R Brown Bag session: tidyverse overview

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install.packages("tidyverse", repos = "http://cran.us.r project.org")

install.packages("readxl", repos = "http://cran.us.r project.org")

library(tidyverse)  
library(readxl)

# Part 1: Exploring your data

## Load 2020 Census Population dataset

Census2020 <- read\_excel("2020 Census File.xlsx")

## Investigate with glimpse

glimpse(Census2020)

## Rows: 51  
## Columns: 10  
## $ Area <chr> "Alabama", "Alas~  
## $ Region <chr> "South", "West",~  
## $ `2020 Census Resident Population` <dbl> 5024279, 733391,~  
## $ `2010 Census Resident Population` <dbl> 4779736, 710231,~  
## $ `Numeric Change` <dbl> 244543, 23160, 7~  
## $ `Percent Change` <dbl> 5.1, 3.3, 11.9, ~  
## $ `State Rank Based on 2020 Census Resident Population` <chr> "24", "48", "14"~  
## $ `State Rank Based on 2010 Census Resident Population` <chr> "23", "47", "16"~  
## $ `State Rank Based on Numeric Change` <chr> "24", "45", "8",~  
## $ `State Rank Based on Percent Change` <chr> "27", "36", "9",~

## Explore the dimensions

dim(Census2020)

## [1] 51 10

## Display column and row names

colnames(Census2020)

## [1] "Area"   
## [2] "Region"   
## [3] "2020 Census Resident Population"   
## [4] "2010 Census Resident Population"   
## [5] "Numeric Change"   
## [6] "Percent Change"   
## [7] "State Rank Based on 2020 Census Resident Population"  
## [8] "State Rank Based on 2010 Census Resident Population"  
## [9] "State Rank Based on Numeric Change"   
## [10] "State Rank Based on Percent Change"

rownames(Census2020)

## [1] "1" "2" "3" "4" "5" "6" "7" "8" "9" "10" "11" "12" "13" "14" "15"  
## [16] "16" "17" "18" "19" "20" "21" "22" "23" "24" "25" "26" "27" "28" "29" "30"  
## [31] "31" "32" "33" "34" "35" "36" "37" "38" "39" "40" "41" "42" "43" "44" "45"  
## [46] "46" "47" "48" "49" "50" "51"

## View top and bottom observations

head(Census2020)

## # A tibble: 6 x 10  
## Area Region `2020 Census Resident ~ `2010 Census Resident~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Alabama South 5024279 4779736 244543  
## 2 Alaska West 733391 710231 23160  
## 3 Arizona West 7151502 6392017 759485  
## 4 Arkans~ South 3011524 2915918 95606  
## 5 Califo~ West 39538223 37253956 2284267  
## 6 Colora~ West 5773714 5029196 744518  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

tail(Census2020)

## # A tibble: 6 x 10  
## Area Region `2020 Census Resident~ `2010 Census Residen~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Vermont North 643077 625741 17336  
## 2 Virginia South 8631393 8001024 630369  
## 3 Washing~ West 7705281 6724540 980741  
## 4 West Vi~ South 1793716 1852994 -59278  
## 5 Wiscons~ Midwest 5893718 5686986 206732  
## 6 Wyoming West 576851 563626 13225  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

## Explore largest and smallest values in a column

max(Census2020$`2020 Census Resident Population`)

## [1] 39538223

min(Census2020$`2020 Census Resident Population`)

## [1] 576851

## Display summary stats

summary(Census2020)

## Area Region 2020 Census Resident Population  
## Length:51 Length:51 Min. : 576851   
## Class :character Class :character 1st Qu.: 1816411   
## Mode :character Mode :character Median : 4505836   
## Mean : 6499006   
## 3rd Qu.: 7428392   
## Max. :39538223   
## 2010 Census Resident Population Numeric Change Percent Change   
## Min. : 563626 Min. : -59278 Min. :-3.200   
## 1st Qu.: 1696962 1st Qu.: 86292 1st Qu.: 2.900   
## Median : 4339367 Median : 206732 Median : 5.700   
## Mean : 6053834 Mean : 445171 Mean : 7.024   
## 3rd Qu.: 6636084 3rd Qu.: 495080 3rd Qu.:10.400   
## Max. :37253956 Max. :3999944 Max. :18.400   
## State Rank Based on 2020 Census Resident Population  
## Length:51   
## Class :character   
## Mode :character   
##   
##   
##   
## State Rank Based on 2010 Census Resident Population  
## Length:51   
## Class :character   
## Mode :character   
##   
##   
##   
## State Rank Based on Numeric Change State Rank Based on Percent Change  
## Length:51 Length:51   
## Class :character Class :character   
## Mode :character Mode :character   
##   
##   
##

## Open and explore the dataset in a new pane- with filtering options

View(Census2020)

## Identify a column

Census2020$`2020 Census Resident Population`

## [1] 5024279 733391 7151502 3011524 39538223 5773714 3605944 989948  
## [9] 689545 21538187 10711908 1455271 1839106 12812508 6785528 3190369  
## [17] 2937880 4505836 4657757 1362359 6177224 7029917 10077331 5706494  
## [25] 2961279 6154913 1084225 1961504 3104614 1377529 9288994 2117522  
## [33] 20201249 10439388 779094 11799448 3959353 4237256 13002700 1097379  
## [41] 5118425 886667 6910840 29145505 3271616 643077 8631393 7705281  
## [49] 1793716 5893718 576851

Census2020$Region

## [1] "South" "West" "West" "South" "West" "West" "North"   
## [8] "South" "South" "South" "South" "West" "West" "Midwest"  
## [15] "Midwest" "Midwest" "Midwest" "South" "South" "North" "South"   
## [22] "North" "Midwest" "Midwest" "South" "Midwest" "West" "Midwest"  
## [29] "West" "North" "North" "West" "North" "South" "Midwest"  
## [36] "Midwest" "South" "West" "North" "North" "South" "Midwest"  
## [43] "South" "South" "West" "North" "South" "West" "South"   
## [50] "Midwest" "West"

## Display contents of column as a table

table(Census2020$Region)

##   
## Midwest North South West   
## 12 9 17 13

table(Census2020$Area, Census2020$Region)

