Maps and CO Demographics

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My First Map

Map created using maps package, does not knit to pdf, using ggplot now. Saved here in case it's needed later.

```
col <- map_data("county") %>%
  filter(region == 'colorado')

county_registrants <- vrf %>%
  mutate(count = 1) %>%
  group_by(COUNTY) %>%
  summarise(TOTAL_REGISTERED = sum(count))

county_registrants$COUNTY <- tolower(county_registrants$COUNTY) # matching string

col_reg <- merge(col, county_registrants, by.x = "subregion", by.y = "COUNTY")

col_reg$pop_cat <- cut(col_reg$TOTAL_REGISTERED,
                       breaks = c(seq(0, 500000, by = 100000)), labels=1:5)

p <- col_reg %>%
  group_by(group) %>%
  plot_ly(x = ~long, y = ~lat, color = ~pop_cat, colors = c('pink', 'dark red'),
          text = ~subregion, hoverinfo = 'text') %>%
  add_polygons(line = list(width = 0.4)) %>%
  add_polygons(
    fillcolor = 'transparent',
    line = list(color = 'black', width = 0.5),
    showlegend = FALSE, hoverinfo = 'none'
  ) %>%
  layout(
    title = "Colorado Total Registrants by County",
    titlefont = list(size = 10),
    xaxis = list(title = "", showgrid = FALSE,
                 zeroline = FALSE, showticklabels = FALSE),
    yaxis = list(title = "", showgrid = FALSE,
                 zeroline = FALSE, showticklabels = FALSE)
  )

p
```

Data Wrangling Step

```
#Read in the data
vrf <- read_csv("data/2017_CO/VRF_2017/CO_2017_VRF_full.csv",
```

```
    col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess(),
                          VOTER_STATUS = col_guess(),
                          PARTY = col_guess(),
                          REGISTRATION_DATE = col_guess()))

#Create dataframe for total registrants, party
registrants_analysis <- vrf %>%
  mutate(PARTY = ifelse(!(PARTY %in% c("DEM", "REP", "UAF")), "OTHER", PARTY), count = 1) %>%
  group_by(COUNTY) %>%
  summarize(TOTAL_REGISTERED = sum(count), REP = sum(PARTY == "REP"), DEM = sum(PARTY =="DEM"),
            OTHER = sum(PARTY == "OTHER"), UAF = sum(PARTY == "UAF"))

#Read in stats for white population
pct_white <- read_csv("data/2017_CO/Census_Data/Pct_White.csv")
```

```
## Parsed with column specification:
## cols(
##   COUNTY = col_character(),
##   TOTAL_POP = col_integer(),
##   WHITE = col_integer()
## )
```

```
pct_white <- pct_white %>%
  mutate(PCT_WHITE = WHITE/TOTAL_POP) %>%
  slice(-1)

#Read in stats for uurban population
pct_urban <- read_csv("data/2017_CO/Census_Data/Pop_Rurban.csv")
```

```
## Parsed with column specification:
## cols(
##   COUNTY = col_character(),
##   TOTAL = col_integer(),
##   URBAN = col_integer(),
##   RURAL = col_integer()
## )
```

```
pct_urban <- pct_urban %>%
  mutate(PCT_URBAN = URBAN/TOTAL) %>%
  slice(-1)

#Create single dataset for use in the following tables and maps

colorado_pop_stats <- merge(pct_urban, pct_white, by = "COUNTY")
colorado_pop_stats <- merge(colorado_pop_stats, registrants_analysis, by = "COUNTY")

colorado_pop_stats <- colorado_pop_stats %>%
  select(-2) %>%
  mutate(PCT_REGISTERED = TOTAL_REGISTERED/TOTAL_POP,
         PCT_OF_STATE_POP = TOTAL_POP/sum(TOTAL_POP),
         PCT_OF_STATE_REG = TOTAL_REGISTERED/sum(TOTAL_REGISTERED))
```

Tables

Here I will create four tables: one to do with county population and voter registration, one for Colorado-wide demographic characteristics as oposed to national averages, one with the three key electoral reforms that have occured since 1990, and one with the codings and explanations for the different voting methods encountered in the file.

