Turnout Calculations

TEST FOR EL PASO

I move on to the actual calculations.

```
reg16_elpaso <- reg16 %>%
  filter(COUNTY == "El Paso")

hist16_elpaso <- hist16 %>%
  filter(COUNTY_NAME == "El Paso")

#Number of voters that are not in the registration file in general
sum(!(unique(hist16_elpaso$VOTER_ID) %in% reg16_elpaso$VOTER_ID))
```

```
## [1] 38574
```

```
#Remove them from the history file
hist16_elpaso <- hist16_elpaso[(hist16_elpaso$VOTER_ID %in% reg16_elpaso$VOTER_ID),]

#Filter for one specific election
hist16_elpaso_general <- hist16_elpaso %>%
  filter(ELECTION_DATE == as.Date("2016-11-08"))

reg16_elpaso_general <- reg16_elpaso %>%
  filter(REGISTRATION_DATE <= as.Date("2016-11-08") - 22)

t16gen <- signif(nrow(hist16_elpaso_general)/nrow(reg16_elpaso_general), 3)
```

Based on Colorado SoS reports, there were 457,329 registered voters for the general of 2016 in El Paso. My results show 443890. These two numbers are approximately equal.

The total number of voters is reported as 327,649. Based on my data, I have 326955.

My calculation is the following 0.737, which is close to the reported 71.64%.

I will now move on to try to create the ID file Paul suggested.

ID FILE FOR VRF

I will first extract county and voter ID values from the voter registration file.

```
county_reg_ref <- data.frame(reg16$VOTER_ID, reg16$COUNTY)

#Test for duplicate IDs
nrow(county_reg_ref) - length(unique(county_reg_ref$reg16.VOTER_ID))
```

```
## [1] 0
```

```
#Rename
names(county_reg_ref) <- c("VOTER_ID", "COUNTY16")
```

Moving on to 2015 files, while removing 2016 files for memory conservation.

```
reg15 <- read_csv("2015reg2.csv",
                  col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess()))
```

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## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)

## Warning: 524 parsing failures.
## row # A tibble: 5 x 5 col     row col               expected           actual     file           expe
## ... ................. ... .................................................................... ...
## See problems(...) for more details.
```

```r
#How many IDs exist in the 2015 file that are not in the 2016 file?
sum(!(reg15$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 72400
```

```r
#This means that after adding all necessary data from 2016, the length
#of the final df should be:
nrow(county_reg_ref) + 72400
```

```
## [1] 3909050
```

```r
#We add these, and also update counties
county_reg_ref <- left_join(county_reg_ref, reg15, by = "VOTER_ID")
```

```r
names(county_reg_ref)[3] <- "COUNTY15"

#Now for those that dropped off after 2015
dropped15 <- data.frame(reg15[!(reg15$VOTER_ID %in% county_reg_ref$VOTER_ID),], NA)
dropped15 <- dropped15[,c(1, 3, 2)]
names(dropped15) <- c("VOTER_ID", "COUNTY16", "COUNTY15")

county_reg_ref <- rbind(county_reg_ref, dropped15)

#Note that the number of rows is actually correct!
nrow(county_reg_ref)
```

```
## [1] 3909050
```

I now repeat this process for all other years.

```r
reg14 <- read_csv("2014reg2.csv",
                  col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess()))
```

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## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)

## Warning: 38 parsing failures.
## row # A tibble: 5 x 5 col      row col   expected   actual     file           expected    <int> <chr
## ... ................. ... ................................................... ........ .............
## See problems(...) for more details.
```

```
#How many IDs exist in the 2015 file that are not in the 2016 OR 2015 file?
sum(!(reg14$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 265085
```

```
#This means that after adding all necessary data from 2014, the length
#of the final df should be:
nrow(county_reg_ref) + 265085
```

```
## [1] 4174135
```

```
#We add these, and also update counties
county_reg_ref <- left_join(county_reg_ref, reg14, by = "VOTER_ID")

names(county_reg_ref)[4] <- "COUNTY14"

#Now for those that dropped off after 2014
dropped14 <- data.frame(reg14[!(reg14$VOTER_ID %in% county_reg_ref$VOTER_ID),], NA, NA)
dropped14 <- dropped14[,c(1, 3, 4, 2)]
names(dropped14) <- c("VOTER_ID", "COUNTY16", "COUNTY15", "COUNTY14")

county_reg_ref <- rbind(county_reg_ref, dropped14)

#Note that the number of rows is actually correct again!
nrow(county_reg_ref)
```

```
## [1] 4174135
```

Next year

```
reg13 <- read_csv("2013reg2.csv",
                  col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess()))
```

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## Warning in read_tokens_(data, tokenizer, col_specs, col_names, locale_, :
## length of NULL cannot be changed

## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)