##   
## Midwest North South West  
## Alabama 0 0 1 0  
## Alaska 0 0 0 1  
## Arizona 0 0 0 1  
## Arkansas 0 0 1 0  
## California 0 0 0 1  
## Colorado 0 0 0 1  
## Connecticut 0 1 0 0  
## Delaware 0 0 1 0  
## District of Columbia 0 0 1 0  
## Florida 0 0 1 0  
## Georgia 0 0 1 0  
## Hawaii 0 0 0 1  
## Idaho 0 0 0 1  
## Illinois 1 0 0 0  
## Indiana 1 0 0 0  
## Iowa 1 0 0 0  
## Kansas 1 0 0 0  
## Kentucky 0 0 1 0  
## Louisiana 0 0 1 0  
## Maine 0 1 0 0  
## Maryland 0 0 1 0  
## Massachusetts 0 1 0 0  
## Michigan 1 0 0 0  
## Minnesota 1 0 0 0  
## Mississippi 0 0 1 0  
## Missouri 1 0 0 0  
## Montana 0 0 0 1  
## Nebraska 1 0 0 0  
## Nevada 0 0 0 1  
## New Hampshire 0 1 0 0  
## New Jersey 0 1 0 0  
## New Mexico 0 0 0 1  
## New York 0 1 0 0  
## North Carolina 0 0 1 0  
## North Dakota 1 0 0 0  
## Ohio 1 0 0 0  
## Oklahoma 0 0 1 0  
## Oregon 0 0 0 1  
## Pennsylvania 0 1 0 0  
## Rhode Island 0 1 0 0  
## South Carolina 0 0 1 0  
## South Dakota 1 0 0 0  
## Tennessee 0 0 1 0  
## Texas 0 0 1 0  
## Utah 0 0 0 1  
## Vermont 0 1 0 0  
## Virginia 0 0 1 0  
## Washington 0 0 0 1  
## West Virginia 0 0 1 0  
## Wisconsin 1 0 0 0  
## Wyoming 0 0 0 1

## Identify an exact position, [rows, columns]

Census2020[,1]

## # A tibble: 51 x 1  
## Area   
## <chr>   
## 1 Alabama   
## 2 Alaska   
## 3 Arizona   
## 4 Arkansas   
## 5 California   
## 6 Colorado   
## 7 Connecticut   
## 8 Delaware   
## 9 District of Columbia  
## 10 Florida   
## # ... with 41 more rows

Census2020[1,]

## # A tibble: 1 x 10  
## Area Region `2020 Census Resident ~ `2010 Census Resident ~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Alaba~ South 5024279 4779736 244543  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

Census2020[1,1]

## # A tibble: 1 x 1  
## Area   
## <chr>   
## 1 Alabama

## Export to csv

write.csv(Census2020, "Census2020.csv")

# Part 2: Manipulate and transform with Tidyverse: intro to dplyr commands using select, rename, filter, arrange, mutate, summarize

## Read-in two ACS files: 2019 population and 2019 poverty rate

Census2019 <- read\_csv("2019Pop.csv")

##   
## -- Column specification --------------------------------------------------------  
## cols(  
## State = col\_character(),  
## Estimate = col\_double()  
## )

Poverty2019 <- read\_csv("2019Poverty.csv")

##   
## -- Column specification --------------------------------------------------------  
## cols(  
## State = col\_character(),  
## PovertyStatus = col\_double(),  
## BelowPoverty = col\_double(),  
## AbovePoverty = col\_double()  
## )

## Use the select function to keep/select the columns: state name, region, 2020 population,numeric change, percent change, and state rank

Census2020Sub1 <- Census2020 %>%   
 select(`Area`,  
 `Region`,  
 `2020 Census Resident Population`,   
 `Numeric Change`,   
 `Percent Change`,   
 `State Rank Based on 2020 Census Resident Population`)

## View the subsetted object

Census2020Sub1

## # A tibble: 51 x 6  
## Area Region `2020 Census Resident ~ `Numeric Change` `Percent Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Alabama South 5024279 244543 5.1  
## 2 Alaska West 733391 23160 3.3  
## 3 Arizona West 7151502 759485 11.9  
## 4 Arkansas South 3011524 95606 3.3  
## 5 California West 39538223 2284267 6.1  
## 6 Colorado West 5773714 744518 14.8  
## 7 Connecticut North 3605944 31847 0.9  
## 8 Delaware South 989948 92014 10.2  
## 9 District of~ South 689545 87822 14.6  
## 10 Florida South 21538187 2736877 14.6  
## # ... with 41 more rows, and 1 more variable:  
## # State Rank Based on 2020 Census Resident Population <chr>

## Use the rename function to rename columns to easy to work with names

Census2020Sub1 <- Census2020Sub1 %>%   
 rename(State = Area,   
 Pop2020 = `2020 Census Resident Population`,   
 NumChange2020 = `Numeric Change`,   
 PercentChange2020 = `Percent Change`,   
 StateRank = `State Rank Based on 2020 Census Resident Population`)

## View new column names

str(Census2020Sub1)

## tibble [51 x 6] (S3: tbl\_df/tbl/data.frame)  
## $ State : chr [1:51] "Alabama" "Alaska" "Arizona" "Arkansas" ...  
## $ Region : chr [1:51] "South" "West" "West" "South" ...  
## $ Pop2020 : num [1:51] 5024279 733391 7151502 3011524 39538223 ...  
## $ NumChange2020 : num [1:51] 244543 23160 759485 95606 2284267 ...  
## $ PercentChange2020: num [1:51] 5.1 3.3 11.9 3.3 6.1 14.8 0.9 10.2 14.6 14.6 ...  
## $ StateRank : chr [1:51] "24" "48" "14" "33" ...

## Use the filter function to subset rows by pop size, using 9999999 as the limit

PopAboveLimit <- Census2020Sub1 %>%   
 filter(Pop2020 > 9999999)  
  
PopBelowLimit <- Census2020Sub1 %>%   
 filter(Pop2020 <= 9999999)

## View dimenstions of the new objects

dim(PopAboveLimit)

## [1] 10 6

dim(PopBelowLimit)

## [1] 41 6

## Use filter to subset rows by two conditions, using population and state rank

* Use a population limit of 9999999 and state rank limits to narrow down data

PopAboveLimitAND <- Census2020Sub1 %>%   
 filter(Pop2020 > 9999999 & StateRank >= 9)  
  
PopAboveLimitOR <- Census2020Sub1 %>%   
 filter(Pop2020 > 9999999 | StateRank >= 9)

## View the contents of the new object

glimpse(PopAboveLimitAND)

## Rows: 1  
## Columns: 6  
## $ State <chr> "North Carolina"  
## $ Region <chr> "South"  
## $ Pop2020 <dbl> 10439388  
## $ NumChange2020 <dbl> 903905  
## $ PercentChange2020 <dbl> 9.5  
## $ StateRank <chr> "9"

glimpse(PopAboveLimitOR)

## Rows: 11  
## Columns: 6  
## $ State <chr> "California", "District of Columbia", "Florida", "Ge~  
## $ Region <chr> "West", "South", "South", "South", "Midwest", "Midwe~  
## $ Pop2020 <dbl> 39538223, 689545, 21538187, 10711908, 12812508, 1007~  
## $ NumChange2020 <dbl> 2284267, 87822, 2736877, 1024255, -18124, 193691, 82~  
## $ PercentChange2020 <dbl> 6.1, 14.6, 14.6, 10.6, -0.1, 2.0, 4.2, 9.5, 2.3, 2.4~  
## $ StateRank <chr> "1", "X", "3", "8", "6", "10", "4", "9", "7", "5", "~