Population and Voter Registration Table

```
#Create dataset for table
pop_table <- colorado_pop_stats %>%
  select(1, 5, 8, 13:15)

#Create vector with largest counties
big_eight <- c("Jefferson", "El Paso", "Denver", "Arapahoe", "Adams",
               "Larimer", "Boulder", "Douglas")

#Create vector of all other counties together and merge
other <- data.frame("Other", sum(pop_table$TOTAL_POP[!(pop_table$COUNTY %in% big_eight)]),
                    sum(pop_table$TOTAL_REGISTERED[!(pop_table$COUNTY %in% big_eight)]),
                    "---",
                    sum(pop_table$PCT_OF_STATE_POP[!(pop_table$COUNTY %in% big_eight)]),
                    sum(pop_table$PCT_OF_STATE_REG[!(pop_table$COUNTY %in% big_eight)]))

names(other) <- names(pop_table)

pop_table <- rbind(pop_table, other) %>%
  filter(COUNTY %in% c(big_eight, "Other"))

#Create statewide row
Colorado <- data.frame("Colorado", sum(pop_table$TOTAL_POP),
                       sum(pop_table$TOTAL_REGISTERED), mean(pop_table$PCT_REGISTERED), 100, 100)

names(Colorado) <- names(pop_table)

pop_table <- rbind(pop_table, Colorado)

#Largest Metro Areas
pop_table <- data.frame(pop_table, c("Denver-Aurora-Lakewood Metro Area",
                                     "Denver-Aurora-Lakewood Metro Area",
                                     "Boulder", "Denver",
                                     "Denver-Aurora-Lakewood Metro Area",
                                     "Colorado Springs",
                                     "Denver-Aurora-Lakewood Metro Area",
                                     "Fort COllins", "", ""))

#Set final readable names
names(pop_table) <- c("County", "Total Population", "Total Registered Voters",
                      "County Voter Registration Rate",
                      "CO Population %", "% of Statewide Registrants",
                      "Largest Metro Area")

#First table, of statewide population
print(xtable(select(pop_table, 1, 2, 5, 7), type = "latex", booktabs = TRUE))
```

% latex table generated in R 3.5.1 by xtable 1.8-3 package % Sun Sep 16 10:10:21 2018

	County	Total Population	CO Population %	Largest Metro Area
1	Adams	441603	0.09	Denver-Aurora-Lakewood Metro Area
2	Arapahoe	572003	0.11	Denver-Aurora-Lakewood Metro Area
3	Boulder	294567	0.06	Boulder
4	Denver	600158	0.12	Denver
5	Douglas	285465	0.06	Denver-Aurora-Lakewood Metro Area
6	El Paso	622263	0.12	Colorado Springs
7	Jefferson	534543	0.11	Denver-Aurora-Lakewood Metro Area
8	Larimer	299630	0.06	Fort COllins
9	Other	1378964	0.27	
10	Colorado	5029196	100.00	

```
#Second Table, of Voter registration
print(xtable(select(pop_table, 1, 3, 4, 6), type = "latex", booktabs = TRUE))
```

% latex table generated in R 3.5.1 by xtable 1.8-3 package % Sun Sep 16 10:10:21 2018

	County	Total Registered Voters	County Voter Registration Rate	% of Statewide Registrants
1	Adams	270303.00	0.612095026528352	0.07
2	Arapahoe	410546.00	0.717733997898612	0.11
3	Boulder	237091.00	0.804879704787026	0.06
4	Denver	450616.00	0.750828948376927	0.12
5	Douglas	237659.00	0.832532884942112	0.06
6	El Paso	445708.00	0.716269487338955	0.12
7	Jefferson	422362.00	0.790136621375642	0.11
8	Larimer	250626.00	0.836451623669192	0.07
9	Other	1009392.00	—	0.27
10	Colorado	3734303.00		100.00

National Averages Pending

Key Electoral Reforms

```
reform_summary <- data.frame(c("1992", "2008", "2013"),
                             c("No Excuse Absentee Statewide Implementation",
                               "Permanent No-Excuse VBM Lists,
                               Option of Full-VBM Elections for Coordinated County Elections",
                               "Automatic Mail Ballot System Implemented Statewide,
                               Established Vote Centers"))

names(reform_summary) <- c("Year", "Key Changes")

print(xtable(reform_summary, type = "latex", booktabs = TRUE))
```

