Albert Yen Analysis

Loading Libraries and Data

```
library(sf)
```

```
## Linking to GEOS 3.8.0, GDAL 3.0.4, PROJ 6.3.1
```

```
library(ggplot2)
library(tmap)
library(tmaptools)
library(leaflet)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
options(scipen = 999)
library(readxl)
library(gridExtra)
```

```
##
## Attaching package: 'gridExtra'
```

```
## The following object is masked from 'package:dplyr':
##
##     combine
```

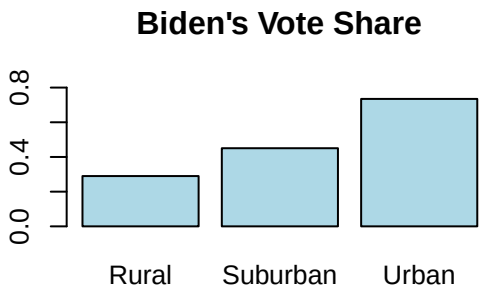
```
input = as.data.frame(read_excel("C:/Users/alber/Downloads/Stat382/Project4/Cleaned_Data.xlsx"))
input[,c(24:27)] = lapply(input[,c(24:27)],as.factor)
```

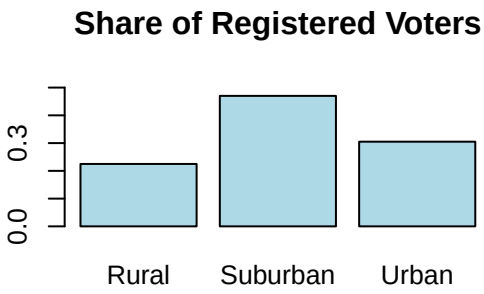
Exploratory Analysis

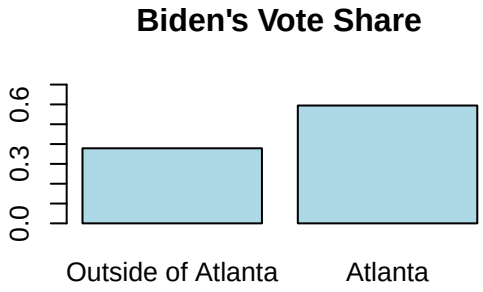
Vote Share by urbanicity and Atlanta

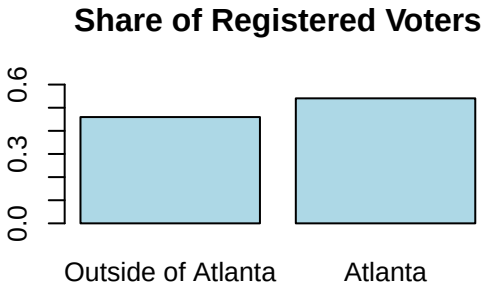
```
Total = tapply(input$Total_votes, input$urbanicity,sum)
B_vote = tapply(input$Total_votes*input$BidenVoteShare/100, input$urbanicity,sum)
#urbanicity = c("Rural","Suburban", "Urban")
voters = tapply(input$`TOTAL VOTERS`, input$urbanicity,sum)
par(mfrow = c(2,2))

barplot(B_vote/Total, col="light blue", main = "Biden's Vote Share",ylim=c(0,0.8))
barplot(voters/sum(voters), col="light blue", main = "Share of Registered Voters", ylim=c(0,0.5))
```

```r
B_atlanta_votes = tapply(input$Total_votes*input$BidenVoteShare/100, input$in_atlanta_metro,sum)
atlanta_voters = tapply(input$`TOTAL VOTERS`, input$in_atlanta_metro,sum)
atlanta_voted = tapply(input$Total_votes, input$in_atlanta_metro,sum)

barplot(B_atlanta_votes/atlanta_voted, col="light blue", main = "Biden's Vote Share", names.arg =c( "Ou
barplot(atlanta_voted/sum(atlanta_voted), col="light blue", names.arg =c("Outside of Atlanta", "Atlanta
```