## Convert state rank from integer to numeric

str(Census2020Sub1$StateRank)

## chr [1:51] "24" "48" "14" "33" "1" "21" "29" "45" "X" "3" "8" "40" "38" ...

Census2020Sub1$StateRank <- as.numeric(Census2020Sub1$StateRank, na.rm = TRUE)

## Warning: NAs introduced by coercion

## Use the arrange function to sort the two population objects by state rank

* Order the filtered objects by ascending

TopPopAsce <- PopAboveLimit %>%   
 arrange(StateRank)   
  
LowPopAsce <- PopBelowLimit %>%   
 arrange(StateRank)

## View new object containing large states arranged by state rank- ascending

head(TopPopAsce)

## # A tibble: 6 x 6  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank  
## <chr> <chr> <dbl> <dbl> <dbl> <chr>   
## 1 California West 39538223 2284267 6.1 1   
## 2 Michigan Midwest 10077331 193691 2 10   
## 3 Texas South 29145505 3999944 15.9 2   
## 4 Florida South 21538187 2736877 14.6 3   
## 5 New York North 20201249 823147 4.2 4   
## 6 Pennsylvania North 13002700 300321 2.4 5

## View new object containing small states arranged by state rank- ascending

head(LowPopAsce)

## # A tibble: 6 x 6  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank  
## <chr> <chr> <dbl> <dbl> <dbl> <chr>   
## 1 New Jersey North 9288994 497100 5.7 11   
## 2 Virginia South 8631393 630369 7.9 12   
## 3 Washington West 7705281 980741 14.6 13   
## 4 Arizona West 7151502 759485 11.9 14   
## 5 Massachusetts North 7029917 482288 7.4 15   
## 6 Tennessee South 6910840 564735 8.9 16

## Use the arrange function to sort the two population objects by state rank

* Order the filtered objects by descending

TopPopDesc <- PopAboveLimit %>%   
 arrange(desc(StateRank))  
  
LowPopDesc <- PopBelowLimit %>%   
 arrange(desc(StateRank))

## View new object with large states arranged by state rank- descending

head(TopPopDesc)

## # A tibble: 6 x 6  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank  
## <chr> <chr> <dbl> <dbl> <dbl> <chr>   
## 1 North Carolina South 10439388 903905 9.5 9   
## 2 Georgia South 10711908 1024255 10.6 8   
## 3 Ohio Midwest 11799448 262944 2.3 7   
## 4 Illinois Midwest 12812508 -18124 -0.1 6   
## 5 Pennsylvania North 13002700 300321 2.4 5   
## 6 New York North 20201249 823147 4.2 4

## View new object with small states arranged by state rank- descending

head(LowPopDesc)

## # A tibble: 6 x 6  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank  
## <chr> <chr> <dbl> <dbl> <dbl> <chr>   
## 1 District of Columbia South 689545 87822 14.6 X   
## 2 Wyoming West 576851 13225 2.3 50   
## 3 Vermont North 643077 17336 2.8 49   
## 4 Alaska West 733391 23160 3.3 48   
## 5 North Dakota Midwest 779094 106503 15.8 47   
## 6 South Dakota Midwest 886667 72487 8.9 46

## Use the mutate function to add a new column

* Calculate the 2010 pop using the 2020 pop and numeric change columns

Census2020Mutate <- Census2020Sub1 %>%   
 mutate(Pop2010 = Pop2020 - NumChange2020)

## View top observations of new object

head(Census2020Mutate)

## # A tibble: 6 x 7  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank Pop2010  
## <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 Alabama South 5024279 244543 5.1 24 4779736  
## 2 Alaska West 733391 23160 3.3 48 710231  
## 3 Arizona West 7151502 759485 11.9 14 6392017  
## 4 Arkansas South 3011524 95606 3.3 33 2915918  
## 5 California West 39538223 2284267 6.1 1 37253956  
## 6 Colorado West 5773714 744518 14.8 21 5029196

## Use the summarise function to determine the total population in the US across all states, for 2020 and 2010

* 2020

Census2020PopSum <- Census2020Mutate %>%   
 summarise(Total2020 = sum(Pop2020))

* 2010

Census2010PopSum <- Census2020Mutate %>%   
 summarise(Total2010 = sum(Pop2010))

## View new objects with totals of 2020 and 2010 population size

* 2020

Census2020PopSum

## # A tibble: 1 x 1  
## Total2020  
## <dbl>  
## 1 331449281

* 2010

Census2010PopSum

## # A tibble: 1 x 1  
## Total2010  
## <dbl>  
## 1 308745538

## Use the summarise function to determine the total population in the US across all states, for 2020 and 2010. Include group\_by region

* 2020

Census2020PopbyRegion <- Census2020Mutate %>%   
 group\_by(Region) %>%  
 summarise(Total2020 = sum(Pop2020))

* 2010

Census2010PopbyRegion <- Census2020Mutate %>%   
 group\_by(Region) %>%  
 summarise(Total2010 = sum(Pop2010))

## View new objects with totals of 2020 and 2010 population size, grouped by region

* 2020

Census2020PopbyRegion

## # A tibble: 4 x 2  
## Region Total2020  
## <chr> <dbl>  
## 1 Midwest 68985454  
## 2 North 57609148  
## 3 South 126266107  
## 4 West 78588572

* 2010

Census2010PopbyRegion

## # A tibble: 4 x 2  
## Region Total2010  
## <chr> <dbl>  
## 1 Midwest 66927001  
## 2 North 55317240  
## 3 South 114555744  
## 4 West 71945553

## Calculate the average national population for 2020 and 2010, include group\_by region

* 2020

Census2020PopbyRegion <- Census2020Mutate %>%   
 group\_by(Region) %>%  
 summarize(Total2020 = mean(Pop2020))

* 2010

Census2010PopbyRegion <- Census2020Mutate %>%   
 group\_by(Region) %>%  
 summarize(Total2010 = mean(Pop2010))

## View new objects with averages of 2020 and 2010 population size, grouped by region

* 2020

Census2020PopbyRegion

## # A tibble: 4 x 2  
## Region Total2020  
## <chr> <dbl>  
## 1 Midwest 5748788.  
## 2 North 6401016.  
## 3 South 7427418.  
## 4 West 6045275.

* 2010

Census2010PopbyRegion

## # A tibble: 4 x 2  
## Region Total2010  
## <chr> <dbl>  
## 1 Midwest 5577250.  
## 2 North 6146360   
## 3 South 6738573.  
## 4 West 5534273.

