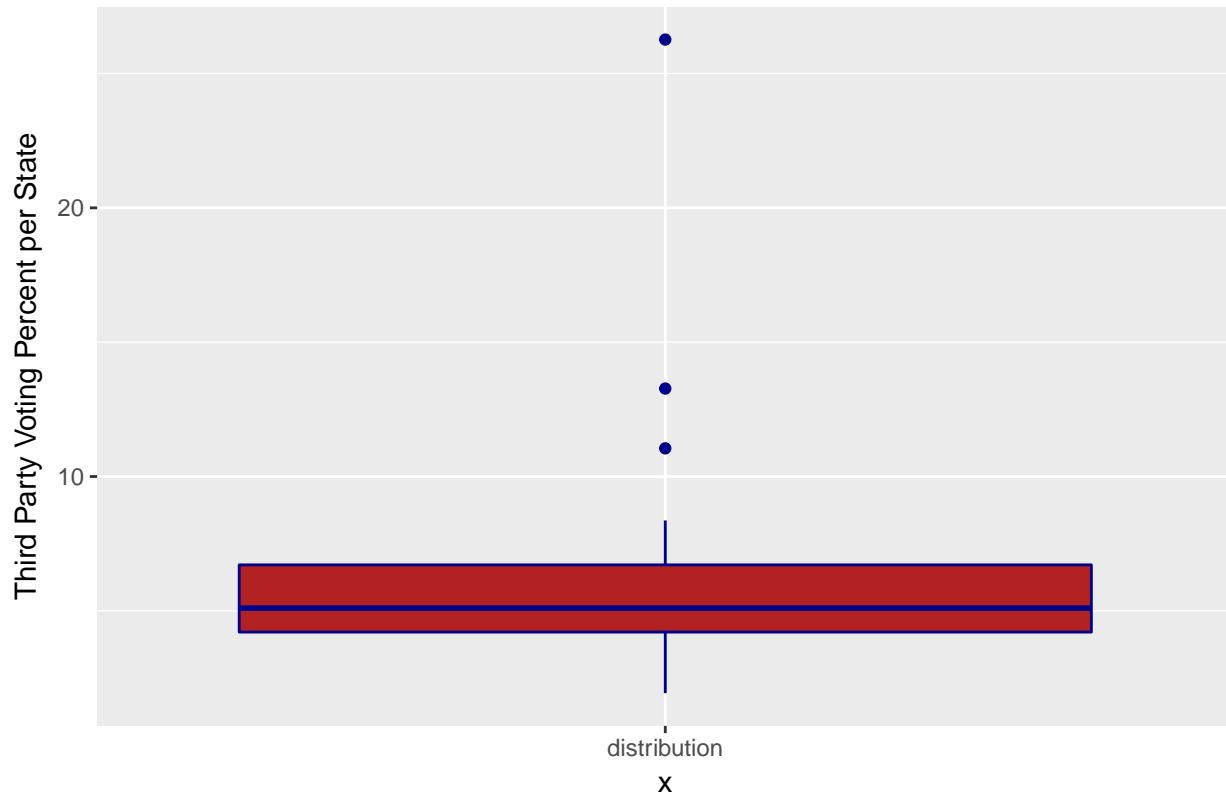
## 2016 State Winner Margin



### #Third Party Vote

```
ggplot(states,aes(x="distribution",y=third)) + geom_boxplot(fill = "firebrick", colour = "darkblue") +
```

## % Third Party Per State



```
state_third = states[,c(10,18)]  
  
state_third$category = NA  
  
for(i in seq(1:dim(state_third)[1])){  
  if(state_third[i,2] < 3){  
    state_third[i,3] = "< 3%"  
  }  
  if(state_third[i,2] > 3 && state_third[i,2] < 5){  
    state_third[i,3] = "3% - 5%"  
  }  
  if(state_third[i,2] > 5 && state_third[i,2] < 7){  
    state_third[i,3] = "5% - 7%"  
  }  
  if(state_third[i,2] > 7 && state_third[i,2] < 10){  
    state_third[i,3] = "7% - 10%"  
  }  
  if(state_third[i,2] > 10 && state_third[i,2] < 15){  
    state_third[i,3] = "10% - 15%"  
  }  
  if(state_third[i,2] > 15){  
    state_third[i,3] = "> 15%"  
  }  
}  
  
colnames(state_third) = c("region", "third", "value")
```

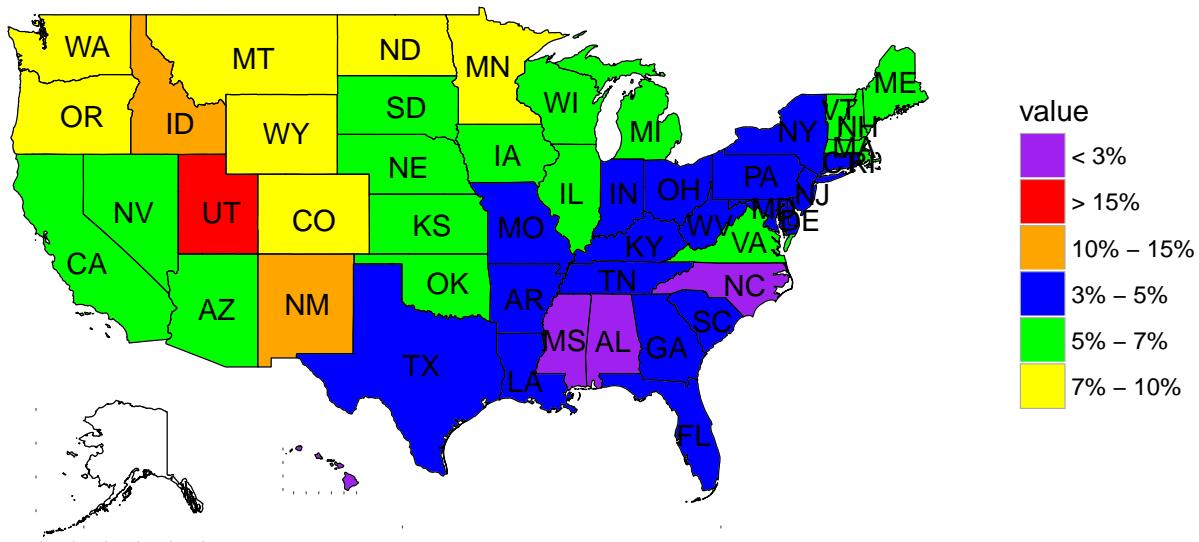
```

c = StateChoropleth$new(state_third)
c$title = "2016 Third Party Vote by State"
c$add_state_outline = TRUE
c$legend = "Third Party %"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values = c("purple", "red", "orange", "blue", "green", "yellow"))
state_third_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska
state_third_US

```

## 2016 Third Party Vote by State



## Examine County Level Winner

```

county_winner = votes[,c(1,8,9)]

county_winner$Trump_margin = (county_winner$Trump - county_winner$Clinton) * 100

for(i in seq(1:dim(county_winner)[1])){
  if(county_winner[i,4] < -10){
    county_winner[i,5] = "Clinton (>10%)"
  }
}

```

```

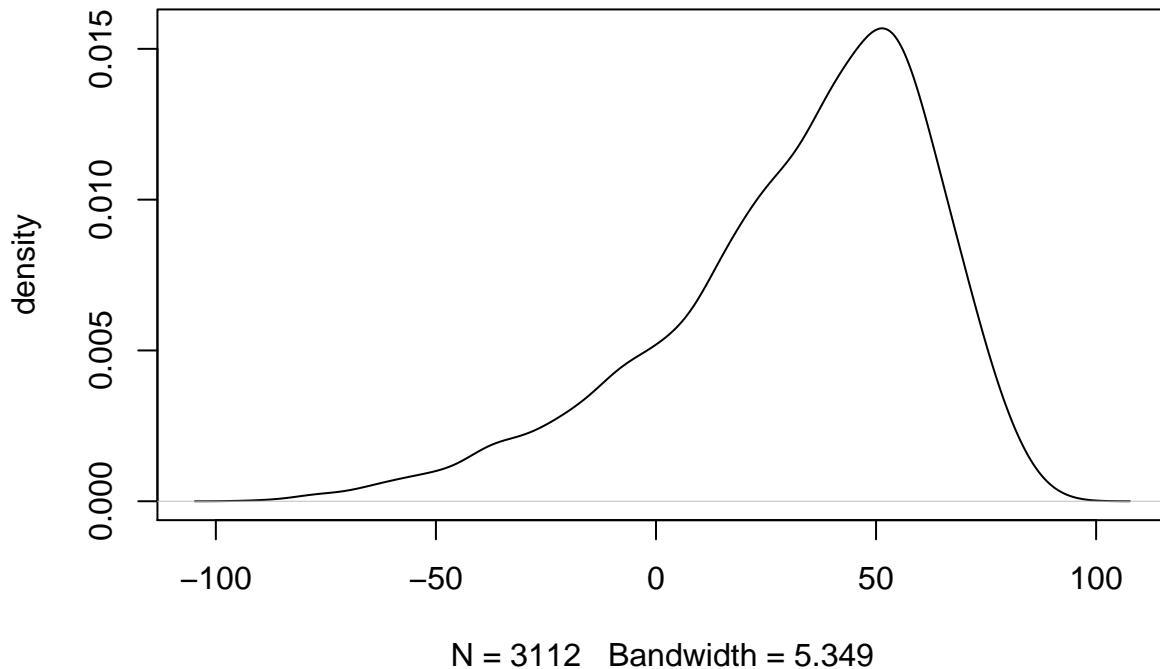
if(county_winner[i,4] > -10 && county_winner[i,4] < -5){
  county_winner[i,5] = "Clinton (5% - 10%)"
}
if(county_winner[i,4] > -5 && county_winner[i,4] < -2){
  county_winner[i,5] = "Clinton (2% - 5%)"
}
if(county_winner[i,4] > -2 && county_winner[i,4] < 0){
  county_winner[i,5] = "Clinton (<2%)"
}
if(county_winner[i,4] > 10){
  county_winner[i,5] = "Trump (>10%)"
}
if(county_winner[i,4] < 10 && county_winner[i,4] > 5){
  county_winner[i,5] = "Trump (5% - 10%)"
}
if(county_winner[i,4] < 5 && county_winner[i,4] > 2){
  county_winner[i,5] = "Trump (2% - 5%)"
}
if(county_winner[i,4] < 2 && county_winner[i,4] > 0){
  county_winner[i,5] = "Trump (<2%)"
}
}

colnames(county_winner)[1] = "region"
colnames(county_winner)[5] = "value"

plot(density(county_winner[,4]),
      main = "Trump County Margin Density Plot",
      ylab = "density")

```

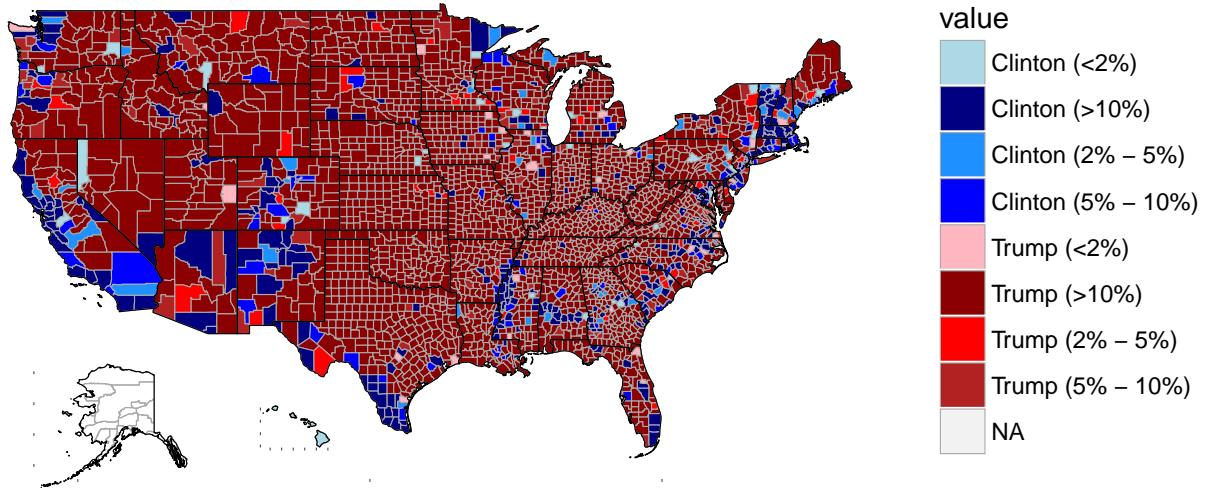
## Trump County Margin Density Plot



```
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin %"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue", "navy", "dodgerblue1", "blue", "lightpink", "orange", "red", "darkred"))
county_US = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_US
```

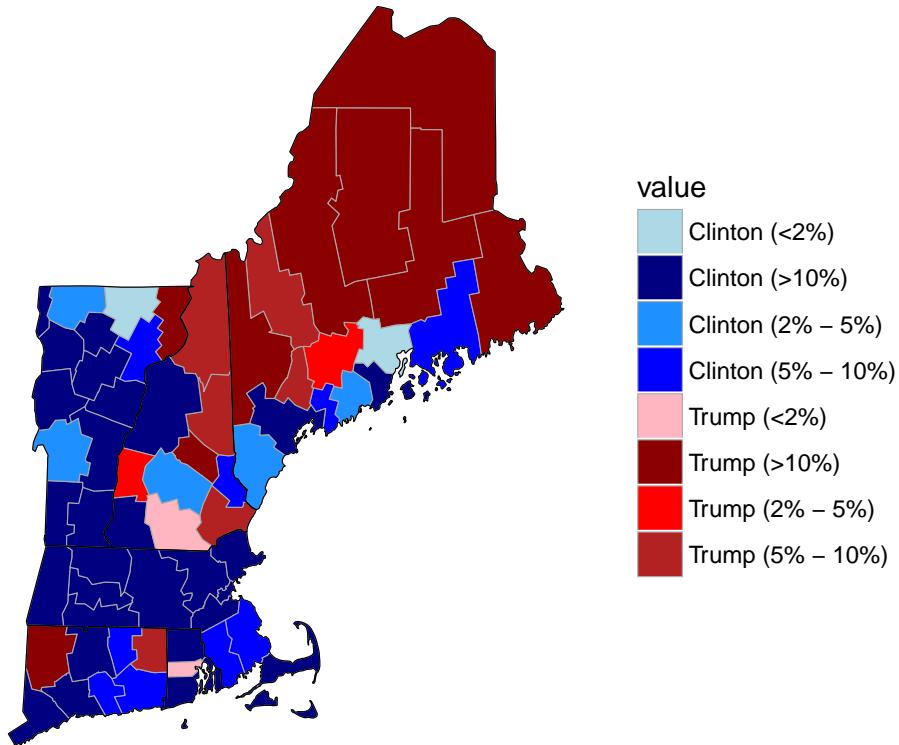
## County Winner Margin %



#Break Down By Region for Easy Viewing

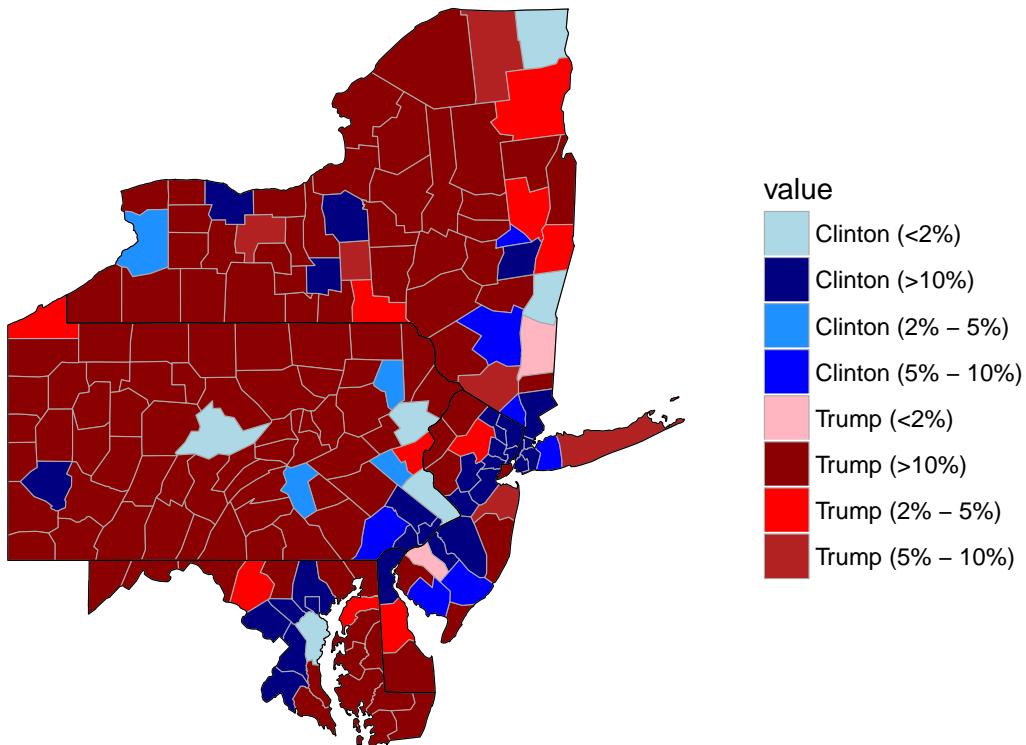
```
#New England
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - New England"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue", "navy", "dodgerblue1", "blue", "lightpink", "darkred", "red", "darkred"))
c$set_zoom(c("maine", "new hampshire", "vermont", "massachusetts", "connecticut", "rhode island"))
county_NE = c$render() +
  theme(legend.position = "right")
county_NE
```