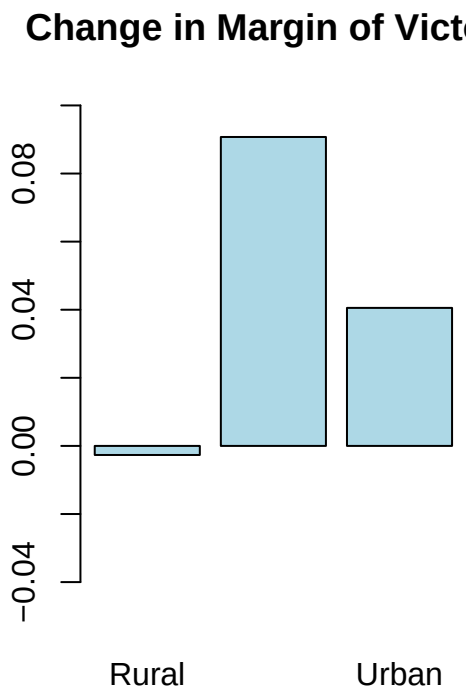


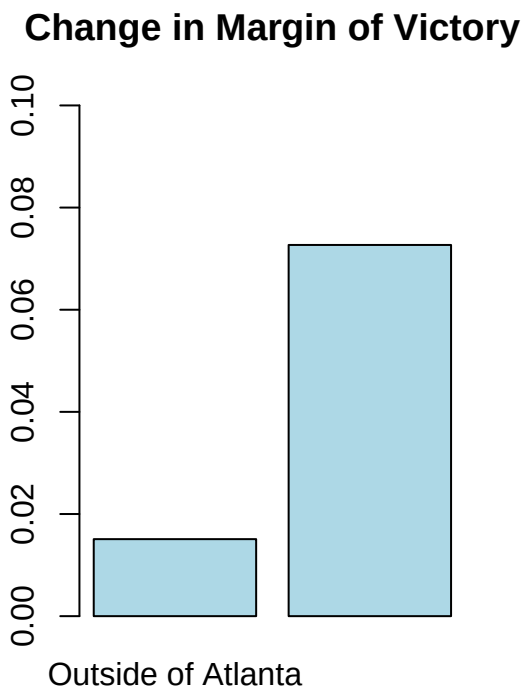




###Margin Increases by Urbanicity and Atlanta Metro

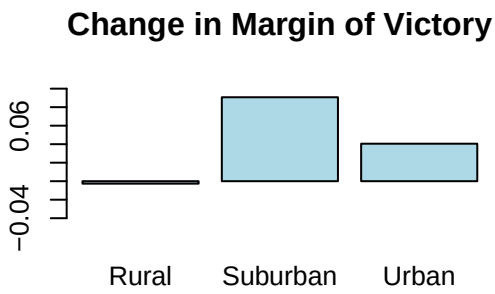
```r
votes2016 = tapply(input$Total_votes*(100-input$voteChange)/100, input$urbanicity,sum)
new_margin = tapply(input$new_margin*input$Total_votes/100, input$urbanicity, sum)/Total
old_margin = tapply(input$old_margin*input$Total_votes*(100-input$voteChange)/100/100, input$urbanicity

par(mfrow = c(1,2))
barplot(new_margin-old_margin,ylim=c(-0.05,0.1), main="Change in Margin of Victory", col="light blue")

atlanta_votes2016 = tapply(input$Total_votes*(100-input$voteChange)/100, input$in_atlanta_metro,sum)
atlanta_new_margin = tapply(input$new_margin*input$Total_votes/100, input$in_atlanta_metro, sum)/atlanta
atlanta_old_margin = tapply(input$old_margin*input$Total_votes*(100-input$voteChange)/100/100, input$in_
barplot(atlanta_new_margin-atlanta_old_margin,ylim=c(0,0.1), main="Change in Margin of Victory", col="li
```