## Calculate the sum of large states, include group\_by region

PopAboveLimitbyRegion <- PopAboveLimit %>%   
 group\_by(Region) %>%  
 summarize(TotalLarge2020 = sum(Pop2020))

## View new object with total population of large states, grouped by region

PopAboveLimitbyRegion

## # A tibble: 4 x 2  
## Region TotalLarge2020  
## <chr> <dbl>  
## 1 Midwest 34689287  
## 2 North 33203949  
## 3 South 71834988  
## 4 West 39538223

## Calculate the sum of small states, include group\_by region

* Use the object PopBelowLimit

PopBelowLimitbyRegion <- PopBelowLimit %>%   
 group\_by(Region) %>%  
 summarize(TotalSmall2020 = sum(Pop2020))

## View new object with total population of small states, grouped by region

PopBelowLimitbyRegion

## # A tibble: 4 x 2  
## Region TotalSmall2020  
## <chr> <dbl>  
## 1 Midwest 34296167  
## 2 North 24405199  
## 3 South 54431119  
## 4 West 39050349

## Examples of combining multiple dplyr verbs in one workflow - You can use all of the verbs chained together in logical order to achieve complex results

## Utilize select and rename functions in one workflow

Census2020Bonus <- Census2020 %>%   
 select(`Area`,   
 `2020 Census Resident Population`,   
 `2010 Census Resident Population`,  
 `State Rank Based on 2020 Census Resident Population`) %>%   
 rename(State = Area,   
 Pop2020 = `2020 Census Resident Population`,   
 Pop2010 = `2010 Census Resident Population`,  
 StateRank = `State Rank Based on 2020 Census Resident Population`)

## View top observations of new object

head(Census2020Bonus)

## # A tibble: 6 x 4  
## State Pop2020 Pop2010 StateRank  
## <chr> <dbl> <dbl> <chr>   
## 1 Alabama 5024279 4779736 24   
## 2 Alaska 733391 710231 48   
## 3 Arizona 7151502 6392017 14   
## 4 Arkansas 3011524 2915918 33   
## 5 California 39538223 37253956 1   
## 6 Colorado 5773714 5029196 21

## Utilize filter and arrange in one workflow

Census2020Bonus1 <- Census2020Bonus %>%   
 filter(StateRank >= 2 & StateRank <= 50) %>%   
 arrange(desc(Pop2020))

## View glimpse of new object

glimpse(Census2020Bonus1)

## Rows: 35  
## Columns: 4  
## $ State <chr> "Texas", "Florida", "New York", "Pennsylvania", "Wisconsin",~  
## $ Pop2020 <dbl> 29145505, 21538187, 20201249, 13002700, 5893718, 5773714, 57~  
## $ Pop2010 <dbl> 25145561, 18801310, 19378102, 12702379, 5686986, 5029196, 53~  
## $ StateRank <chr> "2", "3", "4", "5", "20", "21", "22", "23", "24", "25", "26"~

## Combine the mutate and summarize functions in one workflow

* Sum the population of top largest and smallest states using prior object

Census2020Bonus2 <- Census2020Bonus1 %>%   
 mutate(size = case\_when(Pop2020 > 9999999 ~ 'Big',   
 Pop2020 <= 9999999 ~ 'Small')) %>%   
 group\_by(size) %>%   
 summarize(Total2020 = sum(Pop2020))

## View glimpse of new object

glimpse(Census2020Bonus2)

## Rows: 2  
## Columns: 2  
## $ size <chr> "Big", "Small"  
## $ Total2020 <dbl> 83887641, 85657697

## Put it all together

Census2020Workflow <- Census2020 %>%   
 select(`Area`,   
 `2020 Census Resident Population`,   
 `2010 Census Resident Population`,  
 `State Rank Based on 2020 Census Resident Population`) %>%   
 rename(State = Area,   
 Pop2020 = `2020 Census Resident Population`,   
 Pop2010 = `2010 Census Resident Population`,  
 StateRank = `State Rank Based on 2020 Census Resident Population`) %>%  
 filter(StateRank >= 2 & StateRank <= 50) %>%   
 arrange(desc(Pop2020)) %>%  
 mutate(size = case\_when(Pop2020 > 9999999 ~ 'Big',   
 Pop2020 <= 9999999 ~ 'Small')) %>%   
 group\_by(size) %>%   
 summarize(Total2020 = sum(Pop2020))

## View outcome, it is the same as the workflow seen prior

Census2020Workflow

## # A tibble: 2 x 2  
## size Total2020  
## <chr> <dbl>  
## 1 Big 83887641  
## 2 Small 85657697

## Join 2020 Census with 2019 ACS Population, by state

CensusData1 <- left\_join(Census2020Sub1, Census2019, by = "State")

## View new joined object

head(CensusData1)

## # A tibble: 6 x 7  
## State Region Pop2020 NumChange2020 PercentChange2020 StateRank Estimate  
## <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 Alabama South 5024279 244543 5.1 24 4876250  
## 2 Alaska West 733391 23160 3.3 48 737068  
## 3 Arizona West 7151502 759485 11.9 14 7050299  
## 4 Arkansas South 3011524 95606 3.3 33 2999370  
## 5 California West 39538223 2284267 6.1 1 39283497  
## 6 Colorado West 5773714 744518 14.8 21 5610349

## Join 2020 and 2019 population object with 2019 ACS Poverty, by state

* Use rename function to change generic “estimate” column to something specific before join

CensusData1 <- CensusData1 %>%   
 rename(PopEstimate2019 = Estimate)  
  
CensusData2 <- left\_join(CensusData1, Poverty2019, by = "State")

## View top observations of the new object

head(CensusData2)

## # A tibble: 6 x 10  
## State Region Pop2020 NumChange2020 PercentChange20~ StateRank PopEstimate2019  
## <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 Alaba~ South 5.02e6 244543 5.1 24 4876250  
## 2 Alaska West 7.33e5 23160 3.3 48 737068  
## 3 Arizo~ West 7.15e6 759485 11.9 14 7050299  
## 4 Arkan~ South 3.01e6 95606 3.3 33 2999370  
## 5 Calif~ West 3.95e7 2284267 6.1 1 39283497  
## 6 Color~ West 5.77e6 744518 14.8 21 5610349  
## # ... with 3 more variables: PovertyStatus <dbl>, BelowPoverty <dbl>,  
## # AbovePoverty <dbl>

## Use filter and mutate functions to add a ranking variable for states based on below poverty variable

CensusDataRanked <- CensusData2 %>%   
 mutate(PovertyRank = dense\_rank(desc(BelowPoverty))) %>%   
 filter(PovertyRank <= 10)

## View a glimpse of new object

glimpse(CensusDataRanked)