## County Winner Margin % – New England



```
##Mid-Atlantic Region
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - Mid-Atlantic"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue", "navy", "dodgerblue1", "blue", "lightpink", "darkred", "red", "darkblue"))
c$set_zoom(c("new york", "pennsylvania", "new jersey", "maryland", "delaware"))
county_MA = c$render() +
  theme(legend.position = "right")
county_MA
```

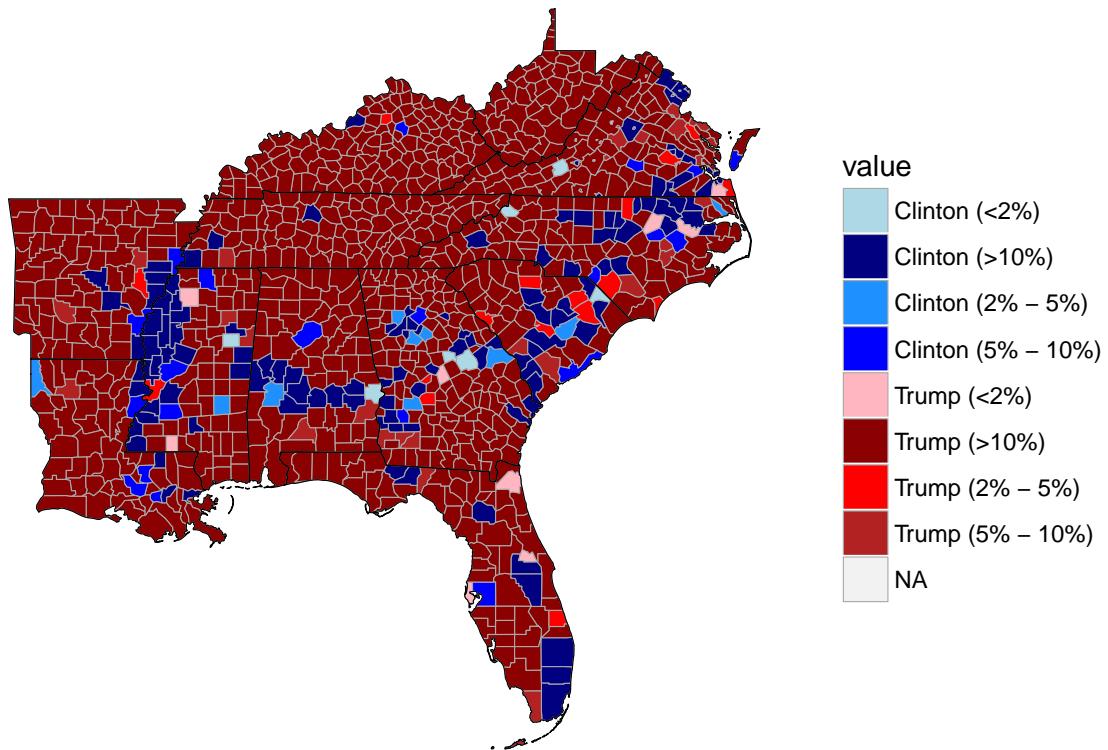
## County Winner Margin % – Mid-Atlantic



```
##South East Region
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - South East"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue","navy", "dodgerblue1","blue", "lightpink", "orange", "red", "darkred"))
c$set_zoom(c("west virginia","virginia","tennessee","kentucky","north carolina","south carolina","georgia"))
county_SE = c$render() +
  theme(legend.position = "right")

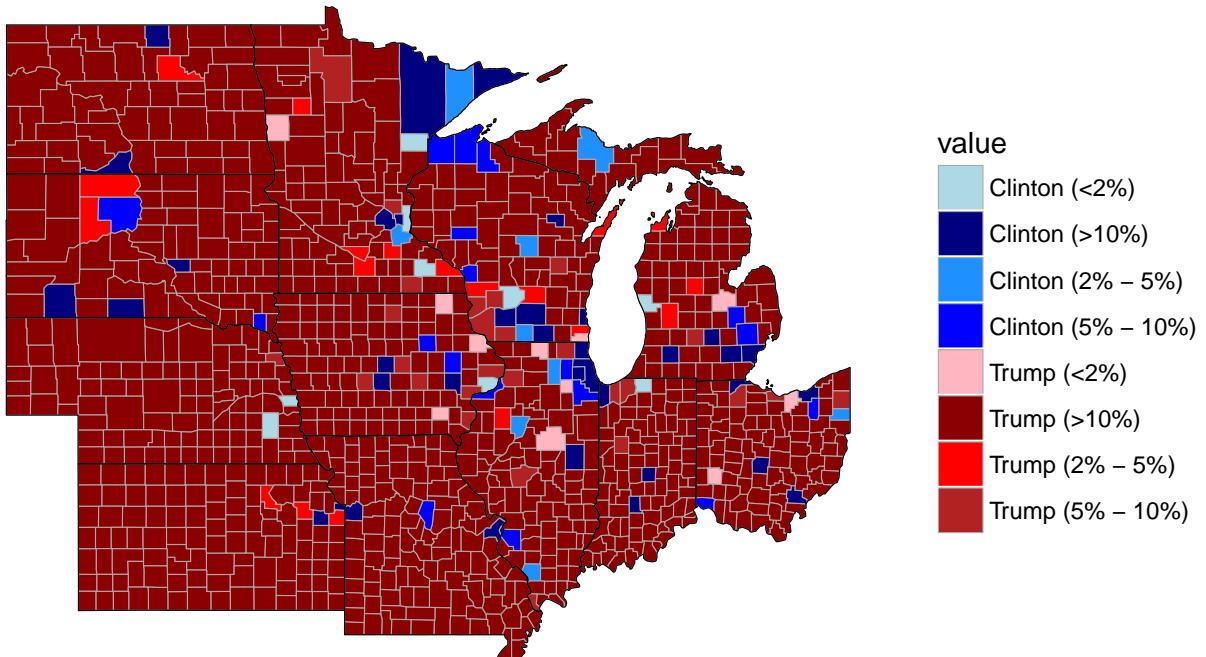
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
county_SE
```

## County Winner Margin % – South East



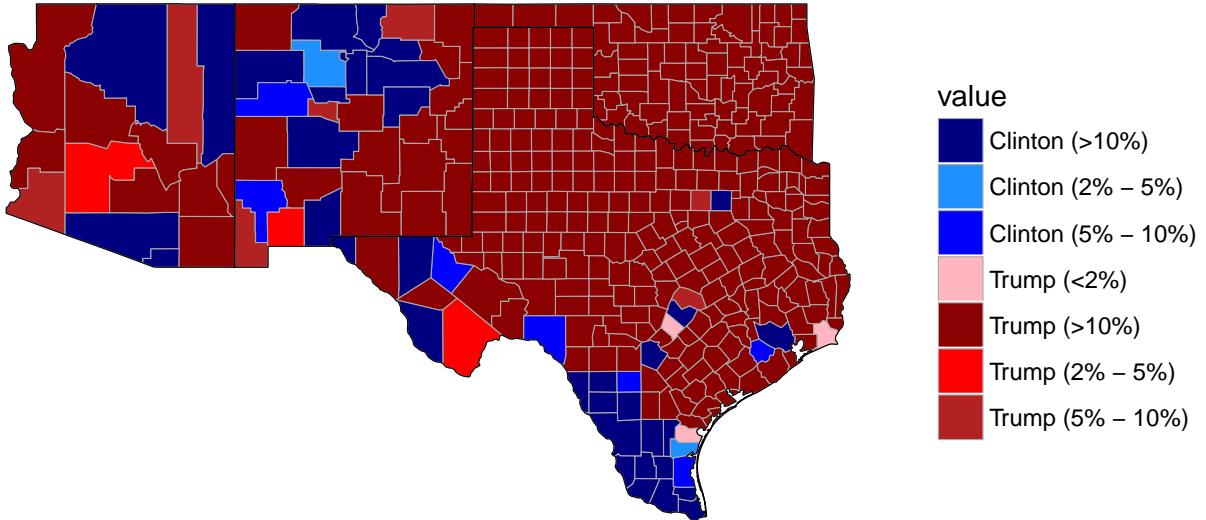
```
##Mid West Region
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - Mid West"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue","navy", "dodgerblue1","blue", "lightpink", "darkred", "red", "darkblue"))
c$set_zoom(c("ohio","michigan","indiana","illinois","wisconsin","minnesota","iowa","missouri","north dakota"))
county_MW = c$render() +
  theme(legend.position = "right")
county_MW
```

## County Winner Margin % – Mid West



```
##South West Region
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - South West"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("navy", "dodgerblue1","blue", "lightpink", "darkred","red"))
c$set_zoom(c("texas","oklahoma","new mexico","arizona"))
county_SW = c$render() +
  theme(legend.position = "right")
county_SW
```

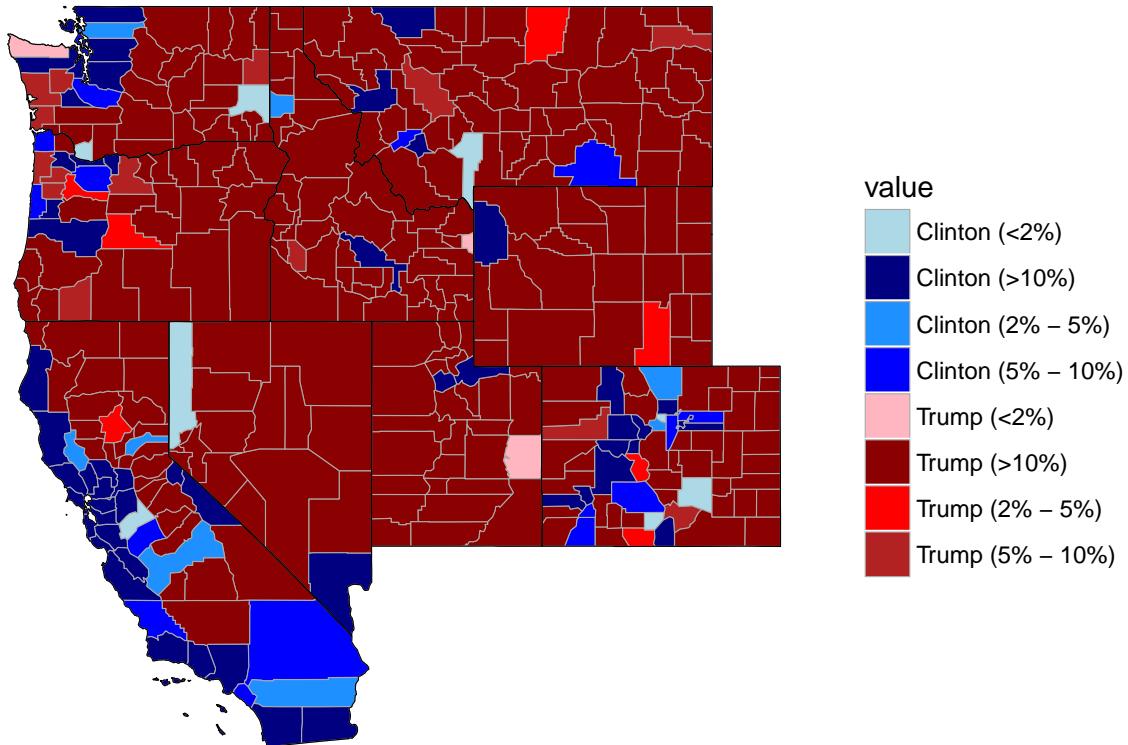
## County Winner Margin % – South West



```
##West Region
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - West"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue", "navy", "dodgerblue1", "blue", "lightpink", "darkred", "red", "darkred"))
c$set_zoom(c("colorado", "wyoming", "montana", "idaho", "utah", "nevada", "california", "oregon", "washington", "arizona", "newmexico"))
county_W = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_W
```

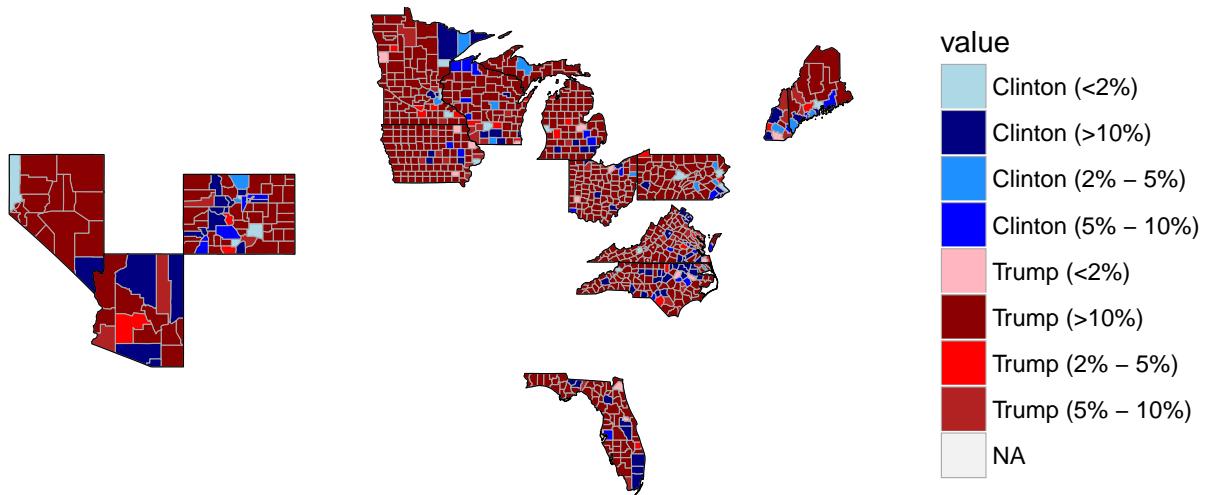
## County Winner Margin % – West



```
#Explore Vote Count by Swing States
c = CountyChoropleth$new(county_winner)
c$title = "County Winner Margin % - Swing States"
c$add_state_outline = TRUE
c$legend = "County Winner Margin"
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("lightblue","navy", "dodgerblue1","blue", "lightpink", "orange", "red", "darkred"))
c$set_zoom(c("new hampshire","pennsylvania","ohio","michigan","north carolina","florida","arizona","iowa"))
county_swing = c$render() +
  theme(legend.position = "right")
```

```
## Warning in self$bind(): The following regions were missing and are being
## set to NA: 51515
county_swing
```

## County Winner Margin % – Swing States



## Analyze Counties that Flipped 2012 to 2016

```

votes$flips = NA

for(i in seq(1:dim(votes)[1])){
  if(votes[i,9] > votes[i,8] && votes[i,19] > votes[i,20]){
    votes[i,99] = "OBAMA to TRUMP"
  } else if(votes[i,9] < votes[i,8] && votes[i,19] < votes[i,20]){
    votes[i,99] = "ROMNEY to CLINTON"
  } else {
    votes[i,99] = "Solid County"
  }
}

flips = votes[,c(1,99)]
colnames(flips) = c("region","value")

c = CountyChoropleth$new(flips)
c$title = "County Flips from 2012 to 2016"
c$add_state_outline = TRUE
c$legend = "County Status"
c$set_num_colors(3)
c$ggplot_scale = scale_fill_manual(values = c("red","blue","white"))
county_flips = c$render() +