% latex table generated in R 3.5.1 by xtable 1.8-3 package % Sun Sep 16 10:10:21 2018

	Year	Key Changes
1	1992	No Excuse Absentee Statewide Implementation
2	2008	Permanent No-Excuse VBM Lists, Option of Full-VBM Elections for Coordinated County Elections
3	2013	Automatic Mail Ballot System Implemented Statewide, Established Vote Centers

Voting Methods Codings

```
voting_methods <- data.frame(c("Absentee Carry", "Absentee Mail",
                               "Early Voting", "In Person",
                               "Mail Ballot", "Polling Place",
                               "Vote Center"),
                             as.character(c("Voters who carried an absentee ballot with them
                               from an early voting location or county office",
                               "Voters who were sent an absentee ballot, and mailed it in",
                               "Voters who physically went to an Early Voting location and voted",
                               "Voters who physically went to a polling place and voted on paper",
                               "Vote By Mail", "'Traditional' polling place voting, discontinued in 201
                               "Voters who cast their ballots at Vote Centers")),
                             c("VBM", "VBM", "In Person", "In Person", "VBM", "In Person",
                               "In Person"))

names(voting_methods) <- c("Voting Method", "Description of Method", "Final Designation")

print(xtable(voting_methods, type = "latex", booktabs = TRUE, auto = TRUE))
```

% latex table generated in R 3.5.1 by xtable 1.8-3 package % Sun Sep 16 10:10:21 2018

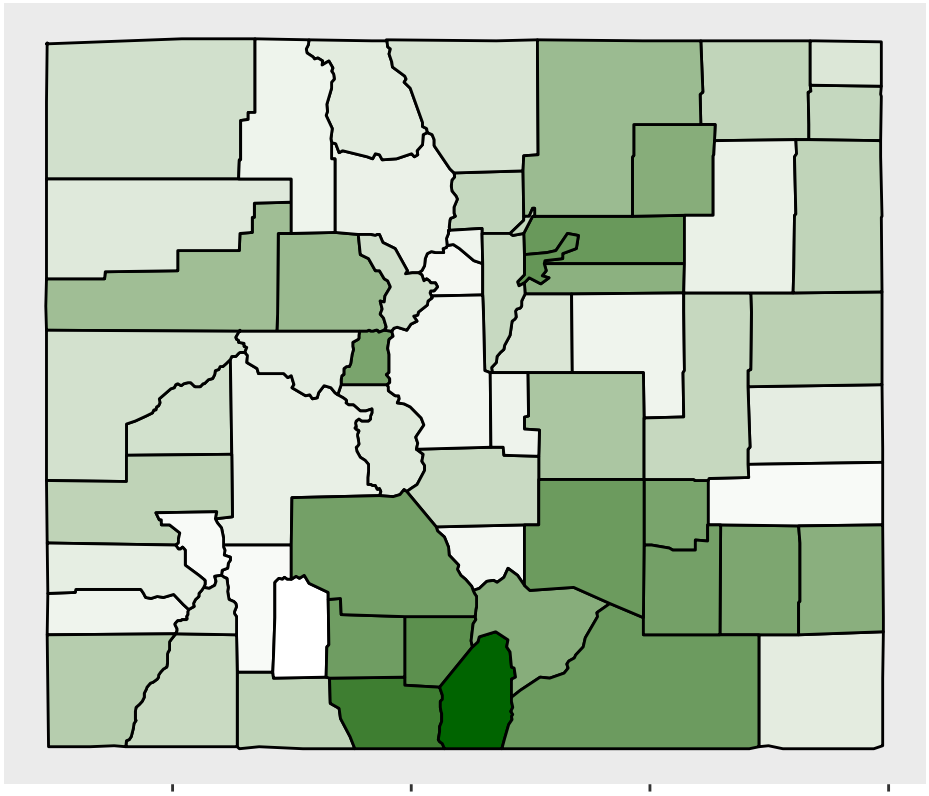
	Voting Method	Description of Method	Fir
1	Absentee Carry	Voters who carried an absentee ballot with them from an early voting location or county office	VB
2	Absentee Mail	Voters who were sent an absentee ballot, and mailed it in	VB
3	Early Voting	Voters who physically went to an Early Voting location and voted	In
4	In Person	Voters who physically went to a polling place and voted on paper	In
5	Mail Ballot	Vote By Mail	VB
6	Polling Place	'Traditional' polling place voting, discontinued in 2013	In
7	Vote Center	Voters who cast their ballots at Vote Centers	In