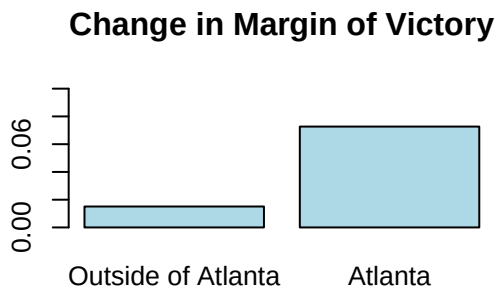


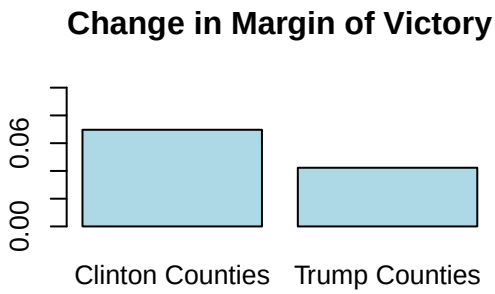


###Democrat's margin increase by urbanicity, Atlanta, and 2016 results

```
winner2016_2016voted = tapply(input$Total_votes*(100-input$voteChange)/100, input$past_result,sum)
winner2016_voted = tapply(input$Total_votes, input$past_result,sum)
winner2016_voter = tapply(input$`TOTAL VOTERS`, input$past_result,sum)
winner2016_new_margin = tapply(input$new_margin*input$Total_votes/100, input$past_result, sum)/winner20
winner2016_old_margin = tapply(input$old_margin*input$Total_votes*(100-input$voteChange)/100/100, input

par(mfrow = c(2,2))
barplot(new_margin-old_margin,ylim=c(-0.05,0.1), main="Change in Margin of Victory", col="light blue")
barplot(atlanta_new_margin-atlanta_old_margin,ylim=c(0,0.1), main="Change in Margin of Victory", col="li
barplot(winner2016_new_margin-winner2016_old_margin,ylim=c(0,0.1), main="Change in Margin of Victory",
```

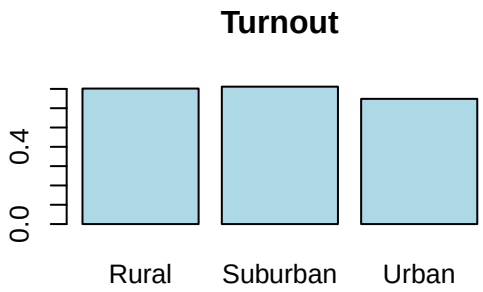


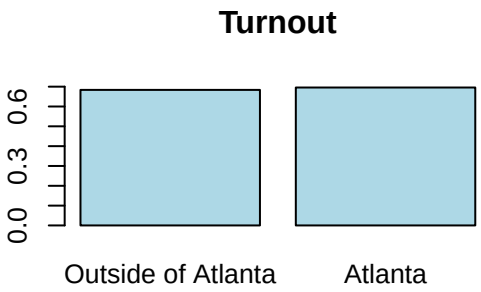


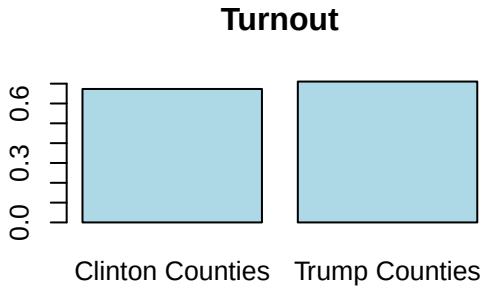


Turnout by by urbanicity, Atlanta, and 2016 results

```
par(mfrow = c(2,2))
turnout = sum(Total)/sum(voters)
barplot(Total/voters, col="light blue", main = "Turnout",
        width = c(0.1,0.1,0.1))
barplot(atlanta_voted/atlanta_voters,main = "Turnout", col="light blue", ylim=c(0,0.7), names.arg =c("Ou
barplot(winner2016_voted/winner2016_voter,main = "Turnout", col="light blue", ylim=c(0,0.7), names.arg =
```