```

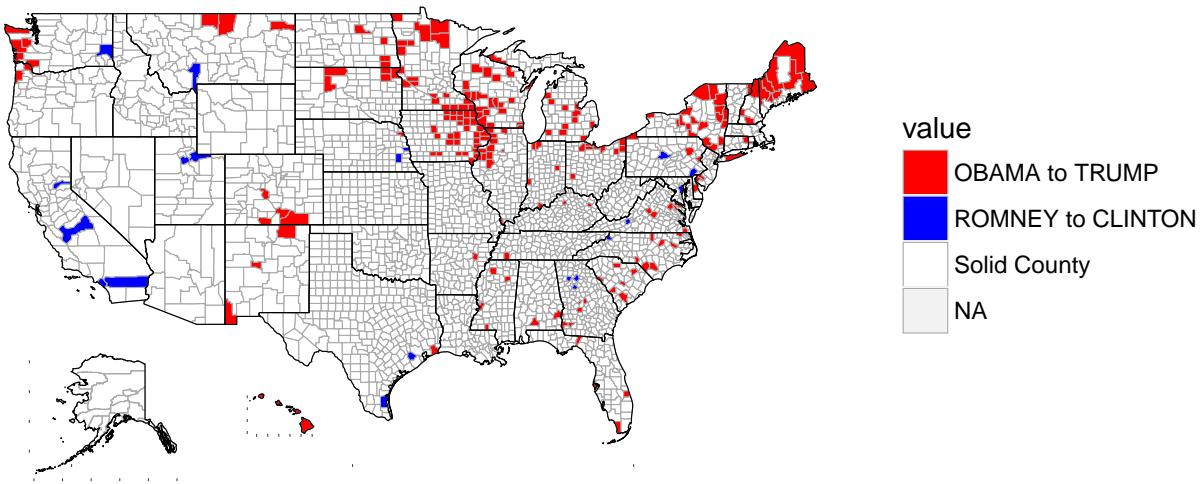
```

    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 2180, 2188, 2240, 2090, 2198,
## 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 2070, 2110, 2130, 2185,
## 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_flips

```

## County Flips from 2012 to 2016



```

#Number of Clinton Flips
length(which(votes$flips == "ROMNEY to CLINTON"))

## [1] 20

#Number of Trump Flips
length(which(votes$flips == "OBAMA to TRUMP"))

## [1] 218

#Number of counties that did not change
length(which(votes$flips == "Solid County"))

## [1] 2874

```

## Exploratory Analysis - Religion

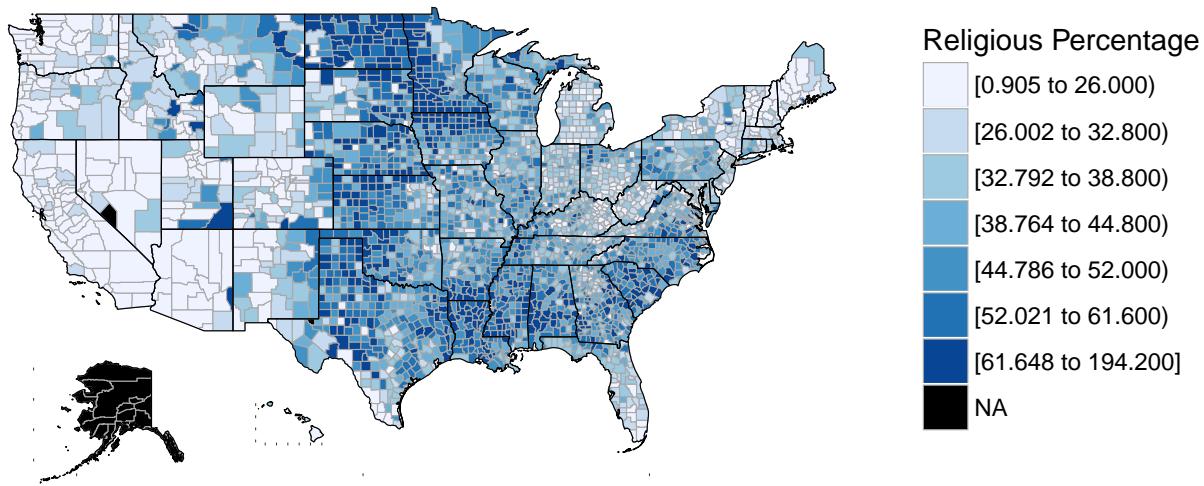
Explore religious variables

```
#total religious population
religious = votes[,c(1,83)]
colnames(religious) = c("region","value")

c= CountyChoropleth$new(religious)
c$title = "Total Religious Population"
c$add_state_outline = TRUE
c$legend = "Religious Percentage"
county_religious = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_religious
```

### Total Religious Population



```
#Evangelical Population
evangelical = votes[,c(1,84)]
colnames(evangelical) = c("region","value")
evangelical$value = cut(evangelical$value, breaks = c(0,1,5,10,20,Inf))

c= CountyChoropleth$new(evangelical)
```

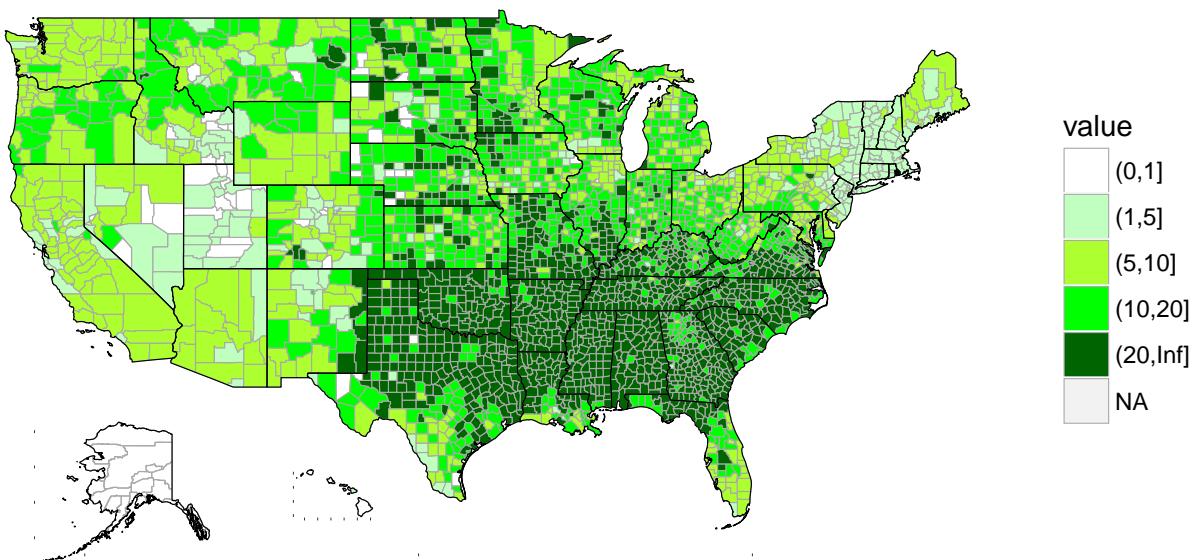
```

c$title = "Evangelical Population"
c$add_state_outline = TRUE
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("white", "darkseagreen1", "greenyellow", "green", "darkgreen"))
c$legend = "Evangelical Percentage"
county_evangelical = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 16081, 31007, 2050, 2105, 2122, 49009, 46075, 46117, 2150, 2164,
## 48301, 2180, 38087, 49033, 2188, 2240, 2090, 2198, 15005, 31005, 2100,
## 2170, 48269, 51515, 2016, 2060, 48109, 2290, 31165, 32029, 30103, 38085,
## 30039, 2282, 48261, 31113, 8014, 32009, 31085, 31117, 8047, 49029, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 8023, 2013, 2261, 2270,
## 2275, 16071, 16025, 16033, 16041
county_evangelical

```

## Evangelical Population



```

#Catholic Population
catholic = votes[,c(1,87)]
colnames(catholic) = c("region", "value")
catholic$value = cut(catholic$value, breaks = c(0,1,5,10,20,Inf))

c= CountyChoropleth$new(catholic)
c$title = "Catholic Population"
c$add_state_outline = TRUE
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("white", "thistle1", "plum3", "purple", "purple4"))

```

```

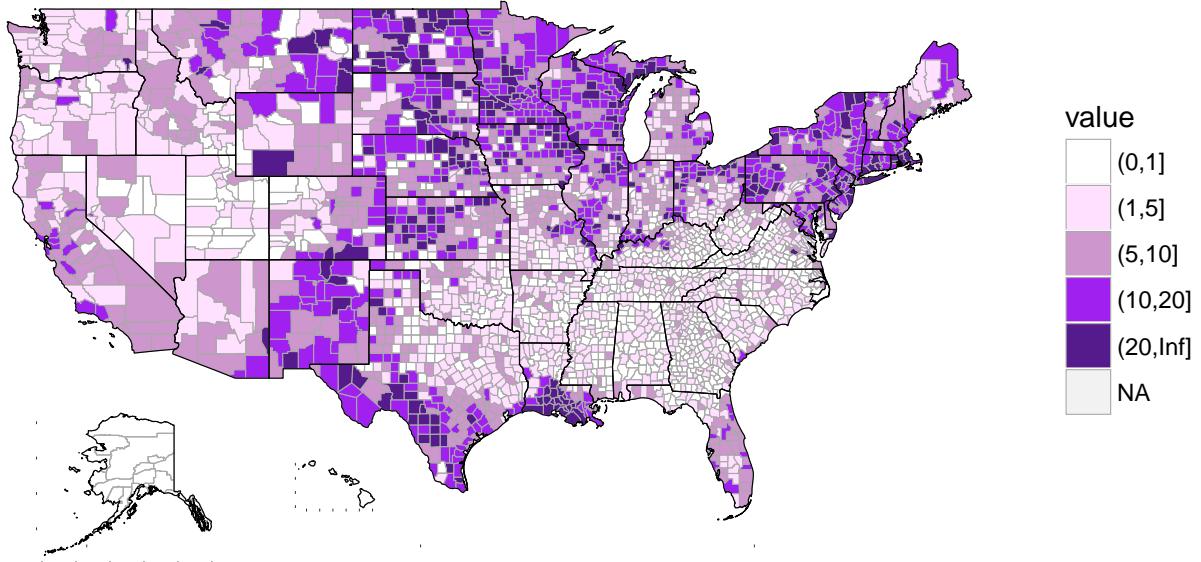
c$legend = "Catholic Percentage"
county_catholic = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 16081, 28009, 28015, 28021, 28031, 13239, 47025, 47033, 47061,
## 31169, 39105, 47067, 47087, 47095, 47135, 47137, 40029, 48045, 48081,
## 38027, 38039, 18115, 40085, 40099, 40107, 30071, 48403, 48417, 48431,
## 30109, 31007, 35021, 47175, 45061, 31115, 28101, 28119, 2050, 28129, 40149,
## 29017, 48447, 49001, 29061, 29067, 29079, 37011, 2105, 42023, 17169, 41049,
## 29129, 37095, 37111, 37143, 2122, 13125, 49009, 49023, 48033, 29175, 29181,
## 29197, 29203, 13169, 45017, 46063, 46075, 13197, 13201, 2150, 13195, 13205,
## 13209, 13213, 13221, 13229, 13231, 13235, 13269, 20187, 20189, 20207,
## 21201, 13243, 22091, 13253, 13265, 13281, 13289, 13295, 13301, 2164, 48301,
## 20049, 56017, 56019, 54027, 54059, 56023, 51015, 51025, 51036, 51049,
## 2180, 51069, 51081, 51091, 51103, 53059, 54017, 54043, 21007, 21061, 21069,
## 21131, 38087, 49033, 49055, 1041, 1057, 1129, 21165, 2188, 51079, 12129,
## 13011, 13019, 13027, 21187, 13033, 13061, 2240, 5149, 28023, 1019, 2090,
## 13007, 13065, 28069, 22013, 2198, 47127, 8079, 47133, 47159, 45069, 46077,
## 51097, 1035, 1063, 1075, 12077, 29185, 30021, 40061, 40069, 21031, 5109,
## 5117, 13307, 13315, 15005, 32011, 21063, 32027, 21087, 13105, 21103, 31005,
## 49017, 48059, 21137, 48075, 2100, 2170, 1105, 1111, 17087, 17151, 48119,
## 48269, 18005, 13143, 13183, 13193, 13207, 13219, 13237, 13249, 37007,
## 37033, 37073, 51133, 51179, 51515, 13259, 13283, 20025, 20033, 37179,
## 1133, 2016, 2060, 21203, 21235, 22025, 22083, 48101, 48111, 48125, 48345,
## 48351, 51163, 51181, 51183, 48197, 48237, 51640, 51685, 51750, 53069, 8113,
## 2290, 18171, 20129, 5021, 21119, 21177, 19051, 19185, 37079, 20021, 28055,
## 28111, 28125, 28131, 47023, 40067, 40105, 40151, 28037, 40129, 28061,
## 31165, 31175, 28161, 29005, 29025, 32015, 30103, 38085, 39163, 47073,
## 47097, 47121, 48407, 48495, 29199, 31015, 31021, 24019, 29063, 37015,
## 37029, 40001, 40007, 40041, 47171, 29227, 37177, 31103, 37131, 5075, 5077,
## 2282, 16007, 26083, 18155, 13167, 13177, 13287, 54063, 51071, 51077, 51089,
## 51159, 51175, 51570, 51735, 47169, 5049, 5127, 47015, 38083, 13251, 13263,
## 13273, 21223, 21089, 51021, 51027, 51037, 29211, 8014, 30037, 31137, 31171,
## 8025, 31183, 32009, 32033, 30069, 30107, 31009, 31073, 31085, 31097, 31117,
## 28103, 38007, 12125, 13001, 45005, 45009, 47007, 47057, 13055, 47081,
## 47173, 45049, 46095, 13079, 41069, 48393, 48433, 48009, 48011, 48079,
## 48095, 8053, 48159, 8057, 48247, 48263, 48349, 51530, 8111, 54013, 49029,
## 49031, 51007, 51017, 51063, 51075, 51111, 1029, 1037, 1059, 1067, 1085,
## 2070, 2110, 2130, 2185, 2195, 2220, 2230, 5147, 6003, 1119, 1131, 2020,
## 2068, 1007, 1011, 6049, 1065, 2013, 13149, 2261, 2270, 13093, 13101, 13119,
## 8061, 12089, 13003, 13005, 13023, 13025, 13037, 13053, 2275, 12041, 1079,
## 8081, 8103, 5025, 5073, 5081, 5099, 13321, 5013, 16071, 16077, 5101, 5111,
## 17047, 5129, 16025, 16033, 16041, 13309, 16065, 13313, 13141, 13155, 13159,
## 13171, 13319, 20099, 22081, 21139, 21153, 21159, 13181, 19075, 16051,
## 20017, 13211

county_catholic