Maps

Here I will create four maps. One for racial demographics, one for party affiliation, one for rural/urban population, and one for percentage of registered voters by population.

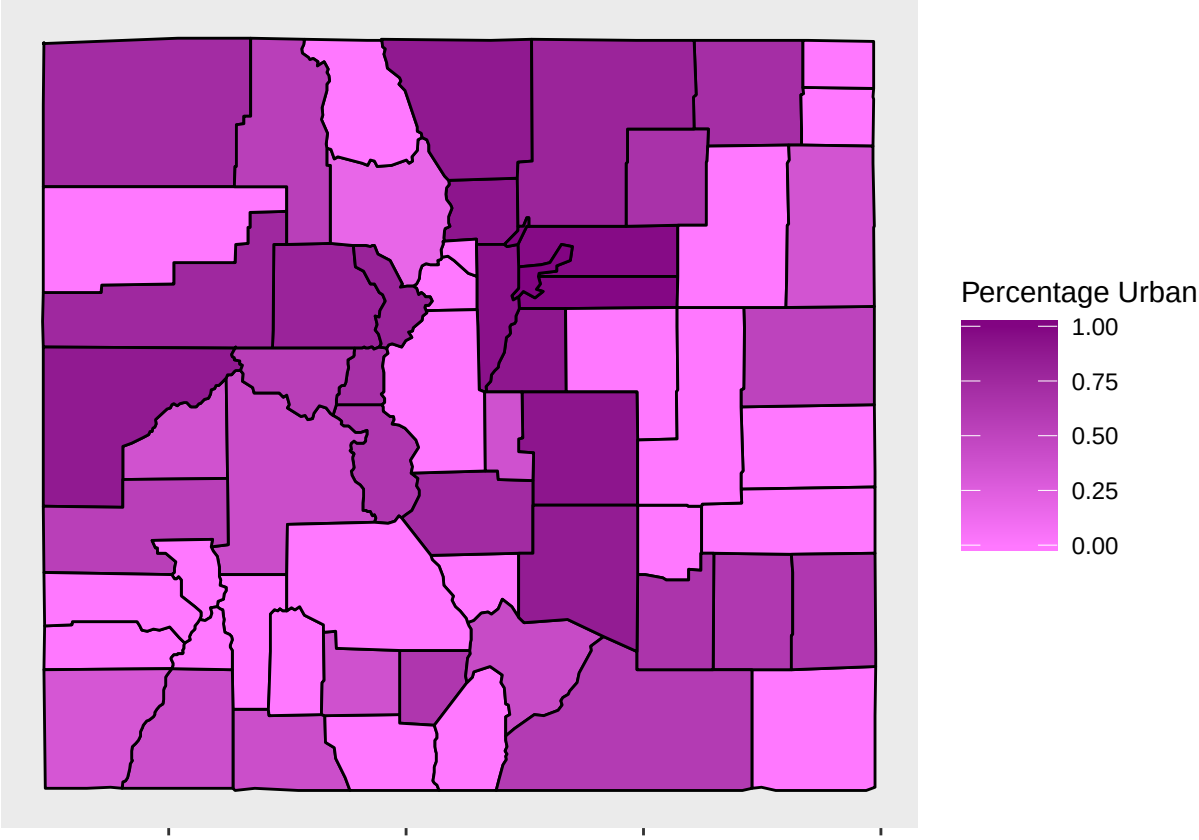
Racial Demographics

```
col <- map_data("county") %>%
  filter(region == 'colorado')

pct_white$COUNTY <- tolower(pct_white$COUNTY)

col_pct_white <- merge(col, pct_white, by.x = "subregion", by.y = "COUNTY")

ggplot(col_pct_white, mapping = aes(long, lat, group = group, fill = PCT_WHITE)) +
  scale_fill_gradient(low = "dark green", high = "white") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "Percentage