## Warning: 34 parsing failures.
## row # A tibble: 5 x 5 col      row col   expected   actual     file           expected    <int> <chr
## ... ................. ... ................................................... ........ .............
## See problems(...) for more details.
```

```r
#How many IDs exist in the 2015 file that are not in the 2016 OR 2015 file?
sum(!(reg13$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 96779
```

```r
#This means that after adding all necessary data from 2014, the length
#of the final df should be:
nrow(county_reg_ref) + 96779
```

```
## [1] 4270914
```

```r
#We add these, and also update counties
county_reg_ref <- left_join(county_reg_ref, reg13, by = "VOTER_ID")

names(county_reg_ref)[5] <- "COUNTY13"

#Now for those that dropped off after 2013
dropped13 <- data.frame(reg13[!(reg13$VOTER_ID %in% county_reg_ref$VOTER_ID),], NA, NA, NA)
dropped13 <- dropped13[,c(1, 3, 4, 5, 2)]
names(dropped13) <- c("VOTER_ID", "COUNTY16", "COUNTY15", "COUNTY14", "COUNTY13")

county_reg_ref <- rbind(county_reg_ref, dropped13)

#Note that the number of rows is actually correct again!
nrow(county_reg_ref)
```

```
## [1] 4270914
```

Last year!

```r
reg12 <- read_csv("2012reg2.csv",
                  col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess()))
```

```
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## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)

## Warning: 52 parsing failures.
## row # A tibble: 5 x 5 col      row col   expected   actual     file           expected    <int> <chr
## ... ................. ... ................................................... ....... .............
## See problems(...) for more details.
```

```r
#How many IDs exist in the 2015 file that are not in the 2016 OR 2015 file?
sum(!(reg12$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 176260
```

```r
#This means that after adding all necessary data from 2014, the length
#of the final df should be:
nrow(county_reg_ref) + 176260
```

```
## [1] 4447174
```

```
#We add these, and also update counties
county_reg_ref <- left_join(county_reg_ref, reg12, by = "VOTER_ID")

names(county_reg_ref)[6] <- "COUNTY12"

#Now for those that dropped off after 2012
dropped12 <- data.frame(reg12[!(reg12$VOTER_ID %in% county_reg_ref$VOTER_ID),], NA, NA, NA, NA)
dropped12 <- dropped12[,c(1, 3, 4, 5, 6, 2)]
names(dropped12) <- c("VOTER_ID", "COUNTY16", "COUNTY15", "COUNTY14", "COUNTY13", "COUNTY12")

county_reg_ref <- rbind(county_reg_ref, dropped12)

#Note that the number of rows is actually correct again!
nrow(county_reg_ref)
```

```
## [1] 4447185
```

```
#This may be confusing, but note the following:
length(unique(reg12$VOTER_ID)) - length(reg12$VOTER_ID)
```

```
## [1] -11
```

```
length(unique(county_reg_ref$VOTER_ID)) - length(county_reg_ref$VOTER_ID)
```

```
## [1] -11
```

```
#This means that the 2012 registration file contains 11 duplicates of voter IDs!
```

Apart from everything I just ran, the following should also be noted:

```
#2012-13 files have some NAs in County
sum(is.na(reg16$COUNTY))
```

```
## [1] 0
```

```
sum(is.na(reg15$COUNTY))
```

```
## [1] 0
```

```
sum(is.na(reg14$COUNTY))
```

```
## [1] 0
```

```
sum(is.na(reg13$COUNTY))
```

```
## [1] 4785
```

```
sum(is.na(reg12$COUNTY))
```

```
## [1] 4232
```

```
#There is one NA in ID in 2013,
#four NAs in ID in 2012. These are automatically not included by
#the left join in my code

sum(is.na(reg16$VOTER_ID))
```

```
## [1] 0
```

```
sum(is.na(reg15$VOTER_ID))
```

```
## [1] 0
```

```
sum(is.na(reg14$VOTER_ID))
```

```
## [1] 0
```

```
sum(is.na(reg13$VOTER_ID))
```

```
## [1] 1
```

```
sum(is.na(reg12$VOTER_ID))
```

```
## [1] 4
```

For future reference, this file will be written as a csv and stored in the Google drive under “interim results”

LONG VHIST FILE

For all IDs included in the long voter registration file, I will extract voting histories.