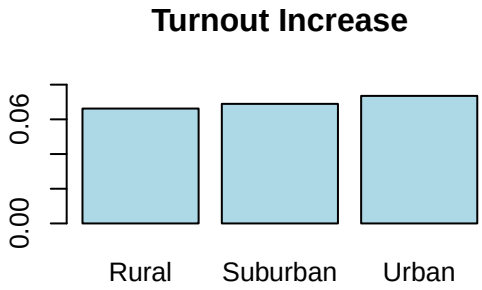


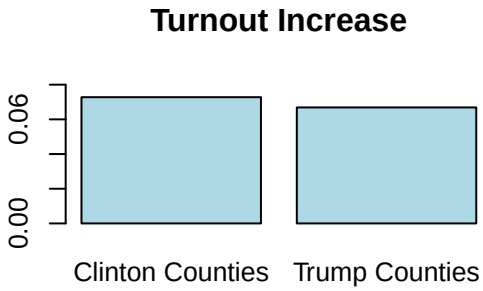


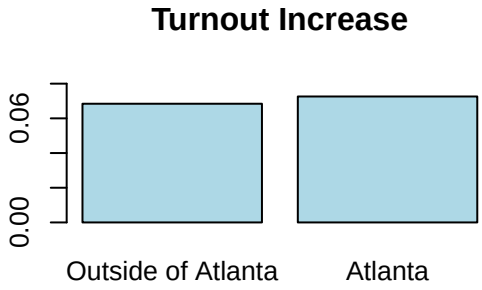


###Voter turnout Increases by urbanicity, Atlanta, and 2016 results

```
winner2016_2016total_voters = tapply(input$Total_votes*(100-input$voteChange)/100/(input$Turnout-input$

atlanta_2016total_voters = tapply(input$Total_votes*(100-input$voteChange)/100/(input$Turnout-input$Tur

total_voters2016 = tapply(input$Total_votes*(100-input$voteChange)/100/(input$Turnout-input$TurnoutChan

winner2016_2016turnout = winner2016_2016voted/winner2016_2016total_voters
winner2016_turnout = winner2016_voted/winner2016_voter

turnout2016 = votes2016/total_voters2016
increase = Total/voters-turnout2016

atlanta_turnout2016 = atlanta_votes2016/atlanta_2016total_voters
atlanta_turnout_increase = atlanta_voted/atlanta_voters - atlanta_turnout2016

par(mfrow = c(2,2))
barplot(increase,main = "Turnout Increase", col="light blue", ylim=c(0,0.08))

barplot(winner2016_turnout-winner2016_2016turnout,main = "Turnout Increase", col="light blue", ylim=c(0

barplot(atlanta_turnout_increase,main = "Turnout Increase", col="light blue", ylim=c(0,0.08), names.arg
```

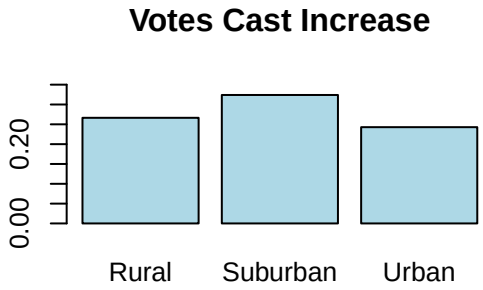


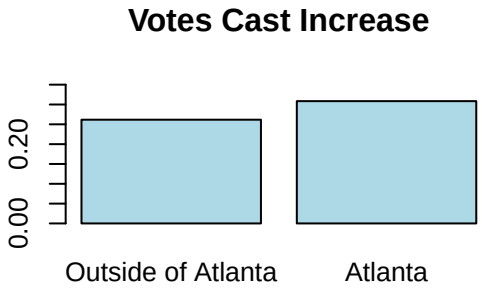


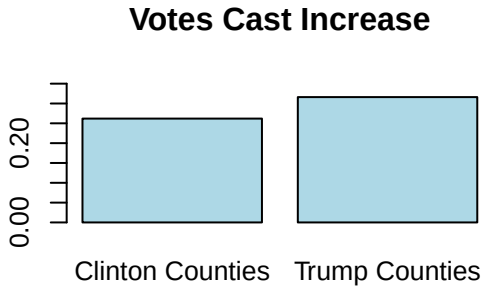


###Change in total number of votes cast by urbanicity, Atlanta, and 2016 results

```
input$voted2016 = round(input$Total_votes*(100-input$voteChange)/100)
input$raw_vote_increase = input$Total_votes-input$voted2016

par(mfrow = c(2,2))

barplot(tapply(input$raw_vote_increase, input$urbanicity, sum)/as.vector(tapply(input$voted2016,input$u

barplot(tapply(input$raw_vote_increase, input$in_atlanta_metro, sum)/as.vector(tapply(input$voted2016,i

barplot(tapply(input$raw_vote_increase, input$past_result, sum)/as.vector(tapply(input$voted2016,input$
```







#Generating Map Graphics

read in map data

```
mymap <- st_read("C:/Users/alber/Downloads/Stat382/Project4/georgia/Georgia_Counties.shp", stringsAsFac
```