```

## Catholic Population



```
#Mormon Population
mormon = votes[,c(1,89)]
colnames(mormon) = c("region", "value")
mormon$value = cut(mormon$value, breaks = c(0,1,5,10,20,Inf))

c= CountyChoropleth$new(mormon)
c$title = "Mormon Population"
c$add_state_outline = TRUE
c$legend = "Mormon Percentage"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("white", "lightpink", "lightpink3", "firebrick1", "firebrick"))
county_mormon = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 1001, 27097, 27099, 27111, 27119, 27129, 27133, 19059, 27141,
## 27149, 27157, 27163, 28005, 17005, 28009, 28011, 28015, 28021, 19149,
## 28045, 28051, 28053, 17009, 28067, 28073, 13239, 27077, 45031, 45035,
## 45037, 47017, 47021, 47025, 47033, 47041, 47047, 23015, 28041, 31149,
## 31151, 17035, 31169, 31181, 32005, 32013, 39105, 39107, 39117, 39125,
## 39129, 39139, 39149, 39161, 47067, 47071, 47077, 47083, 47087, 17065,
## 47095, 47101, 47107, 47109, 47111, 47119, 47135, 47137, 1107, 18051, 18059,
## 33019, 39167, 39175, 40003, 40011, 40025, 40029, 40035, 40045, 40055,
## 48045, 48055, 48065, 48073, 48077, 48081, 48087, 24047, 25007, 25015,
## 34033, 34041, 30055, 37195, 37199, 38005, 38009, 38027, 38029, 38037,
## 38039, 38043, 38047, 38053, 18115, 38059, 38063, 40085, 40091, 40099,
## 18125, 40101, 40107, 26003, 18131, 30091, 30097, 1121, 18139, 38065, 38067,
```

```

## 38071, 38075, 38081, 38089, 38093, 38097, 39001, 18153, 39011, 39013,
## 39019, 48369, 18173, 48385, 48387, 48399, 48403, 48417, 48419, 48427,
## 18179, 48431, 26019, 26027, 30109, 31007, 31011, 31013, 31019, 31025,
## 31029, 31039, 31051, 31057, 31071, 19009, 39033, 35019, 35021, 35025,
## 35033, 47143, 47147, 47155, 47161, 47167, 19021, 47175, 45055, 45061,
## 45065, 45071, 45073, 26041, 19031, 17131, 13191, 31079, 31083, 31087,
## 31099, 19039, 31101, 31105, 31115, 31119, 28097, 28101, 28119, 2050, 28129,
## 36013, 40137, 40145, 17079, 40149, 41013, 41021, 26087, 26093, 26095,
## 28141, 28143, 17103, 28155, 28157, 28163, 29017, 29023, 29035, 29041,
## 29045, 17107, 36041, 36051, 36073, 48435, 48437, 48447, 48483, 17129,
## 48489, 26071, 26131, 26135, 17139, 29051, 29055, 29057, 29067, 29073,
## 17145, 29087, 2105, 17155, 36093, 36099, 42023, 17169, 45089, 46033, 46039,
## 46045, 46051, 17175, 46059, 26159, 27011, 27017, 27025, 27041, 27043,
## 27059, 37037, 17189, 37059, 37069, 37075, 37077, 17203, 42029, 42049,
## 42067, 42073, 27063, 27065, 27069, 29111, 29125, 29129, 29139, 29141,
## 29153, 29157, 37095, 37115, 18033, 37121, 37139, 37143, 37153, 2122, 13125,
## 42109, 42119, 13129, 48017, 48023, 48033, 13131, 48035, 29171, 29186,
## 29197, 29207, 37169, 39071, 39077, 44001, 44003, 45001, 45017, 45023,
## 46063, 46065, 46069, 46075, 46079, 46085, 46097, 46101, 46115, 46117,
## 46127, 30005, 30019, 31129, 13197, 31133, 19015, 19019, 19023, 19027,
## 13201, 17091, 17093, 17099, 17101, 17117, 17125, 17127, 2150, 13189, 13195,
## 13199, 13205, 13209, 13213, 13221, 13229, 13231, 13225, 13235, 13241,
## 13247, 13257, 13267, 13269, 20183, 20187, 20197, 20207, 21191, 21201,
## 21205, 21207, 21221, 13243, 21233, 21237, 21239, 22005, 22091, 22093,
## 22099, 22113, 13253, 21013, 21015, 21027, 17137, 13265, 17147, 17153,
## 17191, 13279, 13281, 13289, 13301, 20041, 20047, 13285, 20053, 20063,
## 20073, 20077, 20087, 22023, 22031, 22035, 22041, 22043, 13303, 21039,
## 21041, 21057, 21065, 21079, 21085, 2164, 20027, 21091, 21097, 48267, 48271,
## 48281, 48285, 48287, 48291, 48293, 48295, 48301, 48305, 48317, 48327,
## 48331, 20039, 48333, 51810, 51840, 53003, 53017, 20049, 53023, 51600,
## 55107, 55111, 55119, 55125, 20065, 56017, 56019, 54025, 54033, 20075,
## 54045, 54051, 54053, 54059, 54065, 54069, 54075, 20085, 54087, 54091,
## 54093, 54099, 54103, 54105, 55011, 55013, 20095, 55019, 55021, 55023,
## 50003, 20105, 50011, 51005, 51011, 51019, 20115, 51031, 51033, 51036,
## 51045, 51049, 51051, 54081, 2180, 20127, 51069, 51081, 51091, 51095, 51103,
## 51119, 50025, 20135, 54017, 54029, 54043, 54055, 54073, 20145, 54095,
## 51115, 22111, 21001, 21005, 21007, 21019, 21037, 21049, 21061, 21069,
## 21081, 21109, 21125, 21131, 40037, 20163, 37187, 38003, 38013, 38025,
## 38041, 38055, 38069, 38087, 38095, 39021, 54109, 55027, 50013, 20185,
## 51009, 51023, 51035, 51053, 51065, 1027, 20195, 1115, 1129, 21165, 21181,
## 19043, 20203, 19073, 19081, 19091, 19115, 19131, 19147, 19157, 20205,
## 19165, 19187, 19197, 35059, 2188, 36077, 51079, 12129, 13011, 21187, 13033,
## 13039, 13061, 2240, 21189, 6091, 8011, 8019, 20023, 27071, 27079, 27087,
## 27101, 27107, 27125, 27131, 27143, 27159, 27169, 28007, 28035, 28043,
## 36113, 42025, 42053, 21219, 42075, 42099, 1013, 1019, 21229, 2090, 8049,
## 12121, 12133, 22001, 13007, 13035, 13047, 13065, 13075, 28057, 28069,
## 22119, 22125, 22013, 25003, 45033, 47051, 47075, 2198, 47099, 47127, 13085,
## 13099, 13117, 8055, 8065, 8079, 8089, 12007, 22077, 26059, 26113, 26119,
## 27013, 27023, 27033, 47133, 47159, 47165, 22105, 45059, 45069, 45087,
## 46025, 46037, 46049, 46057, 46067, 46077, 51097, 51109, 1035, 1039, 1053,
## 1063, 21003, 1075, 12047, 12067, 12077, 5011, 5037, 5055, 5065, 5079,
## 29115, 29121, 29163, 29173, 29185, 29223, 46091, 21025, 46107, 46119,
## 46129, 40057, 40061, 40069, 40075, 40093, 40103, 5141, 21031, 40133, 40141,
## 5117, 5135, 13307, 13311, 13315, 15005, 21053, 17017, 31123, 31127, 31143,

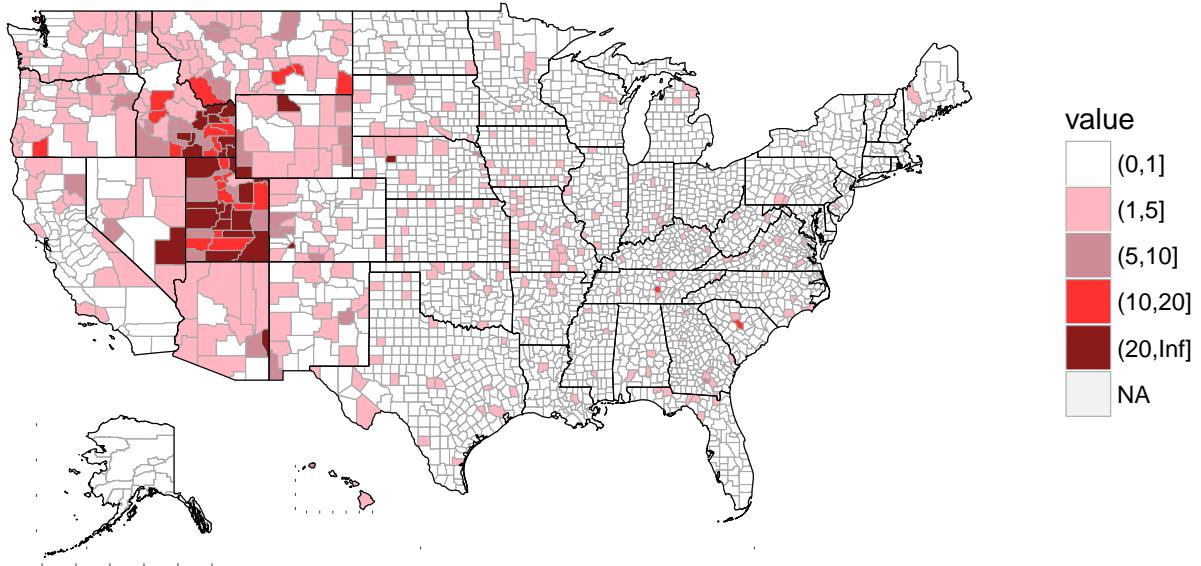
```

```

## 31167, 31179, 31185, 32011, 21063, 32027, 33017, 21077, 48363, 48373,
## 48405, 48413, 48421, 48455, 13083, 21087, 13111, 8071, 5095, 17025, 17039,
## 21099, 17061, 17069, 18049, 18075, 18093, 18113, 21103, 18119, 30049,
## 30075, 31001, 31005, 31017, 31027, 31041, 31059, 31069, 31077, 48493,
## 21121, 47183, 48019, 48059, 5145, 21137, 48075, 48089, 2100, 2170, 1105,
## 1111, 21143, 19003, 19025, 19035, 17071, 17075, 17087, 17123, 17151, 17199,
## 31107, 28077, 28081, 21157, 28107, 28123, 28133, 28145, 28159, 29003,
## 29039, 29059, 48107, 48119, 48131, 48143, 48153, 48163, 21175, 48173,
## 48175, 48219, 48255, 48269, 48279, 48289, 8033, 19047, 18027, 13127, 13133,
## 13163, 13183, 13193, 13207, 13219, 13227, 13237, 13249, 29083, 29093,
## 19063, 37003, 37007, 37009, 37073, 37085, 19067, 37123, 48299, 48335,
## 48343, 51127, 19079, 51515, 51620, 51680, 51720, 51740, 13259, 13271,
## 13283, 20025, 20031, 20033, 19095, 20069, 20081, 20093, 20101, 20111,
## 20123, 20133, 20139, 20151, 19105, 20159, 37157, 37173, 39069, 39115,
## 39127, 39137, 39165, 40005, 19121, 55053, 55067, 55078, 55099, 55121,
## 55135, 2016, 2060, 20179, 21197, 19137, 21203, 21215, 22007, 22021, 22025,
## 22047, 22059, 22067, 22083, 48101, 48105, 48109, 48111, 48125, 48133,
## 19151, 48145, 48151, 48193, 48345, 48351, 19161, 51137, 51139, 51169,
## 51171, 51181, 55035, 55037, 55041, 55043, 55047, 55049, 55057, 53043,
## 48197, 19181, 48211, 48235, 48237, 48239, 48243, 19195, 48253, 48259,
## 51191, 51195, 51520, 51610, 20005, 51640, 51678, 51683, 51685, 51710,
## 51750, 51790, 55075, 20015, 55077, 55083, 55091, 55093, 55097, 53069,
## 27073, 54005, 54009, 54011, 54015, 54019, 8093, 8107, 8113, 8115, 5125,
## 2290, 18171, 27085, 19005, 17059, 27093, 20129, 20137, 20153, 20175, 22065,
## 5021, 21119, 21127, 21133, 21149, 21155, 19051, 19065, 27113, 19071, 19083,
## 19097, 19109, 18111, 19119, 19133, 19143, 19167, 27121, 19173, 19185,
## 19191, 20001, 20007, 22071, 27075, 27123, 27127, 27151, 27155, 27165,
## 27167, 27173, 28019, 28027, 27147, 19117, 37053, 37079, 20021, 28055,
## 28063, 27153, 22087, 38021, 38023, 38033, 38049, 28105, 27161, 28111,
## 28113, 28125, 35051, 42043, 28003, 45029, 6043, 28013, 47023, 38051, 40067,
## 40077, 40089, 40095, 40105, 28017, 31139, 19037, 17083, 17085, 28037,
## 47055, 23025, 40129, 26001, 41025, 26089, 26105, 28147, 28061, 47029,
## 31165, 31175, 26011, 28065, 30079, 26109, 28149, 28161, 29005, 29025,
## 39095, 45011, 22121, 32029, 39111, 39123, 30105, 38085, 38099, 29031,
## 41055, 23009, 41063, 29113, 39163, 23029, 47089, 47091, 47097, 47115,
## 47121, 47123, 47131, 48377, 48391, 48407, 36079, 48443, 48461, 48473,
## 48479, 48495, 48501, 48007, 29199, 26013, 31015, 31021, 26153, 46071,
## 46081, 46089, 46105, 46109, 34001, 24029, 31043, 31049, 31061, 29069,
## 29081, 29089, 37015, 37023, 37029, 29133, 29143, 29149, 29155, 37113,
## 24039, 40001, 40007, 40021, 40023, 40033, 37189, 48051, 24041, 47153,
## 47163, 47171, 47181, 36097, 36105, 36115, 46009, 46021, 29209, 26009,
## 29227, 37177, 39067, 39073, 48071, 26015, 45077, 26053, 46047, 26023,
## 46053, 27007, 27015, 27021, 27027, 46135, 30025, 30033, 30045, 25005,
## 25019, 26037, 31091, 31095, 31103, 28093, 27031, 27049, 27055, 37131,
## 37137, 37149, 42103, 34025, 26057, 35005, 38001, 5041, 5057, 5075, 5077,
## 17013, 17021, 17027, 18023, 2282, 26083, 5105, 5107, 18123, 18147, 18155,
## 18163, 26085, 18039, 13145, 13167, 13177, 13179, 17161, 17171, 17173,
## 17181, 17193, 26097, 13287, 13291, 21105, 48311, 48315, 48337, 54071,
## 51077, 51083, 5108
```