```
#Make sure I have the reference file for VR
county_reg_ref <- read_csv("County_Reg_Per_Year.csv")
```

```
## Warning: Missing column names filled in: 'X1' [1]
```

```
## Parsed with column specification:
## cols(
##   X1 = col_integer(),
##   VOTER_ID = col_integer(),
##   COUNTY16 = col_character(),
##   COUNTY15 = col_character(),
##   COUNTY14 = col_character(),
##   COUNTY13 = col_character(),
##   COUNTY12 = col_character()
## )
```

```
#Load 2016 history file
vhist16 <- read_csv("2016hist.csv")
```

```
## Parsed with column specification:
## cols(
##   VOTER_ID = col_integer(),
##   ELECTION_TYPE = col_character(),
##   ELECTION_DATE = col_character(),
##   ELECTION_DESCRIPTION = col_character(),
##   VOTING_METHOD = col_character(),
##   PARTY = col_character(),
##   COUNTY_NAME = col_character()
## )
```

```
#Create first image of full voter history file
vhist_full <- vhist16[vhist16$VOTER_ID %in% county_reg_ref$VOTER_ID,]

#Note that all voters from the 2016 history file
#have a corresponding registration. This makes sense, given how
#the registration file was constructed
sum(!(vhist16$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

Now I move on to sequentially adding the rest of the histories.

```
#Read in the data
vhist15 <- read_csv("2015hist.csv")
```

```
## Parsed with column specification:
## cols(
##   VOTER_ID = col_integer(),
##   ELECTION_TYPE = col_character(),
##   ELECTION_DATE = col_character(),
##   ELECTION_DESCRIPTION = col_character(),
##   VOTING_METHOD = col_character(),
##   PARTY = col_character(),
##   COUNTY_NAME = col_character()
## )
```

```
#How many from this file are missing from the registration file?
sum(!(vhist15$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

```
#NONE! YAY!

#Now on to adding the extra values to the large dataset
missing15 <- vhist15[!(vhist15$VOTER_ID %in% vhist_full$VOTER_ID), ]

vhist_full <- rbind(vhist_full, missing15)
```

```
#Read in the data
vhist14 <- read_csv("2014hist.csv")
```

```
## Parsed with column specification:
## cols(
##   VOTER_ID = col_integer(),
##   ELECTION_TYPE = col_character(),
##   ELECTION_DATE = col_character(),
##   ELECTION_DESCRIPTION = col_character(),
##   VOTING_METHOD = col_character(),
##   PARTY = col_character(),
##   COUNTY_NAME = col_character()
## )
```

```
## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)
```

```
## Warning: 62 parsing failures.
## row # A tibble: 5 x 5 col       row col           expected           actual    file           expecte
## ... ................. ... ................................................................... ......
## See problems(...) for more details.
```

```
#How many from this file are missing from the registration file?
sum(!(vhist14$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

```
#NONE! YAY!

#Now on to adding the extra values to the large dataset
missing14 <- vhist14[!(vhist14$VOTER_ID %in% vhist_full$VOTER_ID), ]
```

```r
vhist_full <- rbind(vhist_full, missing14)
```

```r
#Read in the data
vhist13 <- read_csv("2013hist.csv")
```

```
## Parsed with column specification:
## cols(
##   VOTER_ID = col_integer(),
##   ELECTION_TYPE = col_character(),
##   ELECTION_DATE = col_character(),
##   ELECTION_DESCRIPTION = col_character(),
##   VOTING_METHOD = col_character(),
##   PARTY = col_character(),
##   COUNTY_NAME = col_character()
## )
```

```r
#How many from this file are missing from the registration file?
sum(!(vhist13$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

```r
#NONE! YAY!

#Now on to adding the extra values to the large dataset
missing13 <- vhist13[!(vhist13$VOTER_ID %in% vhist_full$VOTER_ID), ]

vhist_full <- rbind(vhist_full, missing13)
```

```r
#Read in the data
vhist12 <- read_csv("2012hist.csv")
```

```
## Parsed with column specification:
## cols(
##   VOTER_ID = col_integer(),
##   ELECTION_TYPE = col_character(),
##   ELECTION_DATE = col_character(),
##   ELECTION_DESCRIPTION = col_character(),
##   VOTING_METHOD = col_character(),
##   PARTY = col_character(),
##   COUNTY_NAME = col_character()
## )
```

```r
#How many from this file are missing from the registration file?
sum(!(vhist12$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

```r
#NONE! YAY!

#Now on to adding the extra values to the large dataset
missing12 <- vhist12[!(vhist12$VOTER_ID %in% vhist_full$VOTER_ID), ]

vhist_full <- rbind(vhist_full, missing12)
```

```r
#I noticed that some date observations are weird...
#So I'm fixing them by cutting to max 10 characters!
vhist_full$ELECTION_DATE <- substr(vhist_full$ELECTION_DATE, 1, 10)
```

…and this is the final voter history file! Similarly, I will write this file as a csv and upload it.