White", title = "Percentage of White Residents") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```



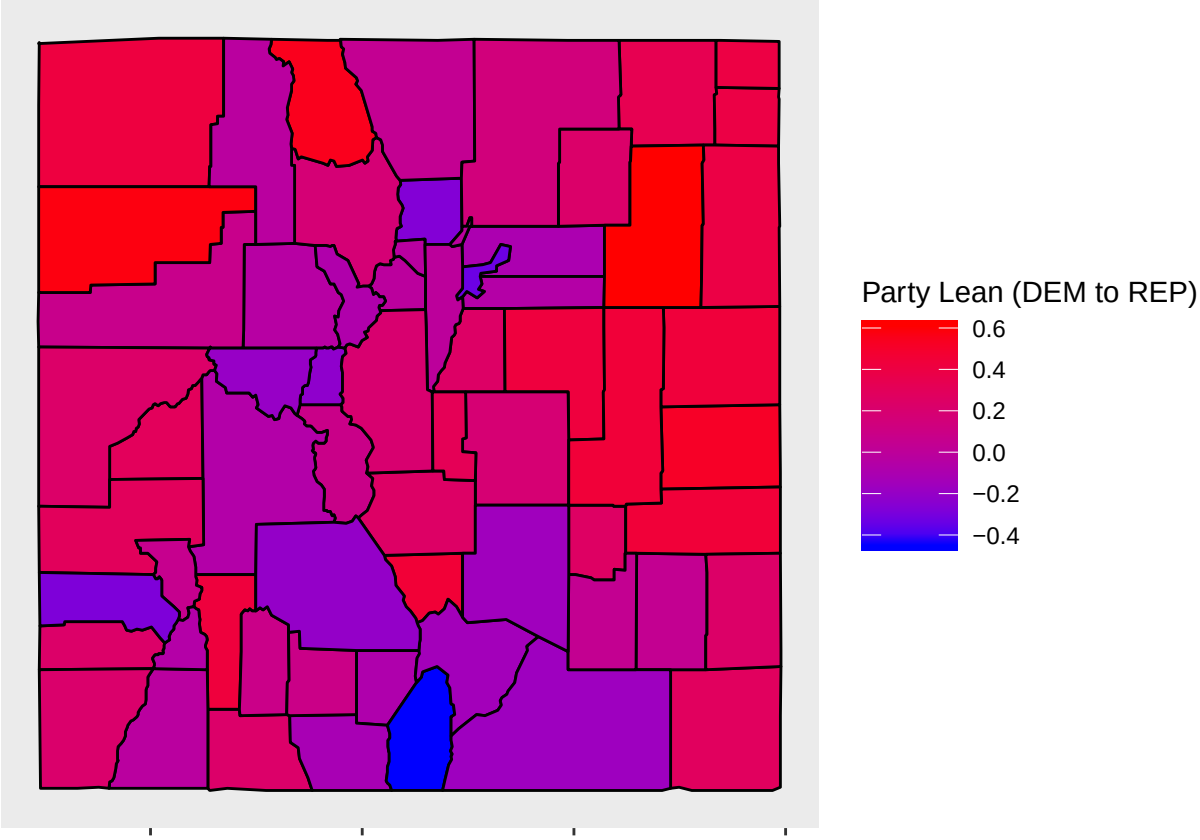
Rural/Urban Population

```
pct_urban$COUNTY <- tolower(pct_urban$COUNTY)

col_pct_urban <- merge(col, pct_urban, by.x = "subregion", by.y = "COUNTY")

ggplot(col_pct_urban, mapping = aes(long, lat, group = group, fill = PCT_URBAN)) +
  scale_fill_gradient(low = "#FF78FF", high = "#820482") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "Percentage Urban", "Percentage of Urban Population") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```