county\_mormon

## Mormon Population



```
#Jewish Population
jewish = votes[,c(1,88)]
colnames(jewish) = c("region", "value")
jewish$value = cut(jewish$value, breaks = c(0,1,2,5,10,Inf))

c= CountyChoropleth$new(jewish)
c$title = "Jewish Population"
c$add_state_outline = TRUE
c$legend = "Jewish Percentage"
c$set_num_colors(5)
c$ggplot_scale = scale_fill_manual(values = c("white", "cyan", "cyan3", "blue", "darkblue"))
county_jewish = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 1001, 1009, 1099, 16067, 27091, 27095, 27097, 27099, 27105,
## 27111, 27115, 27117, 27119, 16081, 27129, 27133, 19059, 27141, 27145,
## 27149, 27157, 27163, 27171, 28005, 17005, 28009, 28015, 28021, 28031,
## 28039, 19149, 28045, 28051, 28053, 17009, 28059, 28067, 28073, 23007,
## 13239, 27077, 45031, 45035, 45037, 47011, 47017, 47021, 47025, 47033,
## 47035, 47041, 47047, 47049, 47059, 17029, 47061, 23015, 23021, 23023,
## 23031, 28041, 31149, 31151, 31155, 17035, 31161, 31169, 31173, 31181,
## 32005, 32007, 32013, 32017, 32023, 17049, 39105, 39107, 39117, 39125,
## 39129, 39133, 39135, 39141, 17055, 39149, 39157, 39161, 47067, 47071,
## 47077, 47083, 47087, 17065, 47095, 47101, 47107, 47109, 47111, 47119,
## 47125, 47135, 47137, 24011, 1107, 18051, 24021, 24023, 32510, 33003, 33009,
## 18059, 33019, 39167, 39171, 39175, 40003, 40011, 18069, 40013, 40017,
```

```

## 40025, 40029, 40035, 40039, 40045, 40049, 40055, 37193, 18079, 47141,
## 48045, 48049, 48055, 48065, 48067, 48073, 48077, 48081, 18085, 48087,
## 48091, 18095, 34033, 35007, 30055, 30057, 37195, 37199, 38005, 38009,
## 38027, 38029, 38037, 38039, 38043, 38047, 38053, 18115, 38059, 38063,
## 47001, 47003, 40065, 40083, 40085, 40091, 40099, 18125, 40107, 40111,
## 40117, 40119, 40125, 26003, 26005, 18131, 26007, 30063, 30065, 30071,
## 30077, 30083, 30087, 30091, 30097, 30101, 1121, 18139, 38065, 38067, 38071,
## 38075, 38081, 38089, 38093, 38097, 38101, 39001, 18153, 39005, 39011,
## 39013, 39019, 48361, 48369, 48383, 18173, 48385, 48387, 48395, 48399,
## 48403, 48415, 48417, 48419, 48427, 18179, 48431, 26019, 26027, 26031,
## 26033, 30109, 31007, 31011, 18183, 31013, 31019, 31025, 31029, 31033,
## 31039, 31045, 31051, 31057, 31071, 19009, 31075, 39025, 39033, 39037,
## 39041, 35019, 19017, 35021, 35025, 35033, 35039, 47143, 47147, 47149,
## 47155, 47161, 47167, 19021, 47175, 47177, 45055, 45061, 45065, 45071,
## 45073, 26041, 26043, 19031, 26051, 26069, 17131, 13191, 31079, 31081,
## 31083, 31087, 31099, 19039, 31101, 31105, 31115, 31119, 28091, 28097,
## 28101, 28109, 28119, 2050, 17073, 28121, 28129, 35041, 35057, 35061, 17077,
## 36033, 40131, 40135, 40137, 40145, 17079, 40149, 41003, 41005, 41011,
## 41013, 41021, 41027, 26079, 26087, 26093, 26095, 26099, 26101, 28137,
## 28141, 28143, 28153, 17103, 28155, 28157, 28163, 29007, 29017, 29023,
## 29029, 29035, 29041, 29045, 17107, 36041, 36045, 36051, 36073, 36075,
## 48435, 17121, 48437, 48447, 48451, 48457, 48467, 48477, 48483, 17129,
## 48485, 48489, 48499, 49001, 49007, 26071, 26131, 26135, 26145, 17139,
## 26147, 26157, 29047, 29055, 29057, 29061, 29067, 29073, 17145, 29079,
## 29087, 37011, 37013, 37019, 37025, 13223, 36089, 2105, 17155, 36099, 36107,
## 36117, 42023, 17169, 45089, 46005, 46011, 46019, 46023, 46033, 46039,
## 46041, 46045, 46051, 17175, 46059, 26159, 27001, 27003, 27011, 27017,
## 27025, 27035, 17179, 27041, 27043, 27045, 27059, 37035, 37037, 37039,
## 37041, 17189, 37059, 37061, 37065, 37069, 37075, 37077, 37083, 37087,
## 17203, 42061, 42067, 18009, 41033, 41049, 41059, 41065, 41071, 18011,
## 27063, 27065, 27069, 29105, 29111, 29119, 29125, 29129, 29139, 29141,
## 18021, 29147, 29153, 29157, 29161, 29167, 37095, 37099, 37105, 37111,
## 37115, 18033, 37121, 37135, 37139, 37143, 37153, 2122, 13125, 42109, 42111,
## 42115, 42119, 49009, 49013, 13129, 49019, 49023, 48001, 48013, 48015,
## 48017, 48023, 48025, 48033, 13131, 48035, 48039, 29171, 29175, 29177,
## 29181, 29186, 29187, 29197, 29203, 13139, 29207, 29213, 29225, 30003,
## 37159, 37163, 37169, 37175, 13157, 39071, 39077, 39087, 13169, 45001,
## 45007, 45017, 45023, 45025, 46063, 46065, 46069, 13175, 46075, 46079,
## 46085, 46093, 46097, 46101, 46113, 46115, 46117, 46121, 13187, 46127,
## 30005, 30009, 30015, 30019, 30023, 30029, 30035, 30041, 31129, 13197,
## 31133, 31141, 19007, 19011, 19015, 19019, 19023, 19027, 19033, 17081,
## 13201, 17091, 17093, 17101, 17105, 17109, 17117, 17125, 17127, 2150, 13217,
## 13185, 13189, 13195, 13199, 13205, 13209, 13213, 13221, 13229, 13231,
## 13225, 13235, 13241, 13247, 13255, 13257, 13267, 13269, 20183, 20187,
## 20189, 13233, 20197, 20207, 21191, 21193, 21201, 21205, 21207, 21217,
## 21221, 21231, 13243, 21233, 21237, 21239, 22005, 22091, 22093, 22097,
## 22099, 22113, 13253, 22117, 21011, 21013, 21015, 21027, 21029, 17133,
## 17137, 17141, 13265, 17147, 17153, 17159, 17165, 17177, 17191, 13277,
## 18001, 13275, 13279, 13281, 13289, 13295, 13301, 20035, 20041, 20047,
## 13285, 20051, 20053, 20057, 20063, 20073, 20077, 20079, 20087, 22011,
## 22015, 13293, 22023, 22031, 22035, 22041, 22043, 22049, 21035, 13303,
## 21039, 21041, 21045, 21057, 21065, 21071, 21079, 21083, 21085, 2164, 20027,
## 21091, 21097, 21101, 21107, 48267, 48271, 48277, 48281, 48285, 48287,
## 20029, 48291, 48293, 48295, 48301, 48305, 48307, 48317, 48323, 48327,

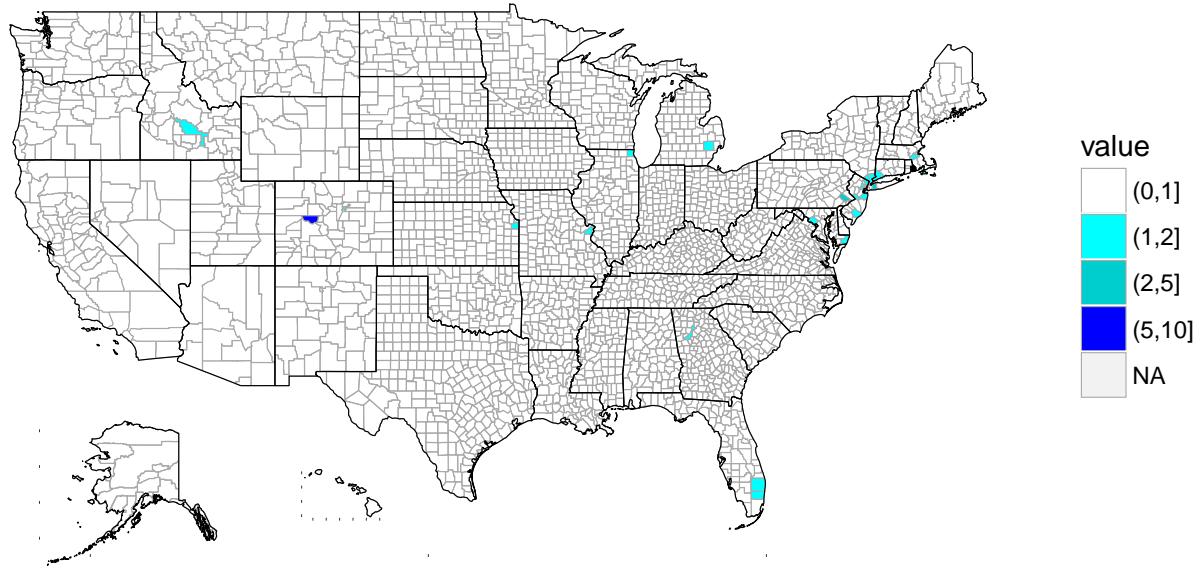
```

```

## 48331, 20039, 48333, 51800, 53001, 53003, 53015, 53017, 53019, 20049,
## 53023, 53025, 51600, 55107, 55111, 55113, 55119, 55123, 55125, 20065,
## 56003, 56009, 56017, 56019, 54023, 54025, 54027, 54033, 20075, 54037,
## 54045, 54051, 54059, 54065, 54075, 48341, 54083, 20085, 54087, 54091,
## 54093, 54097, 54099, 54103, 54105, 55011, 55013, 20095, 55019, 55021,
## 55023, 53029, 49039, 49045, 49049, 20105, 50011, 50015, 56023, 51005,
## 51011, 51013, 51015, 51019, 20115, 51025, 51031, 51033, 51036, 51045,
## 51049, 51051, 51061, 51067, 2180, 20127, 51069, 51073, 51081, 51085, 51091,
## 51095, 51103, 49037, 51119, 20135, 53037, 53039, 53059, 53075, 54029,
## 54043, 54073, 54085, 20145, 54095, 51057, 51115, 22095, 22111, 21001,
## 21005, 21007, 21019, 21037, 20155, 21049, 21061, 21069, 21081, 21093,
## 21109, 21125, 21131, 40037, 40047, 20163, 37187, 38003, 38013, 38025,
## 38041, 38055, 38069, 38087, 38095, 39021, 54109, 55015, 55027, 49027,
## 49033, 49041, 49055, 50013, 20185, 51003, 51009, 51023, 51035, 51065,
## 1003, 1027, 1041, 1057, 20195, 1091, 1103, 1115, 1129, 21147, 21165, 21181,
## 19041, 19043, 20203, 19049, 19073, 19081, 19091, 19099, 19115, 19131,
## 19147, 19157, 20205, 19165, 19187, 19197, 39031, 39045, 35017, 35037,
## 35059, 2188, 21183, 36017, 36031, 36049, 51079, 12129, 13011, 13019, 13027,
## 21187, 13033, 13039, 13061, 2240, 5149, 6011, 6027, 6063, 21189, 6091,
## 8011, 8019, 8027, 20013, 20023, 27071, 27079, 21199, 27087, 27101, 27107,
## 27125, 27131, 27143, 27159, 27169, 28007, 28023, 21209, 28043, 36101,
## 42025, 42037, 42053, 21219, 42057, 42099, 42117, 42131, 1005, 1013, 1019,
## 21229, 6061, 2090, 8041, 8049, 12093, 12121, 12133, 22001, 13007, 13035,
## 13047, 13065, 13075, 28057, 28069, 22119, 22125, 22013, 23017, 24015,
## 26039, 45021, 45033, 47009, 47019, 47051, 47063, 47075, 47085, 1017, 2198,
## 22053, 47099, 47127, 6035, 13085, 13099, 13117, 8051, 8055, 8065, 8079,
## 8089, 8117, 12007, 12019, 22077, 12027, 26059, 26063, 26113, 26119, 26137,
## 26149, 27005, 22089, 27013, 27023, 27033, 27047, 27061, 47133, 47145,
## 47159, 47165, 22105, 45047, 45059, 45069, 45087, 46015, 46025, 46037,
## 46049, 46057, 22115, 46067, 46077, 51097, 51109, 1035, 1039, 1049, 1053,
## 1063, 21003, 1075, 1077, 12047, 12067, 12077, 4001, 4007, 5011, 5023,
## 21009, 5037, 5039, 5055, 5065, 5079, 29099, 29115, 29121, 29135, 29145,
## 21017, 29163, 29173, 29185, 29201, 29215, 29223, 30007, 30021, 46091,
## 21025, 46107, 46119, 46129, 40057, 40061, 40069, 40075, 40093, 40103,
## 40115, 5141, 21031, 40133, 40141, 41009, 5109, 5117, 5135, 21043, 13307,
## 13311, 13315, 15005, 16005, 16027, 16039, 16063, 16075, 21053, 17017,
## 30047, 31123, 31127, 31143, 31153, 31167, 31179, 31185, 32011, 21063,
## 32027, 41023, 41061, 42009, 21077, 48363, 48373, 48389, 48405, 48413,
## 48421, 48455, 48471, 13083, 21087, 13097, 13105, 13111, 8071, 5095, 17025,
## 17039, 21099, 17045, 17061, 17069, 18049, 18063, 18075, 18093, 18099,
## 18113, 21103, 18119, 18133, 18145, 35011, 30049, 30053, 30075, 30085,
## 31001, 21115, 31005, 31017, 31027, 31041, 31059, 31069, 31077, 31089,
## 48481, 48493, 21121, 48503, 49005, 49017, 47183, 47187, 48003, 48019,
## 48027, 48041, 48059, 5145, 21137, 48075, 48083, 48089, 2100, 2170, 1105,
## 1111, 1113, 1123, 21143, 18165, 19003, 19025, 19035, 17071, 17075, 17087,
## 21151, 17123, 17135, 17151, 17163, 17187, 17199, 31107, 28077, 28085,
## 21157, 28107, 28123, 28133, 28145, 28159, 29003, 29015, 29027, 29039,
## 21169, 29049, 29059, 29071, 48107, 48119, 48131, 48143, 48153, 48163,
## 48171, 21175, 48173, 48175, 48187, 48205, 48209, 48219,
county_jewish

```

## Jewish Population

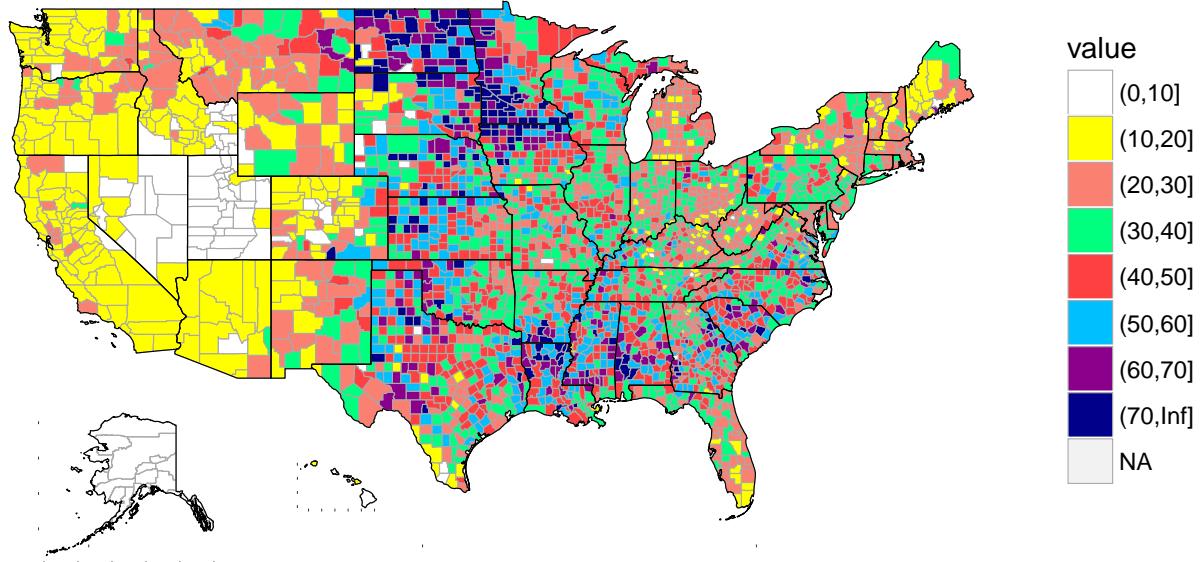


```
#Total Christian Population
votes$Christian = votes$Evangelical + votes$Protestant + votes$Catholic + votes$Historically_Black + votes$Other
christian = votes[,c(1,100)]
colnames(christian) = c("region","value")
christian$value = cut(christian$value, breaks = c(0,10,20,30,40,50,60,70,Inf))

c= CountyChoropleth$new(christian)
c$title = "Christian Population"
c$add_state_outline = TRUE
c$set_num_colors(8)
c$ggplot_scale = scale_fill_manual(values = c("white","yellow", "salmon","springgreen","brown1", "deepskyblue"))
c$legend = "Christian Percentage"
county_christian = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 16081, 31007, 2050, 2105, 2122, 49009, 46075, 2150, 2164, 48301,
## 2180, 49033, 2188, 2240, 2090, 2198, 15005, 2100, 2170, 48269, 51515, 2016,
## 2060, 2290, 2282, 8014, 32009, 31117, 49029, 2070, 2110, 2130, 2185, 2195,
## 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275, 16025
county_christian
```

## Christian Population



## Model Construction

### Prepare Data for Modeling

```
#change decimals to match the other percentage values
votes$Trump = votes$Trump * 100
votes$Clinton = votes$Clinton * 100
votes$Obama = votes$Obama * 100
votes$Romney = votes$Romney * 100
votes$White = votes$White * 100
votes$Black = votes$Black * 100
votes$Hispanic = votes$Hispanic * 100
votes$Clinton_Obama = votes$Clinton_Obama * 100
votes$Trump_Romney = votes$Trump_Romney * 100
votes$per_shift = votes$per_shift * 100
```

### Predict Clinton-Obama Deviation

```
CO_Dev_Predict = votes[,c(14:16,19,20,26:28,30:35,40,42:63,67:77,83:95,100)]
CO_Dev_Predict = na.omit(CO_Dev_Predict)
null_CO = lm(Clinton_Obama~1,data = CO_Dev_Predict)
```

```

full_CO = lm(Clinton_Obama~, data = CO_Dev_Predict)

CO_Dev = step(null_CO, scope=list(upper=full_CO), data=CO_Dev_Predict, direction="both")

votes$CO_Dev_Pred = predict(CO_Dev, votes)