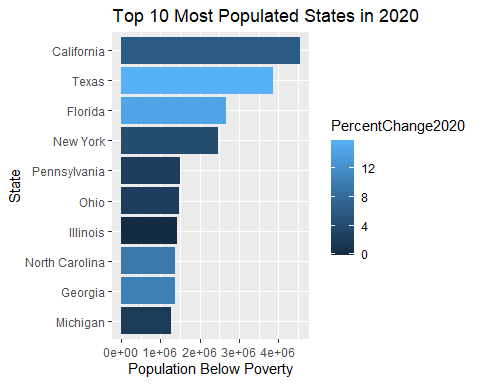
## Rows: 10  
## Columns: 11  
## $ State <chr> "California", "Florida", "Georgia", "Illinois", "Mic~  
## $ Region <chr> "West", "South", "South", "Midwest", "Midwest", "Nor~  
## $ Pop2020 <dbl> 39538223, 21538187, 10711908, 12812508, 10077331, 20~  
## $ NumChange2020 <dbl> 2284267, 2736877, 1024255, -18124, 193691, 823147, 9~  
## $ PercentChange2020 <dbl> 6.1, 14.6, 10.6, -0.1, 2.0, 4.2, 9.5, 2.3, 2.4, 15.9  
## $ StateRank <dbl> 1, 3, 8, 6, 10, 4, 9, 7, 5, 2  
## $ PopEstimate2019 <dbl> 39283497, 20901636, 10403847, 12770631, 9965265, 195~  
## $ PovertyStatus <dbl> 38733295, 21048884, 10332523, 12373209, 9772151, 189~  
## $ BelowPoverty <dbl> 4552837, 2664772, 1373909, 1420542, 1269062, 2467006~  
## $ AbovePoverty <dbl> 34180458, 18384112, 8958614, 10952667, 8503089, 1646~  
## $ PovertyRank <int> 1, 3, 9, 7, 10, 4, 8, 6, 5, 2

glimpse(CensusDataRanked$PovertyRank)

## int [1:10] 1 3 9 7 10 4 8 6 5 2

## Visualize using ggplot

ggplot(CensusDataRanked) +  
 geom\_bar(mapping = aes(x = reorder(State, BelowPoverty),   
 y = BelowPoverty,   
 fill = PercentChange2020),   
 stat = 'identity') +  
 labs(title = "Top 10 Most Populated States in 2020",  
 x = "State",  
 y = "Population Below Poverty") +  
 coord\_flip()



## Part 3: Explore with Tidycensus and API

## API Key and load Tidycensus package

library(tidycensus)  
  
census\_api\_key("INSERT YOUR API HERE", overwrite = FALSE, install = TRUE)

## Search for Variables

vars <- load\_variables(2020, "pl")  
  
print(tbl\_df(vars), n=301)

## Warning: `tbl\_df()` was deprecated in dplyr 1.0.0.  
## Please use `tibble::as\_tibble()` instead.  
## This warning is displayed once every 8 hours.  
## Call `lifecycle::last\_warnings()` to see where this warning was generated.

## # A tibble: 301 x 3  
## name label concept   
## <chr> <chr> <chr>   
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## 2 H1\_00~ " !!Total:!!Occupied" OCCUPANCY STATUS   
## 3 H1\_00~ " !!Total:!!Vacant" OCCUPANCY STATUS   
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## 244 P4\_02~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 245 P4\_02~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 246 P4\_02~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 247 P4\_02~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 248 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 249 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 250 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 251 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 252 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 253 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 254 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 255 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 256 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 257 P4\_03~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 258 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 259 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 260 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 261 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 262 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 263 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 264 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 265 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 266 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 267 P4\_04~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 268 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 269 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 270 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 271 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 272 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 273 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 274 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 275 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 276 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 277 P4\_05~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 278 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 279 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 280 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 281 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 282 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 283 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 284 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 285 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 286 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 287 P4\_06~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 288 P4\_07~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 289 P4\_07~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 290 P4\_07~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 291 P4\_07~ " !!Total:!!Not Hispanic or Latin~ HISPANIC OR LATINO, AND NOT HISPA~  
## 292 P5\_00~ " !!Total:" GROUP QUARTERS POPULATION BY MAJO~  
## 293 P5\_00~ " !!Total:!!Institutionalized pop~ GROUP QUARTERS POPULATION BY MAJO~  
## 294 P5\_00~ " !!Total:!!Institutionalized pop~ GROUP QUARTERS POPULATION BY MAJO~  
## 295 P5\_00~ " !!Total:!!Institutionalized pop~ GROUP QUARTERS POPULATION BY MAJO~  
## 296 P5\_00~ " !!Total:!!Institutionalized pop~ GROUP QUARTERS POPULATION BY MAJO~  
## 297 P5\_00~ " !!Total:!!Institutionalized pop~ GROUP QUARTERS POPULATION BY MAJO~  
## 298 P5\_00~ " !!Total:!!Noninstitutionalized ~ GROUP QUARTERS POPULATION BY MAJO~  
## 299 P5\_00~ " !!Total:!!Noninstitutionalized ~ GROUP QUARTERS POPULATION BY MAJO~  
## 300 P5\_00~ " !!Total:!!Noninstitutionalized ~ GROUP QUARTERS POPULATION BY MAJO~  
## 301 P5\_01~ " !!Total:!!Noninstitutionalized ~ GROUP QUARTERS POPULATION BY MAJO~

## Look at Decennial Population Numbers

pop20 <- get\_decennial(  
 geography = "state",  
 variables = "P1\_001N",  
 year = 2020)

## Getting data from the 2020 decennial Census

## Using the PL 94-171 Redistricting Data summary file

## Note: 2020 decennial Census data use differential privacy, a technique that  
## introduces errors into data to preserve respondent confidentiality.  
## i Small counts should be interpreted with caution.  
## i See https://www.census.gov/library/fact-sheets/2021/protecting-the-confidentiality-of-the-2020-census-redistricting-data.html for additional guidance.  
## This message is displayed once per session.