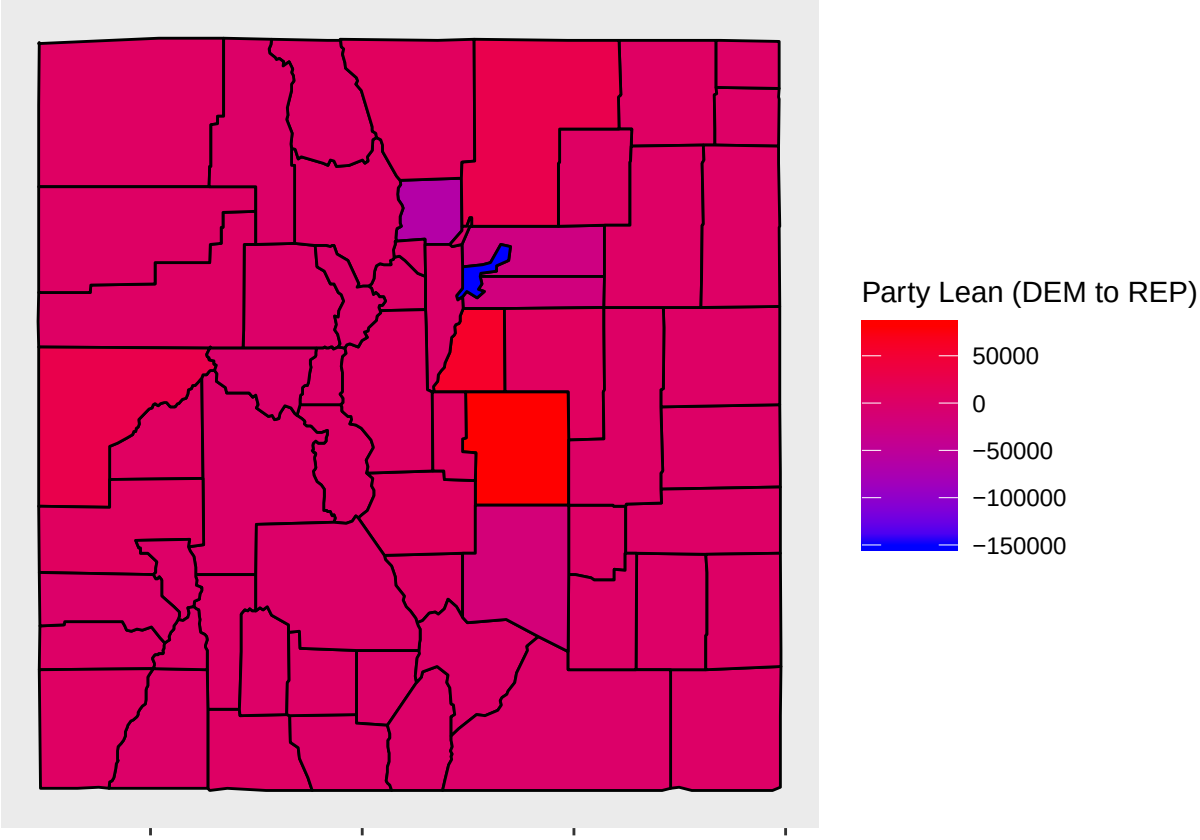


Party Affiliation

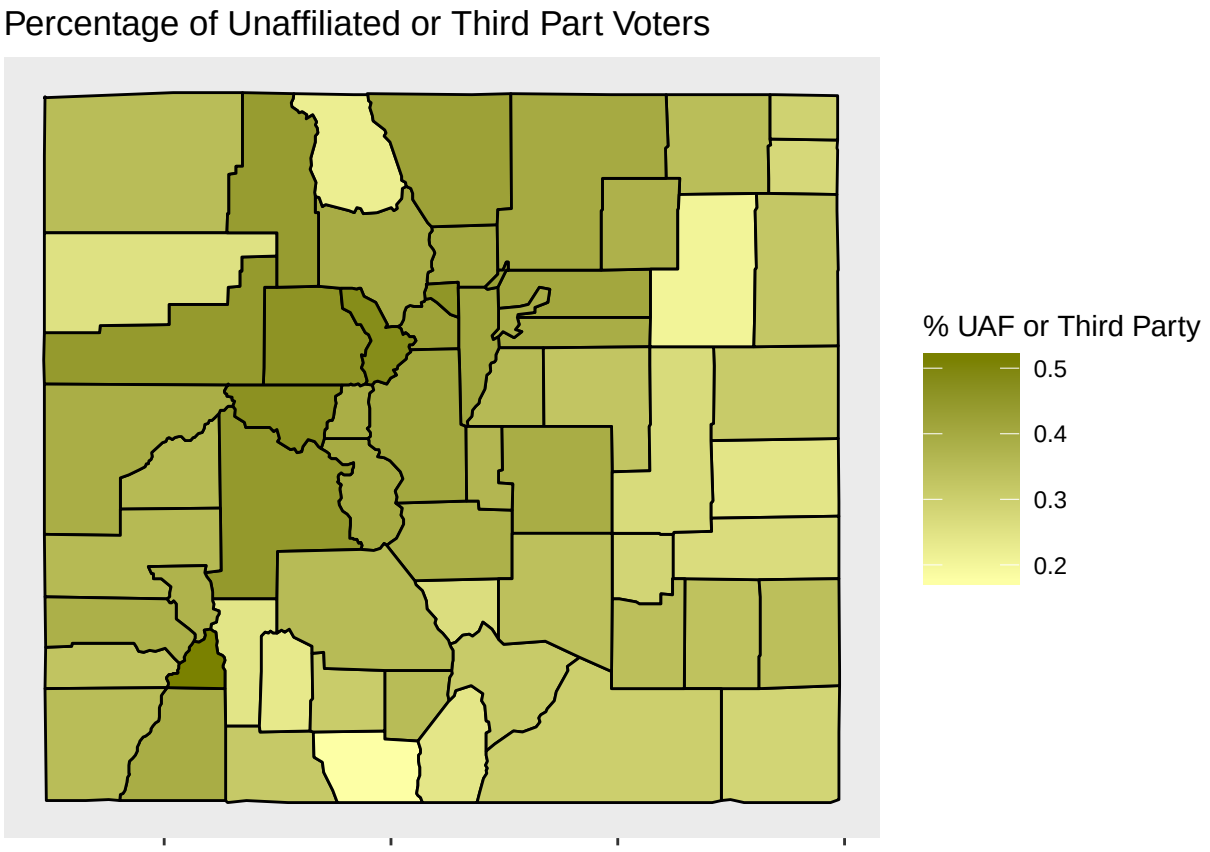
```
party_map <- registrants_analysis %>%
  mutate(PARTY_LEAN <- (REP - DEM)/TOTAL_REGISTERED, PARTY_MAJ <- (REP - DEM),
         PCT_UAF_OTHER <- (OTHER + UAF)/TOTAL_REGISTERED)

names(party_map)[7:9] <- c("PARTY_LEAN", "PARTY_MAJ", "PCT_UAF_OTHER")

party_map$COUNTY <- tolower(party_map$COUNTY)

party_map <- merge(col, party_map, by.x = "subregion", by.y = "COUNTY")

#Plot of party lean normalized over registered voters
ggplot(party_map, mapping = aes(long, lat, group = group, fill = PARTY_LEAN)) +
  scale_fill_gradient(low = "blue", high = "red") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "Party Lean (DEM to REP)", "Party Affiliation Lean") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```




```
#Plot of party affiliation by population size
#This map is, unsurprisingly, basically a population map, with
#rural counties swinging slightly republican. I keep it in just to show.

ggplot(party_map, mapping = aes(long, lat, group = group, fill = PARTY_MAJ)) +
  scale_fill_gradient(low = "blue", high = "red") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "Party Lean (DEM to REP)", "Party Affiliation Lean-Raw Number of Voters") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```