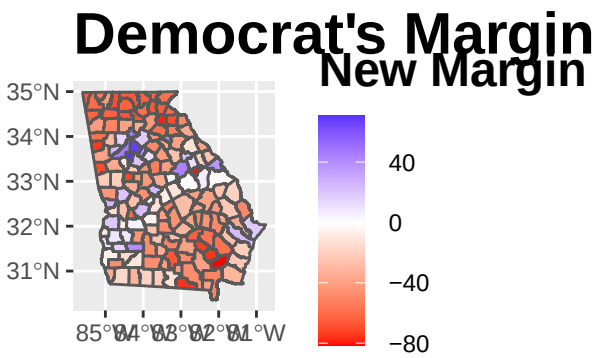
```
## Reading layer `Georgia_Counties' from data source `C:\Users\alber\Downloads\Stat382\Project4\georgia
## Simple feature collection with 159 features and 10 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -85.60517 ymin: 30.35576 xmax: -80.75143 ymax: 35.00067
## geographic CRS: WGS 84
```

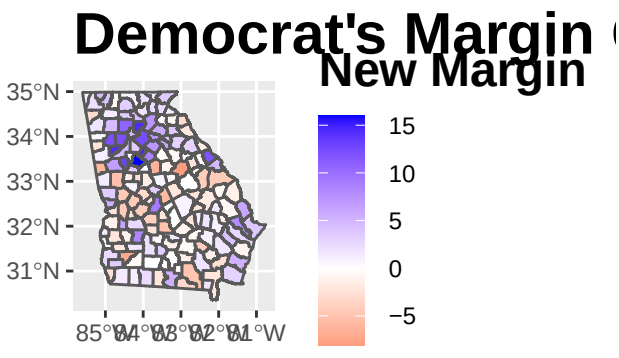
```
names(mymap)[names(mymap)=="Name"] ="County"
map_and_data = inner_join(mymap,input)
```

```
## Joining, by = "County"
```

By Margin

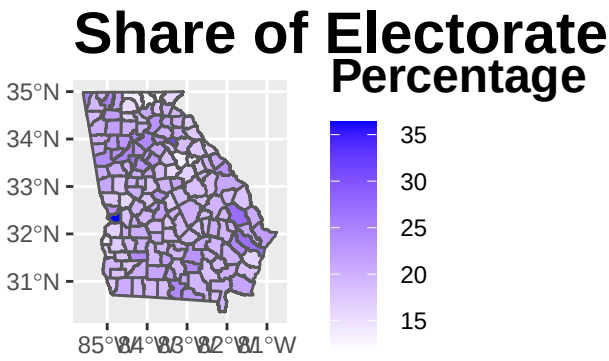
```
map = ggplot(map_and_data)
m=map+geom_sf(aes(fill=new_margin))+scale_fill_gradient2(midpoint = 0, low = "#FF0000", mid = "white", 
   labs(title = "Democrat's Margin by County, 2020") +theme(title =element_text(size=18, face='bold'))
change=map+geom_sf(aes(fill=margin_change))+scale_fill_gradient2(midpoint = 0, low = "#FF0000", mid = "
   labs(title = "Democrat's Margin Change, 2016-2020") +theme(title =element_text(size=18, face='bold'))
grid.arrange(m,change, ncol=2)
```

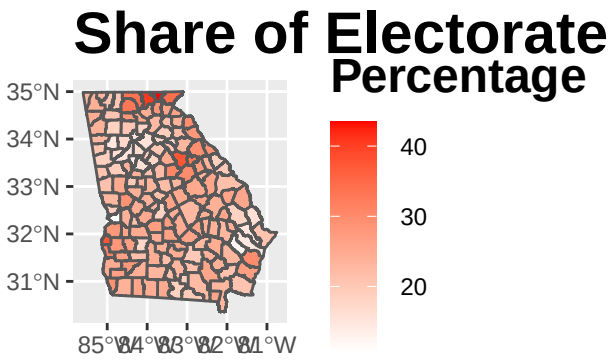




Share of Senior Voters

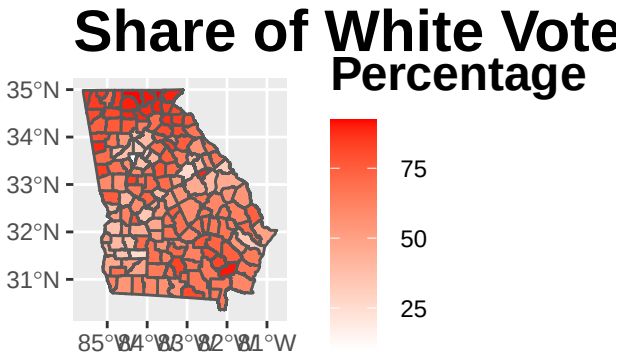
```
o=map+geom_sf(aes(fill=senior))+scale_fill_gradient(low= 'white',high='#FF0000', space = "Lab", name="P
   labs(title = "Share of Electorate over 65") +theme(title =element_text(size=18, face='bold'))
y=map+geom_sf(aes(fill=youth))+scale_fill_gradient(low= 'white',high='#0000ff', space = "Lab", name="Pe
   labs(title = "Share of Electorate under 30") +theme(title =element_text(size=18, face='bold'))
grid.arrange(y,o, ncol=2)
```