## View table of decennial counts

print(tbl\_df(pop20), n=52)

## # A tibble: 52 x 4  
## GEOID NAME variable value  
## <chr> <chr> <chr> <dbl>  
## 1 01 Alabama P1\_001N 5024279  
## 2 02 Alaska P1\_001N 733391  
## 3 04 Arizona P1\_001N 7151502  
## 4 05 Arkansas P1\_001N 3011524  
## 5 06 California P1\_001N 39538223  
## 6 08 Colorado P1\_001N 5773714  
## 7 09 Connecticut P1\_001N 3605944  
## 8 10 Delaware P1\_001N 989948  
## 9 11 District of Columbia P1\_001N 689545  
## 10 16 Idaho P1\_001N 1839106  
## 11 12 Florida P1\_001N 21538187  
## 12 13 Georgia P1\_001N 10711908  
## 13 15 Hawaii P1\_001N 1455271  
## 14 17 Illinois P1\_001N 12812508  
## 15 18 Indiana P1\_001N 6785528  
## 16 19 Iowa P1\_001N 3190369  
## 17 20 Kansas P1\_001N 2937880  
## 18 21 Kentucky P1\_001N 4505836  
## 19 22 Louisiana P1\_001N 4657757  
## 20 23 Maine P1\_001N 1362359  
## 21 24 Maryland P1\_001N 6177224  
## 22 25 Massachusetts P1\_001N 7029917  
## 23 26 Michigan P1\_001N 10077331  
## 24 27 Minnesota P1\_001N 5706494  
## 25 28 Mississippi P1\_001N 2961279  
## 26 29 Missouri P1\_001N 6154913  
## 27 30 Montana P1\_001N 1084225  
## 28 31 Nebraska P1\_001N 1961504  
## 29 32 Nevada P1\_001N 3104614  
## 30 33 New Hampshire P1\_001N 1377529  
## 31 34 New Jersey P1\_001N 9288994  
## 32 35 New Mexico P1\_001N 2117522  
## 33 36 New York P1\_001N 20201249  
## 34 37 North Carolina P1\_001N 10439388  
## 35 38 North Dakota P1\_001N 779094  
## 36 39 Ohio P1\_001N 11799448  
## 37 40 Oklahoma P1\_001N 3959353  
## 38 41 Oregon P1\_001N 4237256  
## 39 42 Pennsylvania P1\_001N 13002700  
## 40 44 Rhode Island P1\_001N 1097379  
## 41 45 South Carolina P1\_001N 5118425  
## 42 46 South Dakota P1\_001N 886667  
## 43 47 Tennessee P1\_001N 6910840  
## 44 48 Texas P1\_001N 29145505  
## 45 49 Utah P1\_001N 3271616  
## 46 50 Vermont P1\_001N 643077  
## 47 51 Virginia P1\_001N 8631393  
## 48 53 Washington P1\_001N 7705281  
## 49 54 West Virginia P1\_001N 1793716  
## 50 55 Wisconsin P1\_001N 5893718  
## 51 56 Wyoming P1\_001N 576851  
## 52 72 Puerto Rico P1\_001N 3285874

## View DMV population from Census provided data

* District of Columbia

pop20 %>% filter(GEOID == 11)

## # A tibble: 1 x 4  
## GEOID NAME variable value  
## <chr> <chr> <chr> <dbl>  
## 1 11 District of Columbia P1\_001N 689545

* Maryland

pop20 %>% filter(GEOID == 24)

## # A tibble: 1 x 4  
## GEOID NAME variable value  
## <chr> <chr> <chr> <dbl>  
## 1 24 Maryland P1\_001N 6177224

* Virginia

pop20 %>% filter(GEOID == 51)

## # A tibble: 1 x 4  
## GEOID NAME variable value  
## <chr> <chr> <chr> <dbl>  
## 1 51 Virginia P1\_001N 8631393

## View DMV population from outside source provided data

* District of Columbia

Census2020 %>% filter(Area == "District of Columbia")

## # A tibble: 1 x 10  
## Area Region `2020 Census Residen~ `2010 Census Residen~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 District ~ South 689545 601723 87822  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

* Maryland

Census2020 %>% filter(Area == "Maryland")

## # A tibble: 1 x 10  
## Area Region `2020 Census Resident ~ `2010 Census Resident~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Maryla~ South 6177224 5773552 403672  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

* Virginia

Census2020 %>% filter(Area == "Virginia")

## # A tibble: 1 x 10  
## Area Region `2020 Census Resident ~ `2010 Census Resident~ `Numeric Change`  
## <chr> <chr> <dbl> <dbl> <dbl>  
## 1 Virgin~ South 8631393 8001024 630369  
## # ... with 5 more variables: Percent Change <dbl>,  
## # State Rank Based on 2020 Census Resident Population <chr>,  
## # State Rank Based on 2010 Census Resident Population <chr>,  
## # State Rank Based on Numeric Change <chr>,  
## # State Rank Based on Percent Change <chr>

## Compare the two sources of data, create new objects for each

* District of Columbia

API\_DC <- pop20 %>%   
 filter(GEOID == 11) %>%   
 select(value)  
  
ACS\_DC <- Census2020 %>%   
 filter(Area == "District of Columbia") %>%   
 select(`2020 Census Resident Population`)

* Maryland

API\_MD <- pop20 %>% filter(GEOID == 24) %>%   
 select(value)  
  
ACS\_MD <- Census2020 %>%   
 filter(Area == "Maryland") %>%   
 select(`2020 Census Resident Population`)

* Virginia

API\_VA <- pop20 %>% filter(GEOID == 51) %>%   
 select(value)  
  
ACS\_VA <- Census2020 %>%   
 filter(Area == "Virginia") %>%   
 select(`2020 Census Resident Population`)

## Do the two sources of population data match?

* District of Columbia

all(API\_DC == ACS\_DC)

## [1] TRUE

* Maryland

all(API\_MD == ACS\_MD)

## [1] TRUE

* Virginia

all(API\_VA == ACS\_VA)

## [1] TRUE

## Group quarters data

group\_quarters <- get\_decennial(  
 geography = "state",   
 table = "P5",   
 year = 2020,  
 output = "wide")

## Getting data from the 2020 decennial Census

## Loading PL variables for 2020 from table P5. To cache this dataset for faster access to Census tables in the future, run this function with `cache\_table = TRUE`. You only need to do this once per Census dataset.

## Using the PL 94-171 Redistricting Data summary file

## Show top observations of group quarters data

head(group\_quarters)

## # A tibble: 6 x 12  
## GEOID NAME P5\_001N P5\_002N P5\_003N P5\_004N P5\_005N P5\_006N P5\_007N P5\_008N  
## <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 01 Alabama 127934 70648 39749 1479 27869 1551 57286 45489  
## 2 02 Alaska 30291 7177 4842 457 1781 97 23114 1472  
## 3 04 Arizona 160269 89904 64154 2331 21938 1481 70365 38945  
## 4 05 Arkansas 82518 48001 27079 1248 19266 408 34517 26887  
## 5 06 Califor~ 917932 344896 201570 8966 124804 9556 573036 230361  
## 6 08 Colorado 126848 55851 32307 1525 21379 640 70997 38819  
## # ... with 2 more variables: P5\_009N <dbl>, P5\_010N <dbl>

## Group quarters DMV data

* District of Columbia

dc\_group\_quarters <- get\_decennial(  
 geography = "state",   
 table = "P5",   
 state = "DC",  
 year = 2020,  
 output = "wide")

## Getting data from the 2020 decennial Census

## Loading PL variables for 2020 from table P5. To cache this dataset for faster access to Census tables in the future, run this function with `cache\_table = TRUE`. You only need to do this once per Census dataset.