```

### Predict Trump-Romney Deviation

```

TR_Dev_Predict = votes[,c(14:16,19,20,26:28,30:35,40,42:63,67:76,78,83:95,100)]

TR_Dev_Predict = na.omit(TR_Dev_Predict)

null_TR = lm(Trump_Romney~1, data = TR_Dev_Predict)
full_TR = lm(Trump_Romney~, data = TR_Dev_Predict)

TR_Dev = step(null_TR, scope=list(upper=full_TR), data=TR_Dev_Predict, direction="both")

votes$TR_Dev_Pred = predict(TR_Dev, votes)

```

### Predict Overall Deviation

```

Overall_Dev_Predict = votes[,c(14:16,19,20,26:28,30:35,40,42:63,67:76,83:95,98,100)]

Overall_Dev_Predict = na.omit(Overall_Dev_Predict)

null_Overall = lm(per_shift~1, data = Overall_Dev_Predict)
full_Overall = lm(per_shift~, data = Overall_Dev_Predict)

Overall_Dev = step(null_Overall, scope=list(upper=full_Overall), data=Overall_Dev_Predict, direction = "both")

votes$Overall_Dev_Pred = predict(Overall_Dev, votes)

```

### Deviation Graphics: Clinton-Obama

```

summary(CO_Dev)

##
## Call:
## lm(formula = Clinton_Obama ~ POP645213 + Black + Obama + Edu_batchelors +
##     NonEnglish + Protestant + SEX255214 + HSG495213 + Income +
##     Hispanic + White + votes_gop_2012 + INC110213 + MAN450207 +
##     WTN220207 + HSD310213 + AGE295214 + Mormon + Edu_highschool +
##     SB0415207 + LFE305213 + population_change + Catholic + Density +
##     total_votes_2012 + votes_dem_2012 + population2010 + HSD410213 +
##     BZA010213 + POP715213 + HSG445213 + BPS030214 + BZA110213 +
##     SB0001207 + AFN120207, data = CO_Dev_Predict)
##
## Residuals:
##    Min      1Q  Median      3Q     Max 
## -100000 -100000 -100000 -100000 -100000
##
```

```

## -9.197 -1.395  0.033  1.332 13.576
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)           -1.205e+01  1.893e+00 -6.366 2.24e-10 ***
## POP645213            3.307e-02  1.745e-02  1.895 0.058199 .
## Black                 1.706e-01  6.937e-03 24.588 < 2e-16 ***
## Obama                -2.241e-01  4.136e-03 -54.186 < 2e-16 ***
## Edu_batchelors        3.360e-01  1.067e-02 31.483 < 2e-16 ***
## NonEnglish            5.391e-02  1.397e-02  3.860 0.000116 ***
## Protestant             -2.703e-02  5.351e-03 -5.052 4.64e-07 ***
## SEX255214              2.108e-01  2.287e-02  9.217 < 2e-16 ***
## HSG495213              1.377e-05  1.148e-06 11.992 < 2e-16 ***
## Income                -7.876e-05  2.546e-05 -3.094 0.001992 **
## Hispanic               7.682e-02  9.086e-03  8.455 < 2e-16 ***
## White                  -4.670e-02  6.696e-03 -6.975 3.74e-12 ***
## votes_gop_2012         -3.426e-04  6.895e-05 -4.969 7.10e-07 ***
## INC110213              -2.228e-05  1.158e-05 -1.924 0.054468 .
## MAN450207              6.281e-08  1.790e-08  3.509 0.000456 ***
## WTN220207              -3.791e-08  1.737e-08 -2.182 0.029171 *
## HSD310213              1.661e+00  3.438e-01  4.833 1.41e-06 ***
## AGE295214              -1.304e-01  2.172e-02 -6.005 2.13e-09 ***
## Mormon                 4.633e-02  1.104e-02  4.195 2.80e-05 ***
## Edu_highschool          -3.837e-02  1.201e-02 -3.195 0.001413 **
## SB0415207              3.846e-02  9.685e-03  3.971 7.31e-05 ***
## LFE305213              -2.961e-02  1.113e-02 -2.661 0.007830 **
## population_change       2.790e-02  1.257e-02  2.220 0.026488 *
## Catholic                -1.157e-02  5.809e-03 -1.992 0.046437 *
## Density                 -1.018e-04  3.865e-05 -2.635 0.008460 **
## total_votes_2012        3.509e-04  6.914e-05  5.076 4.09e-07 ***
## votes_dem_2012          -3.549e-04  6.928e-05 -5.122 3.21e-07 ***
## population2010          -9.648e-06  2.803e-06 -3.442 0.000585 ***
## HSD410213              2.445e-05  9.459e-06  2.584 0.009799 **
## BZA010213              -2.103e-04  8.001e-05 -2.629 0.008615 **
## POP715213              4.256e-02  1.321e-02  3.221 0.001289 **
## HSG445213              -2.841e-02  9.159e-03 -3.102 0.001941 **
## BPS030214              -1.063e-04  6.592e-05 -1.613 0.106916
## BZA110213              6.774e-06  2.759e-06  2.456 0.014121 *
## SB0001207              2.486e-05  1.686e-05  1.474 0.140459
## AFN120207              -1.427e-07  9.784e-08 -1.458 0.144885
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.206 on 3073 degrees of freedom
## Multiple R-squared:  0.804, Adjusted R-squared:  0.8018
## F-statistic: 360.3 on 35 and 3073 DF, p-value: < 2.2e-16
votes$model_error_C0 = (votes$Clinton_Obama - votes$C0_Dev_Pred)

ME_C0 = votes[,c(1,104)]
colnames(ME_C0) = c("region","value")
ME_C0$value = cut(ME_C0$value, breaks = c(-10,-5,-1,1,5,10,Inf))

c= CountyChoropleth$new(ME_C0)

```

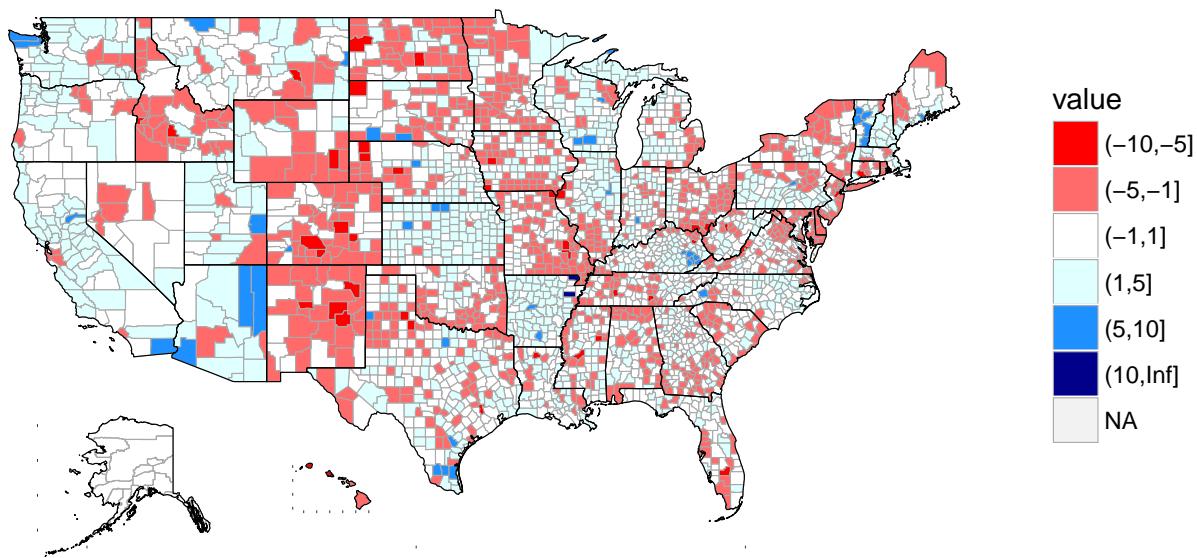
```

c$title = "Model Deviation: Clinton–Obama"
c$add_state_outline = TRUE
c$legend = "Model Deviation"
c$set_num_colors(6)
c$ggplot_scale = scale_fill_manual(values=c("red","indianred1","white","lightcyan1","dodgerblue","darkblue"))
county_ME_CO = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_ME_CO

```

## Model Deviation: Clinton–Obama



## Deviation Graphics: Trump–Romney

```

summary(TR_Dev)

##
## Call:
## lm(formula = Trump_Romney ~ Edu_batchelors + HSD310213 + Mormon +
##     Romney + Black + Hispanic + Christian + White + Income +
##     HSG495213 + LFE305213 + SEX255214 + votes_gop_2012 + NES010213 +
##     Edu_highschool + LND110210 + MAN450207 + AGE135214 + Other_Religion +
##     WTN220207 + Orthodox + INC110213 + Poverty + SB0415207 +

```

```

##      BZA110213 + Density + VET605213 + Jewish + HSG096213 + Obama +
##      AFN120207 + SB0315207 + HSG445213 + BZA115213, data = TR_Dev_Predict)
##
## Residuals:
##      Min       1Q   Median      3Q     Max
## -21.3646 -1.4701  0.0437  1.6070 18.0019
##
## Coefficients:
##                               Estimate Std. Error t value Pr(>|t|)
## (Intercept)        4.489e+01  6.852e+00  6.550 6.71e-11 ***
## Edu_batchelors -4.210e-01  1.315e-02 -32.004 < 2e-16 ***
## HSD310213        -2.480e+00  4.041e-01 -6.136 9.54e-10 ***
## Mormon           -2.518e-01  1.374e-02 -18.325 < 2e-16 ***
## Romney            -2.929e-01  6.622e-02 -4.423 1.01e-05 ***
## Black             -1.444e-01  9.071e-03 -15.920 < 2e-16 ***
## Hispanic          -1.195e-01  6.662e-03 -17.940 < 2e-16 ***
## Christian         2.357e-02  3.811e-03  6.185 7.04e-10 ***
## White              4.487e-02  8.625e-03  5.203 2.09e-07 ***
## Income             1.868e-04  3.063e-05  6.099 1.20e-09 ***
## HSG495213        -2.004e-05  1.322e-06 -15.156 < 2e-16 ***
## LFE305213         5.907e-02  1.360e-02  4.343 1.45e-05 ***
## SEX255214        -1.231e-01  2.621e-02 -4.696 2.77e-06 ***
## votes_gop_2012 -1.663e-05  4.492e-06 -3.702 0.000217 ***
## NES010213         2.898e-05  5.693e-06  5.090 3.79e-07 ***
## Edu_highschool -5.161e-02  1.467e-02 -3.518 0.000441 ***
## LND110210        -1.710e-04  4.487e-05 -3.810 0.000142 ***
## MAN450207        -5.789e-08  1.954e-08 -2.963 0.003066 **
## AGE135214        -2.449e-01  6.499e-02 -3.768 0.000168 ***
## Other_Religion   4.432e-02  1.730e-02  2.562 0.010451 *
## WTN220207         7.415e-08  1.927e-08  3.847 0.000122 ***
## Orthodox          6.386e-01  2.859e-01  2.233 0.025594 *
## INC110213         5.861e-05  1.502e-05  3.902 9.75e-05 ***
## Poverty            5.837e-02  1.788e-02  3.265 0.001107 **
## SB0415207        -2.763e-02  1.164e-02 -2.374 0.017678 *
## BZA110213        -8.215e-06  1.956e-06 -4.199 2.76e-05 ***
## Density            1.256e-04  4.285e-05  2.930 0.003410 **
## VET605213         2.484e-05  1.231e-05  2.018 0.043691 *
## Jewish             6.635e-01  2.557e-01  2.595 0.009512 **
## HSG096213        -3.147e-02  1.198e-02 -2.628 0.008643 **
## Obama             -1.031e-01  6.684e-02 -1.543 0.122909
## AFN120207         2.106e-07  1.211e-07  1.739 0.082180 .
## SB0315207         1.669e-02  1.032e-02  1.618 0.105734
## HSG445213        -1.999e-02  1.262e-02 -1.584 0.113403
## BZA115213        -1.211e-02  8.407e-03 -1.440 0.149921
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.713 on 3074 degrees of freedom
## Multiple R-squared:  0.7663, Adjusted R-squared:  0.7637
## F-statistic: 296.4 on 34 and 3074 DF,  p-value: < 2.2e-16
votes$model_error_TR = (votes$Trump_Romney - votes$TR_Dev_Pred)

ME_TR = votes[,c(1,105)]

```

```

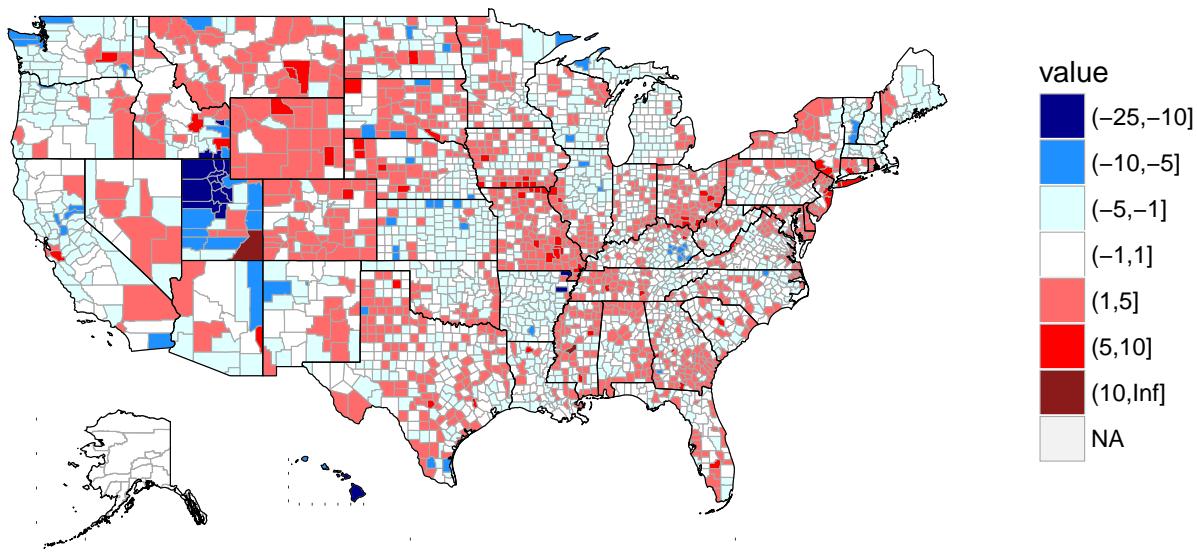
colnames(ME_TR) = c("region", "value")
ME_TR$value = cut(ME_TR$value, breaks = c(-25, -10, -5, -1, 1, 5, 10, Inf))

c = CountyChoropleth$new(ME_TR)
c$title = "Model Deviation: Trump–Romney"
c$add_state_outline = TRUE
c$legend = "Model Deviation"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values=c("darkblue", "dodgerblue", "lightcyan", "white", "indianred1", "red"))
county_ME_TR = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_ME_TR

```

## Model Deviation: Trump–Romney



## Deviation Graphics: Overall

```

summary(Overall_Dev)

##
## Call:
## lm(formula = per_shift ~ Edu_batchelors + HSD310213 + Romney +