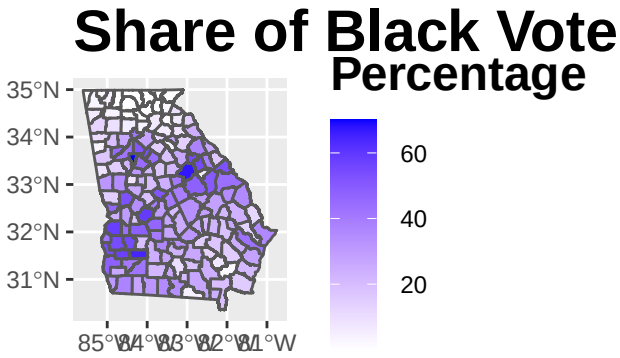


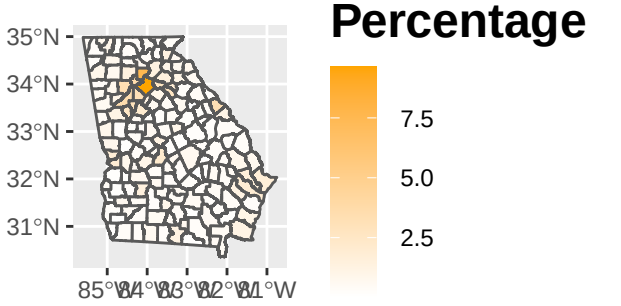


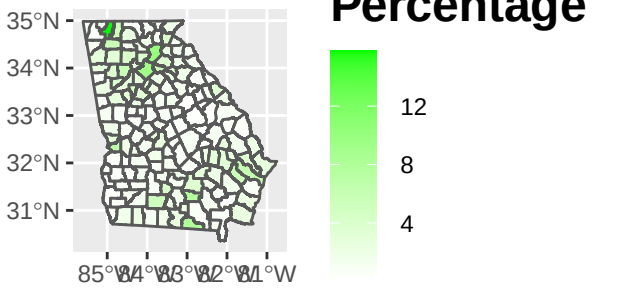
Demographic Overview

```
w = map+geom_sf(aes(fill=WH))+scale_fill_gradient(low= 'white',high='#FF0000', space = "Lab", name="Per
   labs(title = "Share of White Voters") +theme(title =element_text(size=18, face='bold'))
b = map+geom_sf(aes(fill=BH))+scale_fill_gradient(low= 'white',high='#0000ff', space = "Lab", name="Per
   labs(title = "Share of Black Voters") +theme(title =element_text(size=18, face='bold'))
h = map+geom_sf(aes(fill=HP))+scale_fill_gradient(low= 'white',high='green', space = "Lab", name="Percen
   labs(title = "Share of Hispanic Voters") +theme(title =element_text(size=18, face='bold'))
a = map+geom_sf(aes(fill=AP))+scale_fill_gradient(low= 'white',high='orange', space = "Lab", name="Perc
   labs(title = "Share of Asian Voters") +theme(title =element_text(size=18, face='bold'))
grid.arrange(w, b, a, h, ncol=2, nrow=2)
```


Share of White Vote
Percentage
35°N
34°N
33°N
32°N
31°N
85°W
84°W
83°W
82°W
81°W
75
50
25


Share of Black Vote
Percentage
35°N
34°N
33°N
32°N
31°N
85°W
84°W
83°W
82°W
81°W
60
40
20


Share of Asian Vote
Percentage
35°N
34°N
33°N
32°N
31°N
85°W
84°W
83°W
82°W
81°W
7.5
5.0
2.5


Share of Hispanic V
Percentage
35°N
34°N
33°N
32°N
31°N
85°W
84°W
83°W
82°W
81°W
12
8
4