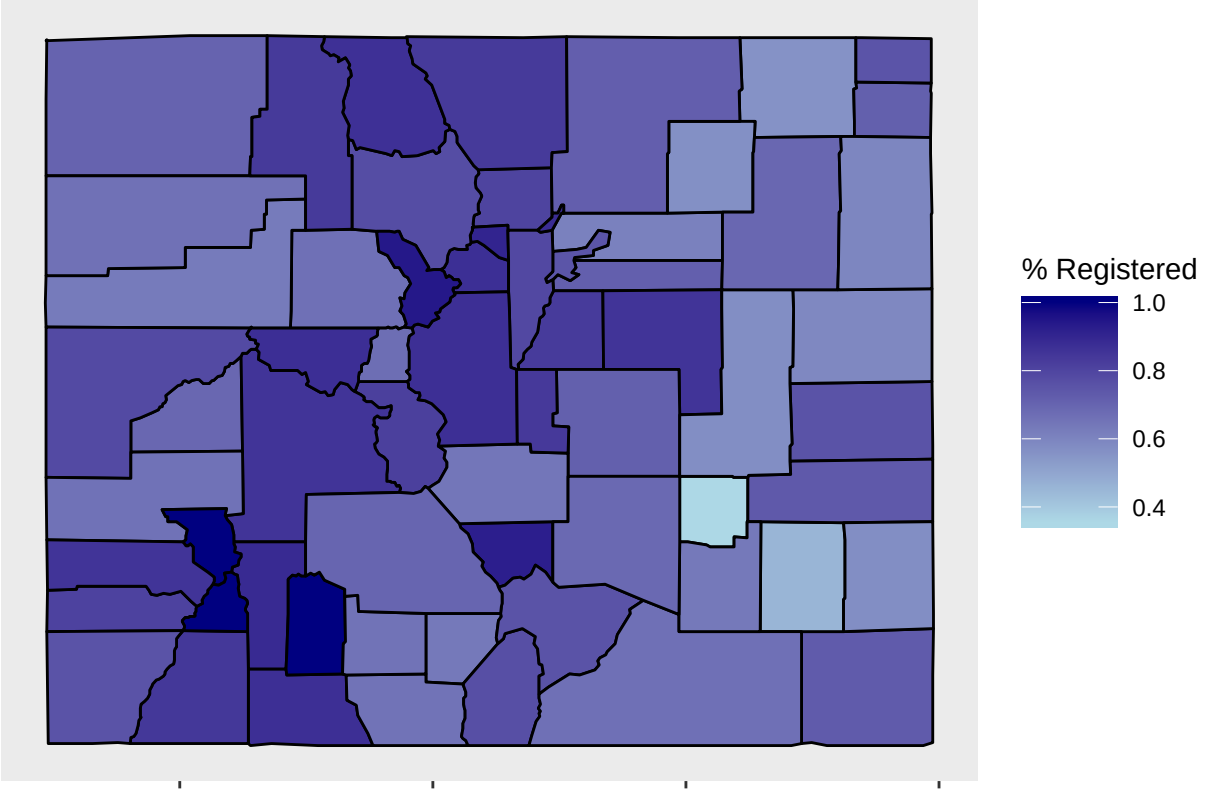

```
#Percent unaffiliated or third party
ggplot(party_map, mapping = aes(long, lat, group = group, fill = PCT_UAF_OTHER)) +
  scale_fill_gradient(low = "#FDFFA5", high = "#7A8100") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "% UAF or Third Party", title = "Percentage of Unaffiliated or Third Part Voters") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```



Registered Voters per Pop

```
colorado_pop_stats$COUNTY <- tolower(colorado_pop_stats$COUNTY)

colorado_pop_stats$PCT_REGISTERED[colorado_pop_stats$PCT_REGISTERED >= 1] <- 1

pct_reg_map <- merge(col, colorado_pop_stats, by.x = "subregion", by.y = "COUNTY")

ggplot(pct_reg_map, mapping = aes(long, lat, group = group, fill = PCT_REGISTERED)) +
  scale_fill_gradient(low = "light blue", high = "navy blue") +
  geom_polygon(color = "black") +
  theme(legend.title = element_text(),
        legend.key.width = unit(.5, "in")) +
  labs(fill = "% Registered", title = "Percentage of Registered Voters") +
  theme(panel.grid = element_blank(),
        axis.title = element_blank(),
        axis.text = element_blank(),
        axis.ticks.y = element_blank())
```

Percentage of Registered Voters




```
#Issue is population statistics from 2010
```