```

```

##      Black + Hispanic + Mormon + Christian + White + HSG495213 +
##      INC110213 + votes_gop_2012 + NES010213 + SEX255214 + LFE305213 +
##      Income + MAN450207 + WTN220207 + SB0415207 + NonEnglish +
##      LND110210 + BZA110213 + Density + Poverty + AFN120207 + Other_Religion +
##      Orthodox + HSG445213, data = Overall_Dev_Predict)
##
## Residuals:
##      Min       1Q    Median       3Q      Max
## -29.1120 -2.7512  0.0554  2.8877 21.0307
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) 6.269e+01 3.142e+00 19.955 < 2e-16 ***
## Edu_batchelors -7.741e-01 2.015e-02 -38.412 < 2e-16 ***
## HSD310213 -3.785e+00 6.466e-01 -5.854 5.29e-09 ***
## Romney -4.155e-01 8.061e-03 -51.544 < 2e-16 ***
## Black -3.153e-01 1.411e-02 -22.345 < 2e-16 ***
## Hispanic -1.862e-01 1.892e-02 -9.842 < 2e-16 ***
## Mormon -2.889e-01 2.334e-02 -12.378 < 2e-16 ***
## Christian 3.595e-02 6.439e-03 5.583 2.57e-08 ***
## White 8.760e-02 1.430e-02 6.128 1.00e-09 ***
## HSG495213 -3.547e-05 2.159e-06 -16.429 < 2e-16 ***
## INC110213 9.860e-05 2.498e-05 3.947 8.09e-05 ***
## votes_gop_2012 -1.997e-05 5.055e-06 -3.950 7.99e-05 ***
## NES010213 5.304e-05 9.717e-06 5.459 5.17e-08 ***
## SEX255214 -3.182e-01 4.291e-02 -7.415 1.57e-13 ***
## LFE305213 7.542e-02 2.219e-02 3.398 0.000687 ***
## Income 2.528e-04 5.160e-05 4.899 1.01e-06 ***
## MAN450207 -1.233e-07 3.324e-08 -3.710 0.000211 ***
## WTN220207 1.245e-07 3.016e-08 4.128 3.76e-05 ***
## SB0415207 -6.407e-02 1.994e-02 -3.213 0.001326 **
## NonEnglish -7.185e-02 2.352e-02 -3.055 0.002272 **
## LND110210 -1.827e-04 7.431e-05 -2.458 0.014022 *
## BZA110213 -1.250e-05 3.229e-06 -3.871 0.000111 ***
## Density 2.107e-04 6.942e-05 3.035 0.002428 **
## Poverty 6.461e-02 2.886e-02 2.239 0.025224 *
## AFN120207 4.275e-07 2.040e-07 2.096 0.036164 *
## Other_Religion 6.023e-02 2.956e-02 2.037 0.041696 *
## Orthodox 9.071e-01 4.852e-01 1.869 0.061659 .
## HSG445213 2.590e-02 1.619e-02 1.600 0.109715
## ---
## Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 4.663 on 3081 degrees of freedom
## Multiple R-squared: 0.7946, Adjusted R-squared: 0.7928
## F-statistic: 441.6 on 27 and 3081 DF, p-value: < 2.2e-16
votes$model_error_overall = (votes$per_shift - votes$Overall_Dev_Pred)

ME_Overall = votes[,c(1,106)]
colnames(ME_Overall) = c("region","value")
ME_Overall$value = cut(ME_Overall$value, breaks = c(-30,-10,-5,-1,1,5,10,Inf))

c= CountyChoropleth$new(ME_Overall)

```

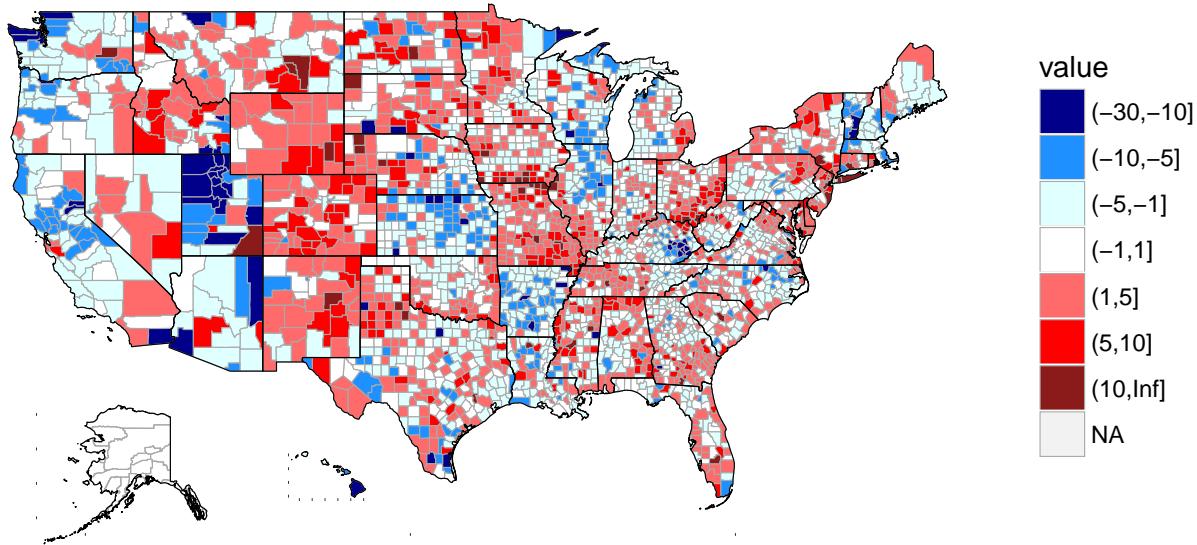
```

c$title = "Model Deviation: 2016 Election Results"
c$add_state_outline = TRUE
c$legend = "Model Deviation"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values=c("darkblue","dodgerblue","lightcyan","white","indianred1","red"))
county_ME_Overall = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_ME_Overall

```

## Model Deviation: 2016 Election Results



## Predict Trump and Clinton percentage

```

Predict_Clinton = votes[,c(8,19,20,26:28,30:35,40,42:63,67:76,83:95,100)]
Predict_Trump = votes[,c(9,19,20,26:28,30:35,40,42:63,67:76,83:95,100)]

Predict_Clinton = na.omit(Predict_Clinton)
Predict_Trump = na.omit(Predict_Trump)

#Clinton
null_Clinton = lm(Clinton~1,data = Predict_Clinton)
full_Clinton = lm(Clinton~.,data = Predict_Clinton)

```

```

Clinton_Dev = step(null_Clinton, scope=list(upper=full_Clinton), data=Predict_Clinton, direction="both")
votes$Clinton_Percent_Predict = predict(Clinton_Dev, votes)

#Trump
null_Trump = lm(Trump~1, data = Predict_Trump)
full_Trump = lm(Trump~., data = Predict_Trump)
Trump_Dev = step(null_Trump, scope=list(upper=full_Trump), data=Predict_Trump, direction="both")
votes$Trump_Percent_Predict = predict(Trump_Dev, votes)

```

## Analyze Predict Percentage

```

#Clinton
summary(Clinton_Dev)

##
## Call:
## lm(formula = Clinton ~ Obama + POP645213 + Black + Edu_batchelors +
##     NonEnglish + Protestant + SEX255214 + HSG495213 + Income +
##     Hispanic + White + VET605213 + NES010213 + MAN450207 + Edu_highschool +
##     SB0415207 + Mormon + AGE295214 + Density + HSG445213 + HSD310213 +
##     INC110213 + POP715213 + WTN220207 + BZA110213 + population_change +
##     AFN120207 + LFE305213 + Catholic + AGE135214, data = Predict_Clinton)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -9.1088 -1.3843  0.0161  1.3411 13.5568
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -1.127e+01  1.928e+00 -5.843  5.68e-09 ***
## Obama        7.770e-01  4.073e-03 190.755 < 2e-16 ***
## POP645213   3.118e-02  1.725e-02   1.807  0.070821 .
## Black         1.686e-01  6.925e-03   24.352 < 2e-16 ***
## Edu_batchelors 3.445e-01  1.054e-02   32.671 < 2e-16 ***
## NonEnglish   5.385e-02  1.402e-02   3.840  0.000126 ***
## Protestant   -2.949e-02  5.330e-03  -5.532  3.43e-08 ***
## SEX255214    2.101e-01  2.300e-02   9.132 < 2e-16 ***
## HSG495213    1.338e-05  1.108e-06  12.071 < 2e-16 ***
## Income        -7.167e-05  2.523e-05  -2.841  0.004523 ** 
## Hispanic      7.556e-02  9.076e-03   8.326 < 2e-16 ***
## White         -4.592e-02  6.750e-03  -6.803  1.23e-11 ***
## VET605213    1.770e-05  6.692e-06   2.645  0.008213 ** 
## NES010213    -2.429e-05  4.745e-06  -5.120  3.24e-07 ***
## MAN450207    6.367e-08  1.590e-08   4.005  6.36e-05 ***
## Edu_highschool -4.245e-02  1.210e-02  -3.507  0.000460 ***
## SB0415207    3.479e-02  9.615e-03   3.619  0.000301 ***
## Mormon        4.558e-02  1.110e-02   4.107  4.11e-05 ***
## AGE295214    -8.695e-02  3.220e-02  -2.700  0.006968 ** 
## Density       -1.292e-04  3.320e-05  -3.891  0.000102 ***
## HSG445213    -3.152e-02  9.264e-03  -3.402  0.000677 ***
## HSD310213    1.545e+00  3.418e-01   4.520  6.41e-06 ***
## INC110213    -2.617e-05  1.150e-05  -2.276  0.022889 *  
## POP715213    3.951e-02  1.336e-02   2.957  0.003130 ** 

```

```

## WTN220207      -5.285e-08  1.539e-08  -3.435 0.000601 ***
## BZA110213       5.876e-06  1.595e-06   3.684 0.000234 ***
## population_change 3.285e-02  1.246e-02   2.637 0.008410 **
## AFN120207      -2.008e-07  9.743e-08  -2.061 0.039420 *
## LFE305213       -2.642e-02  1.112e-02  -2.377 0.017533 *
## Catholic        -1.074e-02  5.788e-03  -1.855 0.063671 .
## AGE135214      -1.306e-01  8.055e-02  -1.622 0.104997
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.217 on 3078 degrees of freedom
## Multiple R-squared:  0.9793, Adjusted R-squared:  0.9791
## F-statistic:  4866 on 30 and 3078 DF,  p-value: < 2.2e-16

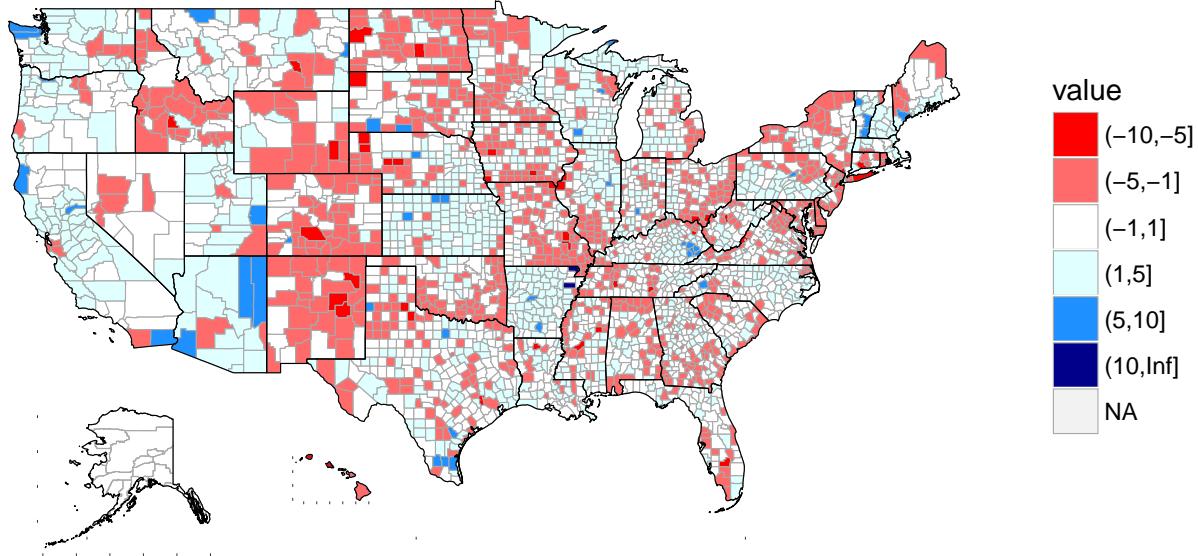
Clinton_Deviation = data.frame(votes[,1])
Clinton_Deviation$deviation = votes$Clinton - votes$Clinton_Percent_Predict
colnames(Clinton_Deviation) = c("region", "value")
Clinton_Deviation$value = cut(Clinton_Deviation$value, breaks = c(-10,-5,-1,1,5,10,Inf))

c= CountyChoropleth$new(Clinton_Deviation)
c$title = "Clinton Percentage Deviation"
c$add_state_outline = TRUE
c$legend = "Model Deviation"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values=c("red","indianred1","white","lightcyan1","dodgerblue","darkblue"))
county_Clinton_Dev = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275
county_Clinton_Dev

```

## Clinton Percentage Deviation



```
#Trump
summary(Trump_Dev)
```

```
##
## Call:
## lm(formula = Trump ~ Obama + Edu_batchelors + HSD310213 + Black +
##     Mormon + Hispanic + Romney + Christian + White + Income +
##     HSG495213 + LFE305213 + SEX255214 + Edu_highschool + NES010213 +
##     MAN450207 + LND110210 + AGE135214 + Other_Religion + SB0415207 +
##     Orthodox + WTN220207 + BZA110213 + Density + AFN120207 +
##     INC110213 + Poverty + HSG096213 + Jewish + HSG445213 + SB0315207 +
##     BZA115213, data = Predict_Trump)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -21.899  -1.461   0.013   1.619  18.015
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept) 4.825e+01  6.799e+00   7.096 1.59e-12 ***
## Obama       -1.217e-01  6.669e-02  -1.825 0.068057 .
## Edu_batchelors -4.294e-01  1.296e-02 -33.139 < 2e-16 ***
## HSD310213   -2.591e+00  4.034e-01  -6.423 1.54e-10 ***
## Black        -1.464e-01  9.070e-03 -16.139 < 2e-16 ***
## Mormon       -2.502e-01  1.375e-02 -18.196 < 2e-16 ***
## Hispanic     -1.182e-01  6.654e-03 -17.763 < 2e-16 ***
```

```

## Romney          6.852e-01  6.600e-02  10.382 < 2e-16 ***
## Christian      2.424e-02  3.802e-03  6.376 2.09e-10 ***
## White           4.403e-02  8.616e-03  5.110 3.41e-07 ***
## Income          1.892e-04  3.068e-05  6.168 7.82e-10 ***
## HSG495213      -1.938e-05 1.314e-06 -14.752 < 2e-16 ***
## LFE305213       5.505e-02  1.347e-02  4.086 4.50e-05 ***
## SEX255214      -1.309e-01 2.614e-02 -5.008 5.80e-07 ***
## Edu_highschool -5.089e-02 1.464e-02 -3.477 0.000514 ***
## NES010213       2.827e-05  5.646e-06  5.008 5.81e-07 ***
## MAN450207       -6.086e-08 1.935e-08 -3.145 0.001677 **
## LND110210       -1.813e-04 4.458e-05 -4.068 4.86e-05 ***
## AGE135214       -2.393e-01 6.508e-02 -3.677 0.000240 ***
## Other_Religion  4.307e-02 1.732e-02  2.487 0.012946 *
## SB0415207      -2.987e-02 1.161e-02 -2.573 0.010135 *
## Orthodox         6.061e-01 2.860e-01  2.119 0.034150 *
## WTN220207       6.665e-08 1.748e-08  3.813 0.000140 ***
## BZA110213       -9.670e-06 1.749e-06 -5.529 3.49e-08 ***
## Density          1.674e-04 3.937e-05  4.251 2.19e-05 ***
## AFN120207       2.676e-07 1.191e-07  2.247 0.024742 *
## INC110213       5.470e-05 1.501e-05  3.643 0.000274 ***
## Poverty          5.698e-02 1.788e-02  3.186 0.001455 **
## HSG096213       -3.918e-02 1.178e-02 -3.324 0.000897 ***
## Jewish           5.920e-01 2.555e-01  2.317 0.020544 *
## HSG445213       -2.515e-02 1.256e-02 -2.002 0.045351 *
## SB0315207       1.810e-02 1.031e-02  1.756 0.079248 .
## BZA115213       -1.259e-02 8.423e-03 -1.494 0.135179
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 2.719 on 3076 degrees of freedom
## Multiple R-squared:  0.9701, Adjusted R-squared:  0.9698
## F-statistic:  3119 on 32 and 3076 DF,  p-value: < 2.2e-16

Trump_Deviation = data.frame(votes[,1])
Trump_Deviation$deviation = votes$Trump - votes$Trump_Percent_Predict
colnames(Trump_Deviation) = c("region", "value")
Trump_Deviation$value = cut(Trump_Deviation$value, breaks = c(-25,-10,-5,-1,1,5,10,Inf))

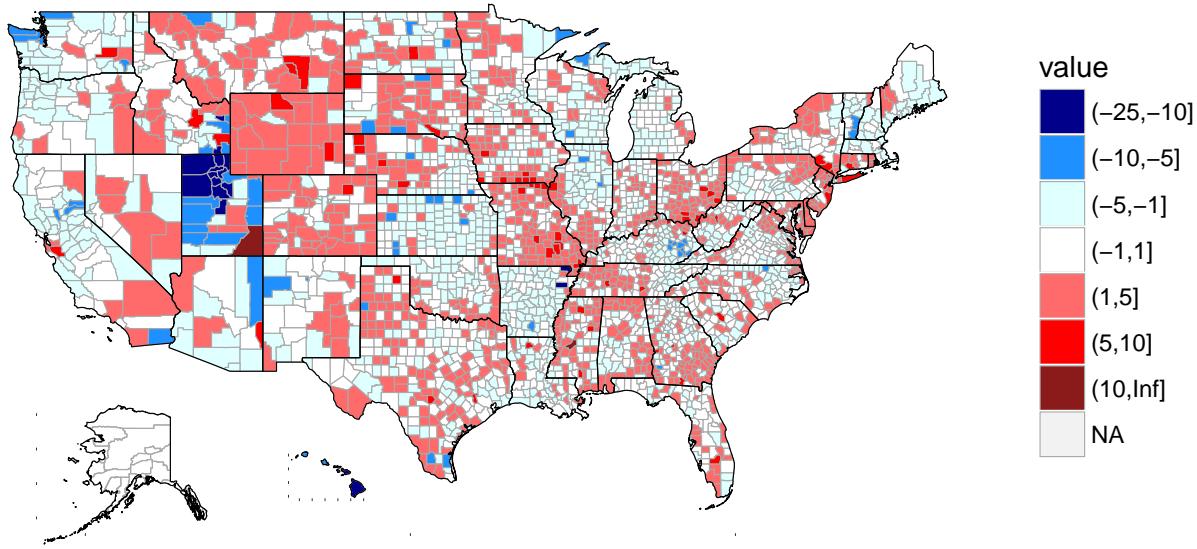
c= CountyChoropleth$new(Trump_Deviation)
c$title = "Trump Percentage Deviation"
c$add_state_outline = TRUE
c$legend = "Model Deviation"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values=c("darkblue", "dodgerblue", "lightcyan", "white", "indianred1", "red"))
county_Trump_Dev = c$render() + theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: 2050, 2105, 2122, 2150, 2164, 48301, 2180, 2188, 2240, 2090,
## 2198, 15005, 2100, 2170, 51515, 2016, 2060, 2290, 2282, 8014, 32009, 2070,
## 2110, 2130, 2185, 2195, 2220, 2230, 2020, 2068, 2013, 2261, 2270, 2275

county_Trump_Dev