## Using the PL 94-171 Redistricting Data summary file

* Maryland

md\_group\_quarters <- get\_decennial(  
 geography = "state",   
 table = "P5",   
 state = "MD",  
 year = 2020,  
 output = "wide")

## Getting data from the 2020 decennial Census

## Loading PL variables for 2020 from table P5. To cache this dataset for faster access to Census tables in the future, run this function with `cache\_table = TRUE`. You only need to do this once per Census dataset.

## Using the PL 94-171 Redistricting Data summary file

* Virginia

va\_group\_quarters <- get\_decennial(  
 geography = "state",   
 table = "P5",   
 state = "VA",  
 year = 2020,  
 output = "wide")

## Getting data from the 2020 decennial Census

## Loading PL variables for 2020 from table P5. To cache this dataset for faster access to Census tables in the future, run this function with `cache\_table = TRUE`. You only need to do this once per Census dataset.

## Using the PL 94-171 Redistricting Data summary file

## Use rbind to concatenate rows

dmv\_group\_quarters <- rbind(dc\_group\_quarters,  
 md\_group\_quarters,  
 va\_group\_quarters)

## View DMV group quarters object

dmv\_group\_quarters

## # A tibble: 3 x 12  
## GEOID NAME P5\_001N P5\_002N P5\_003N P5\_004N P5\_005N P5\_006N P5\_007N P5\_008N  
## <chr> <chr> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl> <dbl>  
## 1 11 Distric~ 40682 5606 2278 315 2727 286 35076 23802  
## 2 24 Maryland 125505 58693 27040 1008 29252 1393 66812 46179  
## 3 51 Virginia 236646 96832 57014 2038 36195 1585 139814 92450  
## # ... with 2 more variables: P5\_009N <dbl>, P5\_010N <dbl>

## Show hispanic DMV data

dmv\_hispanic <- get\_decennial(  
 geography = "county",   
 variables = "P2\_002N",   
 state = c("DC", "MD", "VA"),   
 year = 2020)

## Getting data from the 2020 decennial Census

## Using the PL 94-171 Redistricting Data summary file

## Show DMV Hispanic data

print(tbl\_df(dmv\_hispanic), n=158)