TEST METHOD FOR TURNOUTS

```
if(!(exists("county_reg_ref"))) county_reg_ref <-
  read_csv("County_Reg_Per_Year.csv")

if(!(exists("vhist_full"))) {
  vhist_full <- read_csv("full_voter_history.csv")
  vhist_full$ELECTION_DATE <- mdy(vhist_full$ELECTION_DATE)
}
```

Returning now to El Paso, I will outline the method I will use to find turnout. I will then calculate turnout statistics for the 2014 midterms and check against reported figures. Let's check out this method on Monday and find ways to automate it for all counties.

I will do the following:

DENOMINATOR Find all IDs that were registered to vote in 2014. I will do this through the county/id file I just created. Match these IDs with those from the 2014 VRF. Filter out any with a registration date prior to 22 days before election day. *If calculating turnout over active voters, filter out inactive voters.* The length of the remaining dataset should be the denominator of turnout.

NUMERATOR Use the full history file and filter for election day and county. Match the resulting IDs with the registration file created above (inactive+active). They should all have a match. If any don't, investigate before disregarding. *The number of rows should be the numerator, and should be equal to ballots cast.

I will now apply this step by step to El Paso.

```
#Make base denominator
denom_ep_14 <- county_reg_ref %>%
  filter(COUNTY14 == "El Paso") %>%
  select(2, 5)

#Read in and wrangle registration file
reg14 <- read_csv("2014reg2.csv",
         col_types = cols_only(VOTER_ID = col_guess(), COUNTY = col_guess(),
                               VOTER_STATUS = col_guess(),
                               REGISTRATION_DATE = col_guess()))
```

```
## Warning in read_tokens_(data, tokenizer, col_specs, col_names, locale_, :
## length of NULL cannot be changed

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## Warning in read_tokens_(data, tokenizer, col_specs, col_names, locale_, :
```

```
## length of NULL cannot be changed

## Warning in rbind(names(probs), probs_f): number of columns of result is not
## a multiple of vector length (arg 1)

## Warning: 38 parsing failures.
## row # A tibble: 5 x 5 col      row col   expected   actual     file           expected    <int> <chr
## ... ................. ... ................................................... ........ ..............
## See problems(...) for more details.
```

```
reg14$REGISTRATION_DATE <- mdy(reg14$REGISTRATION_DATE)

#Check if all IDs are present in the reg file
sum(!(denom_ep_14$VOTER_ID %in% reg14$VOTER_ID))
```

```
## [1] 0
```

```
#Matching IDs
denom_ep_14 <- left_join(denom_ep_14, reg14, by = "VOTER_ID")

#Filtering invalid dates
denom_ep_14 <- denom_ep_14 %>%
  filter(REGISTRATION_DATE <= as.Date("2014-11-04") - 22)

#I have turnout statistics from the SoS as percentage of
#Registered Voters, so no need for further filtering!

denominator <- nrow(denom_ep_14)
```

```
#Make file with votes
num_ep_14 <- vhist_full %>%
  filter(ELECTION_DATE == as.Date("2014-11-04") &
           COUNTY_NAME == "El Paso")

#Is any of them not in the reg file?
sum(!(num_ep_14$VOTER_ID %in% denom_ep_14$VOTER_ID))
```

```
## [1] 0
```

```
#Investigate!
missing_voters <- num_ep_14[!(num_ep_14$VOTER_ID %in% denom_ep_14$VOTER_ID),]

#Similarities in PARTY registration...
summary(as.factor(missing_voters$PARTY))
```

```
## integer(0)
```

```
#None appear to have data on their party registration!

#Do they exist in the 2014 reg file?
sum(!(missing_voters$VOTER_ID %in% reg14$VOTER_ID))
```

```
## [1] 0
```

```
#Most of them do!

#Do they exist in the cumulative county reg file?
sum(!(missing_voters$VOTER_ID %in% county_reg_ref$VOTER_ID))
```

```
## [1] 0
```

```
#All of them do!

#Voting methods are different...
summary(as.factor(missing_voters$VOTING_METHOD))
```

```
## integer(0)
```

```
#Check to see active/inactive status
missing_voters <- left_join(missing_voters, reg14, by = "VOTER_ID")

#Almost all active or NA (or weird stuff I will deal with)
summary(as.factor(missing_voters$VOTER_STATUS))
```

```
## integer(0)
```

```
###HOWEVER!###
#Proceeding for now without their inclusion...
numerator <- sum(num_ep_14$VOTER_ID %in% denom_ep_14$VOTER_ID)

turnout <- numerator/denominator
```

It is therefore obvious that these numbers are quite close by the following table:

```
table_df <- data.frame(c("Calculated", "Reported"),
                       c(numerator, 231635), c(denominator, 424553),
                       c(signif(turnout, 3)*100, 54.56))

names(table_df) <- c("", "Ballots Cast", "Total Registered", "Turnout")

kable(table_df)
```

	Ballots Cast	Total Registered	Turnout
Calculated	0	418931	0.00
Reported	231635	424553	54.56