```

## Trump Percentage Deviation



## Predict Total Votes

```
Predict_Votes_Clinton = votes[,c(5,14:16,19,20,26:28,30:35,40,42:63,67:76,83:95,100)]
Predict_Votes_Trump = votes[,c(6,14:16,19,20,26:28,30:35,40,42:63,67:76,83:95,100)]

Predict_Votes_Clinton = na.omit(Predict_Votes_Clinton)
Predict_Votes_Trump = na.omit(Predict_Votes_Trump)

#Clinton
null_Votes_Clinton = lm(votes_dem_2016~1,data = Predict_Votes_Clinton)
full_Votes_Clinton = lm(votes_dem_2016~,data = Predict_Votes_Clinton)
Clinton_Votes_Dev = step(null_Votes_Clinton,scope=list(upper=full_Votes_Clinton),data=Predict_Votes_Clinton)
votes$Clinton_Votes_Predict = predict(Clinton_Votes_Dev,votes)

#Trump
null_Votes_Trump = lm(votes_gop_2016~1,data = Predict_Votes_Trump)
full_Votes_Trump = lm(votes_gop_2016~,data = Predict_Votes_Trump)
Trump_Votes_Dev = step(null_Votes_Trump,scope=list(upper=full_Votes_Trump),data=Predict_Votes_Trump,direction="backward")
votes$Trump_Votes_Predict = predict(Trump_Votes_Dev,votes)
```

## Analyze Total Votes

```
summary(Clinton_Votes_Dev)
```

```

## 
## Call:
## lm(formula = votes_dem_2016 ~ votes_dem_2012 + NES010213 + BZA110213 +
##     votes_gop_2012 + POP645213 + MAN450207 + total_votes_2012 +
##     HSG010214 + population2014 + population2010 + SB0001207 +
##     VET605213 + age65plus + HSD410213 + HSG495213 + HSG096213 +
##     WTN220207 + Hindu + Buddhist + Obama + Poverty + INC110213 +
##     population_change + White + Density + SB0415207 + AGE295214 +
##     Orthodox + Hispanic + NonEnglish + RTN130207 + BZA010213 +
##     Protestant, data = Predict_Votes_Clinton)
##
## Residuals:
##    Min      1Q Median      3Q     Max
## -60622   -577    115    698  67806
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)    
## (Intercept) -8.581e+02  1.813e+03 -0.473  0.636044  
## votes_dem_2012 1.738e+00  1.473e-01 11.798 < 2e-16 ***
## NES010213    -5.240e-01  7.061e-02 -7.421 1.50e-13 ***
## BZA110213     2.142e-02  4.849e-03  4.417 1.04e-05 ***
## votes_gop_2012 7.056e-01  1.459e-01  4.834 1.40e-06 ***
## POP645213     1.002e+02  3.153e+01  3.178 0.001500 ** 
## MAN450207     -8.132e-05 3.297e-05 -2.466 0.013703 *  
## total_votes_2012 -7.815e-01  1.463e-01 -5.341 9.94e-08 *** 
## HSG010214     -1.449e-01  1.476e-02 -9.821 < 2e-16 ***
## population2014 4.417e-01  1.416e-02 31.186 < 2e-16 ***
## population2010 -4.341e-01  1.449e-02 -29.948 < 2e-16 ***
## SB0001207     6.543e-01  8.445e-02  7.748 1.26e-14 *** 
## VET605213     -2.424e-01  2.650e-02 -9.149 < 2e-16 ***
## age65plus      9.401e+01  2.860e+01  3.288 0.001021 ** 
## HSD410213     1.656e-01  2.580e-02  6.418 1.60e-10 *** 
## HSG495213     9.597e-03  1.947e-03  4.930 8.66e-07 *** 
## HSG096213     -3.756e+01  1.394e+01 -2.695 0.007081 ** 
## WTN220207     -1.335e-04  3.143e-05 -4.247 2.23e-05 *** 
## Hindu          2.981e+03  7.133e+02  4.179 3.01e-05 *** 
## Buddhist       -2.497e+03  6.305e+02 -3.961 7.62e-05 *** 
## Obama          -6.072e+01  7.643e+00 -7.944 2.72e-15 *** 
## Poverty         1.125e+02  2.450e+01  4.593 4.54e-06 *** 
## INC110213      6.184e-02  1.672e-02  3.698 0.000221 *** 
## population_change -9.928e+01  2.276e+01 -4.362 1.33e-05 *** 
## White           -3.157e+01  6.946e+00 -4.545 5.69e-06 *** 
## Density          -3.065e-01  7.859e-02 -3.901 9.80e-05 *** 
## SB0415207      5.612e+01  1.759e+01  3.190 0.001435 ** 
## AGE295214      -9.458e+01  3.250e+01 -2.910 0.003634 ** 
## Orthodox         -9.151e+02  4.279e+02 -2.138 0.032560 *  
## Hispanic         -4.545e+01  1.597e+01 -2.846 0.004460 ** 
## NonEnglish       4.866e+01  2.276e+01  2.138 0.032636 *  
## RTN130207      -3.713e-04  1.599e-04 -2.321 0.020326 * 
## BZA010213       2.970e-01  1.730e-01  1.717 0.086111 . 
## Protestant        1.407e+01  9.408e+00  1.495 0.134972 
## --- 
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##

```

```

## Residual standard error: 4042 on 3075 degrees of freedom
## Multiple R-squared:  0.9969, Adjusted R-squared:  0.9968
## F-statistic: 2.974e+04 on 33 and 3075 DF,  p-value: < 2.2e-16

summary(Trump_Votes_Dev)

##
## Call:
## lm(formula = votes_gop_2016 ~ votes_gop_2012 + BZA110213 + HSG010214 +
##     Density + population2014 + BZA010213 + population2010 + total_votes_2012 +
##     votes_dem_2012 + SB0001207 + AFN120207 + BPS030214 + Orthodox +
##     Black + Mormon + population_change + AGE135214 + Edu_batchelors +
##     Romney + INC110213 + SEX255214 + age65plus + HSG495213 +
##     POP645213 + AGE295214 + VET605213 + Hispanic + Protestant +
##     Catholic + SB0415207 + MAN450207 + SB0015207 + SB0315207 +
##     Income + RTN130207 + Jewish, data = Predict_Votes_Trump)
##
## Residuals:
##    Min      1Q Median      3Q     Max
## -54815   -862   -118    659   45629
##
## Coefficients:
##              Estimate Std. Error t value Pr(>|t|)
## (Intercept) -2.573e+03  1.809e+03 -1.422 0.155084
## votes_gop_2012 3.170e+00  1.260e-01  25.160 < 2e-16 ***
## BZA110213 -1.158e-01  4.580e-03 -25.294 < 2e-16 ***
## HSG010214  7.389e-02  1.001e-02   7.380 2.03e-13 ***
## Density     3.893e-01  6.653e-02   5.852 5.36e-09 ***
## population2014 -2.139e-01  1.645e-02 -13.004 < 2e-16 ***
## BZA010213  2.026e+00  1.523e-01  13.301 < 2e-16 ***
## population2010 2.159e-01  1.696e-02  12.729 < 2e-16 ***
## total_votes_2012 -2.196e+00  1.258e-01 -17.459 < 2e-16 ***
## votes_dem_2012  2.166e+00  1.273e-01  17.019 < 2e-16 ***
## SB0001207 -2.340e-01  3.303e-02  -7.086 1.70e-12 ***
## AFN120207  1.694e-03  1.723e-04   9.831 < 2e-16 ***
## BPS030214  1.336e+00  1.927e-01   6.933 5.02e-12 ***
## Orthodox    1.898e+03  4.000e+02   4.745 2.18e-06 ***
## Black       -2.860e+01  7.420e+00  -3.854 0.000119 ***
## Mormon      -4.510e+01  1.856e+01  -2.430 0.015148 *
## population_change 1.433e+02  2.183e+01   6.564 6.13e-11 ***
## AGE135214 -4.508e+02  1.293e+02  -3.485 0.000499 ***
## Edu_batchelors -9.937e+01  1.587e+01  -6.260 4.38e-10 ***
## Romney      -2.268e+01  6.733e+00  -3.368 0.000767 ***
## INC110213  1.041e-01  1.832e-02   5.681 1.46e-08 ***
## SEX255214  2.406e+02  4.065e+01   5.920 3.57e-09 ***
## age65plus   -6.880e+01  2.838e+01  -2.425 0.015376 *
## HSG495213 -1.056e-02  1.899e-03  -5.560 2.93e-08 ***
## POP645213  1.176e+02  2.523e+01   4.663 3.25e-06 ***
## AGE295214 -1.391e+02  5.282e+01  -2.633 0.008511 **
## VET605213  9.149e-02  2.480e-02   3.689 0.000229 ***
## Hispanic    -3.934e+01  9.977e+00  -3.943 8.22e-05 ***
## Protestant -2.186e+01  8.846e+00  -2.471 0.013531 *
## Catholic    2.659e+01  9.652e+00   2.755 0.005904 **
## SB0415207  3.804e+01  1.620e+01   2.349 0.018903 *
## MAN450207  6.798e-05  2.974e-05   2.286 0.022331 *

```

```

## SB0015207      1.236e+01  6.169e+00  2.004 0.045186 *
## SB0315207     -2.780e+01  1.427e+01 -1.947 0.051589 .
## Income        -8.685e-02  4.101e-02 -2.118 0.034252 *
## RTN130207     -2.510e-04  1.454e-04 -1.726 0.084409 .
## Jewish         6.189e+02  3.626e+02  1.707 0.087898 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 3768 on 3072 degrees of freedom
## Multiple R-squared:  0.9914, Adjusted R-squared:  0.9913
## F-statistic:  9828 on 36 and 3072 DF,  p-value: < 2.2e-16

state_predict = data.frame(states[,c(1,10,11)])
state_predict$gop_votes = 0
state_predict$dem_votes = 0
state_predict$winner = NA

for(i in seq(1:dim(votes)[1])){
  for(j in seq(1:dim(state_predict)[1])){
    if(votes[i,12] == state_predict[j,3] && !is.na(votes[i,109]) && !is.na(votes[i,110])){
      state_predict[j,4] = state_predict[j,4] + votes[i,110]
      state_predict[j,5] = state_predict[j,5] + votes[i,109]
    }
  }
}

for(i in seq(1:dim(state_predict)[1])){
  if(state_predict[i,4] > state_predict[i,5]){
    state_predict[i,6] = "TRUMP"
  }
  if(state_predict[i,4] < state_predict[i,5]){
    state_predict[i,6] = "CLINTON"
  }
  if(state_predict[i,4] == state_predict[i,5]){
    state_predict[i,6] = "TIE"
  }
}

colnames(state_predict)[2] = "region"
colnames(state_predict)[6] = "value"

state_predict$gop_margin = ((state_predict$gop_votes - state_predict$dem_votes) / (state_predict$gop_vo

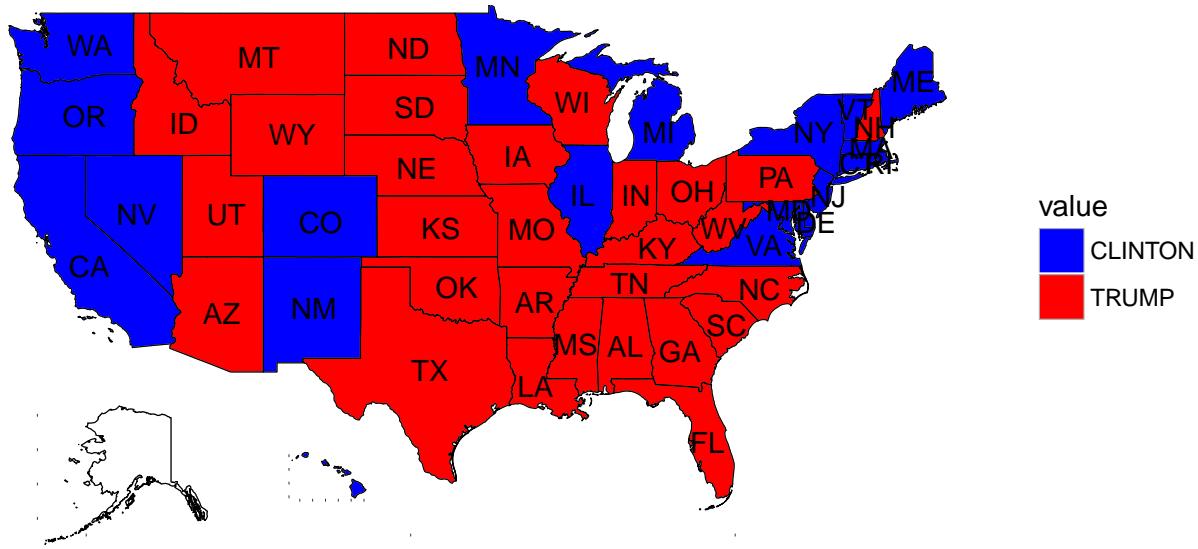
c = StateChoropleth$new(state_predict)
c$title = "2016 Winner Predicted by Model"
c$add_state_outline = TRUE
c$legend = "Winner"
c$set_num_colors(3)
c$ggplot_scale = scale_fill_manual(values = c("blue","red","white"))
state_predict2 = c$render() +
  theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska

```

state\_predict2

## 2016 Winner Predicted by Model



```
state_margin = state_predict[,c(2,7)]
colnames(state_margin) = c("region", "value")
state_margin$value = cut(state_margin$value, breaks = c(-100,-10,-5,-1,1,5,10,100))

c = StateChoropleth$new(state_margin)
c$title = "2016 Winner Predicted by Model"
c$add_state_outline = TRUE
c$legend = "Model Predicted Win Margin"
c$set_num_colors(7)
c$ggplot_scale = scale_fill_manual(values=c("darkblue","dodgerblue","lightcyan","white","indianred1","red"))
state_predict3 = c$render() +
    theme(legend.position = "right")

## Warning in self$bind(): The following regions were missing and are being
## set to NA: alaska
state_predict3
```

## 2016 Winner Predicted by Model