## # A tibble: 158 x 4  
## GEOID NAME variable value  
## <chr> <chr> <chr> <dbl>  
## 1 24003 Anne Arundel County, Maryland P2\_002N 56796  
## 2 24005 Baltimore County, Maryland P2\_002N 61492  
## 3 24011 Caroline County, Maryland P2\_002N 2820  
## 4 24013 Carroll County, Maryland P2\_002N 7745  
## 5 24017 Charles County, Maryland P2\_002N 11677  
## 6 24019 Dorchester County, Maryland P2\_002N 1777  
## 7 24023 Garrett County, Maryland P2\_002N 321  
## 8 24025 Harford County, Maryland P2\_002N 14007  
## 9 24029 Kent County, Maryland P2\_002N 1061  
## 10 24033 Prince George's County, Maryland P2\_002N 205463  
## 11 24035 Queen Anne's County, Maryland P2\_002N 2538  
## 12 24039 Somerset County, Maryland P2\_002N 1075  
## 13 24041 Talbot County, Maryland P2\_002N 3352  
## 14 24043 Washington County, Maryland P2\_002N 10289  
## 15 24045 Wicomico County, Maryland P2\_002N 7091  
## 16 24047 Worcester County, Maryland P2\_002N 2078  
## 17 24510 Baltimore city, Maryland P2\_002N 45927  
## 18 24001 Allegany County, Maryland P2\_002N 1149  
## 19 24009 Calvert County, Maryland P2\_002N 4202  
## 20 24015 Cecil County, Maryland P2\_002N 5450  
## 21 24021 Frederick County, Maryland P2\_002N 32119  
## 22 24027 Howard County, Maryland P2\_002N 27362  
## 23 24031 Montgomery County, Maryland P2\_002N 217409  
## 24 24037 St. Mary's County, Maryland P2\_002N 6545  
## 25 51003 Albemarle County, Virginia P2\_002N 8453  
## 26 51005 Alleghany County, Virginia P2\_002N 178  
## 27 51009 Amherst County, Virginia P2\_002N 838  
## 28 51011 Appomattox County, Virginia P2\_002N 344  
## 29 51015 Augusta County, Virginia P2\_002N 2728  
## 30 51017 Bath County, Virginia P2\_002N 73  
## 31 51021 Bland County, Virginia P2\_002N 60  
## 32 51023 Botetourt County, Virginia P2\_002N 776  
## 33 51027 Buchanan County, Virginia P2\_002N 177  
## 34 51029 Buckingham County, Virginia P2\_002N 413  
## 35 51033 Caroline County, Virginia P2\_002N 1968  
## 36 51035 Carroll County, Virginia P2\_002N 1042  
## 37 51037 Charlotte County, Virginia P2\_002N 253  
## 38 51041 Chesterfield County, Virginia P2\_002N 40236  
## 39 51043 Clarke County, Virginia P2\_002N 887  
## 40 51047 Culpeper County, Virginia P2\_002N 7509  
## 41 51061 Fauquier County, Virginia P2\_002N 7793  
## 42 51049 Cumberland County, Virginia P2\_002N 241  
## 43 51053 Dinwiddie County, Virginia P2\_002N 1128  
## 44 51057 Essex County, Virginia P2\_002N 369  
## 45 51063 Floyd County, Virginia P2\_002N 487  
## 46 51067 Franklin County, Virginia P2\_002N 1955  
## 47 51069 Frederick County, Virginia P2\_002N 9990  
## 48 51073 Gloucester County, Virginia P2\_002N 1410  
## 49 51075 Goochland County, Virginia P2\_002N 862  
## 50 51079 Greene County, Virginia P2\_002N 1330  
## 51 51081 Greensville County, Virginia P2\_002N 276  
## 52 51085 Hanover County, Virginia P2\_002N 3938  
## 53 51087 Henrico County, Virginia P2\_002N 22085  
## 54 51091 Highland County, Virginia P2\_002N 35  
## 55 51093 Isle of Wight County, Virginia P2\_002N 1199  
## 56 51095 James City County, Virginia P2\_002N 5199  
## 57 51097 King and Queen County, Virginia P2\_002N 182  
## 58 51099 King George County, Virginia P2\_002N 1582  
## 59 51101 King William County, Virginia P2\_002N 476  
## 60 51103 Lancaster County, Virginia P2\_002N 125  
## 61 51105 Lee County, Virginia P2\_002N 476  
## 62 51107 Loudoun County, Virginia P2\_002N 59744  
## 63 51109 Louisa County, Virginia P2\_002N 1365  
## 64 51111 Lunenburg County, Virginia P2\_002N 589  
## 65 51113 Madison County, Virginia P2\_002N 441  
## 66 51115 Mathews County, Virginia P2\_002N 197  
## 67 51117 Mecklenburg County, Virginia P2\_002N 821  
## 68 51119 Middlesex County, Virginia P2\_002N 259  
## 69 51121 Montgomery County, Virginia P2\_002N 4651  
## 70 51125 Nelson County, Virginia P2\_002N 663  
## 71 51127 New Kent County, Virginia P2\_002N 731  
## 72 51131 Northampton County, Virginia P2\_002N 1068  
## 73 51133 Northumberland County, Virginia P2\_002N 351  
## 74 51135 Nottoway County, Virginia P2\_002N 773  
## 75 51137 Orange County, Virginia P2\_002N 2171  
## 76 51139 Page County, Virginia P2\_002N 497  
## 77 51143 Pittsylvania County, Virginia P2\_002N 1712  
## 78 51145 Powhatan County, Virginia P2\_002N 792  
## 79 51149 Prince George County, Virginia P2\_002N 4344  
## 80 51153 Prince William County, Virginia P2\_002N 121524  
## 81 51157 Rappahannock County, Virginia P2\_002N 289  
## 82 51159 Richmond County, Virginia P2\_002N 597  
## 83 51163 Rockbridge County, Virginia P2\_002N 513  
## 84 51165 Rockingham County, Virginia P2\_002N 7093  
## 85 51169 Scott County, Virginia P2\_002N 255  
## 86 51171 Shenandoah County, Virginia P2\_002N 3726  
## 87 51175 Southampton County, Virginia P2\_002N 332  
## 88 51177 Spotsylvania County, Virginia P2\_002N 16654  
## 89 51181 Surry County, Virginia P2\_002N 149  
## 90 51183 Sussex County, Virginia P2\_002N 306  
## 91 51187 Warren County, Virginia P2\_002N 2413  
## 92 51191 Washington County, Virginia P2\_002N 891  
## 93 51195 Wise County, Virginia P2\_002N 452  
## 94 51197 Wythe County, Virginia P2\_002N 355  
## 95 51199 York County, Virginia P2\_002N 5136  
## 96 51520 Bristol city, Virginia P2\_002N 455  
## 97 51530 Buena Vista city, Virginia P2\_002N 229  
## 98 51550 Chesapeake city, Virginia P2\_002N 17824  
## 99 11001 District of Columbia, District of Columbia P2\_002N 77652  
## 100 51610 Falls Church city, Virginia P2\_002N 1529  
## 101 51570 Colonial Heights city, Virginia P2\_002N 1276  
## 102 51590 Danville city, Virginia P2\_002N 2074  
## 103 51595 Emporia city, Virginia P2\_002N 345  
## 104 51620 Franklin city, Virginia P2\_002N 218  
## 105 51640 Galax city, Virginia P2\_002N 1061  
## 106 51650 Hampton city, Virginia P2\_002N 8411  
## 107 51670 Hopewell city, Virginia P2\_002N 1889  
## 108 51678 Lexington city, Virginia P2\_002N 335  
## 109 51683 Manassas city, Virginia P2\_002N 18345  
## 110 51685 Manassas Park city, Virginia P2\_002N 7799  
## 111 51700 Newport News city, Virginia P2\_002N 19288  
## 112 51710 Norfolk city, Virginia P2\_002N 23130  
## 113 51720 Norton city, Virginia P2\_002N 81  
## 114 51735 Poquoson city, Virginia P2\_002N 463  
## 115 51740 Portsmouth city, Virginia P2\_002N 4413  
## 116 51760 Richmond city, Virginia P2\_002N 23747  
## 117 51770 Roanoke city, Virginia P2\_002N 8484  
## 118 51775 Salem city, Virginia P2\_002N 1088  
## 119 51790 Staunton city, Virginia P2\_002N 1088  
## 120 51800 Suffolk city, Virginia P2\_002N 4252  
## 121 51810 Virginia Beach city, Virginia P2\_002N 40404  
## 122 51820 Waynesboro city, Virginia P2\_002N 1945  
## 123 51830 Williamsburg city, Virginia P2\_002N 1215  
## 124 51840 Winchester city, Virginia P2\_002N 5494  
## 125 51001 Accomack County, Virginia P2\_002N 3430  
## 126 51007 Amelia County, Virginia P2\_002N 425  
## 127 51013 Arlington County, Virginia P2\_002N 37362  
## 128 51019 Bedford County, Virginia P2\_002N 2055  
## 129 51045 Craig County, Virginia P2\_002N 53  
## 130 51025 Brunswick County, Virginia P2\_002N 387  
## 131 51031 Campbell County, Virginia P2\_002N 1815  
## 132 51036 Charles City County, Virginia P2\_002N 101  
## 133 51051 Dickenson County, Virginia P2\_002N 83  
## 134 51059 Fairfax County, Virginia P2\_002N 199234  
## 135 51065 Fluvanna County, Virginia P2\_002N 1107  
## 136 51071 Giles County, Virginia P2\_002N 244  
## 137 51077 Grayson County, Virginia P2\_002N 596  
## 138 51083 Halifax County, Virginia P2\_002N 760  
## 139 51089 Henry County, Virginia P2\_002N 3301  
## 140 51141 Patrick County, Virginia P2\_002N 567  
## 141 51147 Prince Edward County, Virginia P2\_002N 1088  
## 142 51155 Pulaski County, Virginia P2\_002N 704  
## 143 51161 Roanoke County, Virginia P2\_002N 3507  
## 144 51167 Russell County, Virginia P2\_002N 168  
## 145 51173 Smyth County, Virginia P2\_002N 558  
## 146 51179 Stafford County, Virginia P2\_002N 23646  
## 147 51185 Tazewell County, Virginia P2\_002N 507  
## 148 51193 Westmoreland County, Virginia P2\_002N 1049  
## 149 51510 Alexandria city, Virginia P2\_002N 29372  
## 150 51540 Charlottesville city, Virginia P2\_002N 3207  
## 151 51580 Covington city, Virginia P2\_002N 179  
## 152 51600 Fairfax city, Virginia P2\_002N 4278  
## 153 51630 Fredericksburg city, Virginia P2\_002N 3472  
## 154 51660 Harrisonburg city, Virginia P2\_002N 12045  
## 155 51680 Lynchburg city, Virginia P2\_002N 3880  
## 156 51690 Martinsville city, Virginia P2\_002N 1025  
## 157 51730 Petersburg city, Virginia P2\_002N 1970  
## 158 51750 Radford city, Virginia P2\_002N 765