506 Project Functions

2022-10-23

```
library(writexl)
library(dplyr)
suppressWarnings(library(kableExtra))
library(tidycensus)
library(tigris)
library(tidyverse)
```

```
### Comment out these lines of code; this will change depending on who's running the code, and I think t
# census_api_key("2567b1d4e4122ec716ee4e55fce64f07a9cbae74", install = TRUE, overwrite = TRUE)
# Sys.setenv(CENSUS_API_KEY='Your API key here as a string' )
# Reload .Renviron
readRenviron("~/.Renviron")
Sys.getenv("CENSUS_API_KEY")
```

Function 1

Create a function to extract data from the Census API - Inputs: state, year - Output: a dataframe with the population for each demographic group for each year for each county in the state

```
census_var <- load_variables(year = 2010, dataset = 'sf1', cache=T)
# All races except for hispanic or latino
census_race <- census_var[grepl("^RACE$", census_var$concept), ]
### as well as "Total!!", which are the different demographic groups
census_race1 <- census_race[grepl("^Total!!", census_race$label), ]
### Include the "Total" population
census_race1 <- rbind(census_race1, census_race%>%filter(label == "Total" & name == "P003001")) ### The
### Create a variable with the race
census_race1$race <- substring(census_race1$label, 8)
```

```
### At this point, there are many races
unique(census_race1$race)
```

```
##  [1] "White alone"
##  [2] "Black or African American alone"
##  [3] "American Indian and Alaska Native alone"
##  [4] "Asian alone"
##  [5] "Native Hawaiian and Other Pacific Islander alone"
##  [6] "Some Other Race alone"
##  [7] "Two or More Races"
##  [8] "Population of one race"
##  [9] "Population of one race!!White alone"
```

```
## [10] "Population of one race!!Black or African American alone"
## [11] "Population of one race!!American Indian and Alaska Native alone"
## [12] "Population of one race!!Asian alone"
## [13] "Population of one race!!Native Hawaiian and Other Pacific Islander alone"
## [14] "Population of one race!!Some Other Race alone"
## [15] "Two or More Races!!Population of two races"
## [16] "Two or More Races!!Population of two races!!White; Black or African American"
## [17] "Two or More Races!!Population of two races!!White; American Indian and Alaska Native"
## [18] "Two or More Races!!Population of two races!!White; Asian"
## [19] "Two or More Races!!Population of two races!!White; Native Hawaiian and Other Pacific Islander"
## [20] "Two or More Races!!Population of two races!!White; Some Other Race"
## [21] "Two or More Races!!Population of two races!!Black or African American; American Indian and Ala
## [22] "Two or More Races!!Population of two races!!Black or African American; Asian"
## [23] "Two or More Races!!Population of two races!!Black or African American; Native Hawaiian and Oth
## [24] "Two or More Races!!Population of two races!!Black or African American; Some Other Race"
## [25] "Two or More Races!!Population of two races!!American Indian and Alaska Native; Asian"
## [26] "Two or More Races!!Population of two races!!American Indian and Alaska Native; Native Hawaiian
## [27] "Two or More Races!!Population of two races!!American Indian and Alaska Native; Some Other Race
## [28] "Two or More Races!!Population of two races!!Asian; Native Hawaiian and Other Pacific Islander"
## [29] "Two or More Races!!Population of two races!!Asian; Some Other Race"
## [30] "Two or More Races!!Population of two races!!Native Hawaiian and Other Pacific Islander; Some O
## [31] "Two or More Races!!Population of three races"
## [32] "Two or More Races!!Population of three races!!White; Black or African American; American Indian
## [33] "Two or More Races!!Population of three races!!White; Black or African American; Asian"
## [34] "Two or More Races!!Population of three races!!White; Black or African American; Native Hawaiian
## [35] "Two or More Races!!Population of three races!!White; Black or African American; Some Other Race
## [36] "Two or More Races!!Population of three races!!White; American Indian and Alaska Native; Asian"
## [37] "Two or More Races!!Population of three races!!White; American Indian and Alaska Native; Native
## [38] "Two or More Races!!Population of three races!!White; American Indian and Alaska Native; Some O
## [39] "Two or More Races!!Population of three races!!White; Asian; Native Hawaiian and Other Pacific I
## [40] "Two or More Races!!Population of three races!!White; Asian; Some Other Race"
## [41] "Two or More Races!!Population of three races!!White; Native Hawaiian and Other Pacific Islander
## [42] "Two or More Races!!Population of three races!!Black or African American; American Indian and Al
## [43] "Two or More Races!!Population of three races!!Black or African American; American Indian and Al
## [44] "Two or More Races!!Population of three races!!Black or African American; American Indian and Al
## [45] "Two or More Races!!Population of three races!!Black or African American; Asian; Native Hawaiian
## [46] "Two or More Races!!Population of three races!!Black or African American; Asian; Some Other Race
## [47] "Two or More Races!!Population of three races!!Black or African American; Native Hawaiian and O
## [48] "Two or More Races!!Population of three races!!American Indian and Alaska Native; Asian; Native
## [49] "Two or More Races!!Population of three races!!American Indian and Alaska Native; Asian; Some O
## [50] "Two or More Races!!Population of three races!!American Indian and Alaska Native; Native Hawaii
## [51] "Two or More Races!!Population of three races!!Asian; Native Hawaiian and Other Pacific Islander
## [52] "Two or More Races!!Population of four races"
## [53] "Two or More Races!!Population of four races!!White; Black or African American; American Indian
## [54] "Two or More Races!!Population of four races!!White; Black or African American; American Indian
## [55] "Two or More Races!!Population of four races!!White; Black or African American; American Indian
## [56] "Two or More Races!!Population of four races!!White; Black or African American; Asian; Native Ha
## [57] "Two or More Races!!Population of four races!!White; Black or African American; Asian; Some Othe
## [58] "Two or More Races!!Population of four races!!White; Black or African American; Native Hawaiian
## [59] "Two or More Races!!Population of four races!!White; American Indian and Alaska Native; Asian; N
## [60] "Two or More Races!!Population of four races!!White; American Indian and Alaska Native; Asian; S
## [61] "Two or More Races!!Population of four races!!White; American Indian and Alaska Native; Native N
## [62] "Two or More Races!!Population of four races!!White; Asian; Native Hawaiian and Other Pacific Is
## [63] "Two or More Races!!Population of four races!!Black or African American; American Indian and Ala
```

```
## [64] "Two or More Races!!Population of four races!!Black or African American; American Indian and Ala
## [65] "Two or More Races!!Population of four races!!Black or African American; American Indian and Ala
## [66] "Two or More Races!!Population of four races!!Black or African American; Asian; Native Hawaiian
## [67] "Two or More Races!!Population of four races!!American Indian and Alaska Native; Asian; Native
## [68] "Two or More Races!!Population of five races"
## [69] "Two or More Races!!Population of five races!!White; Black or African American; American Indian
## [70] "Two or More Races!!Population of five races!!White; Black or African American; American Indian
## [71] "Two or More Races!!Population of five races!!White; Black or African American; American Indian
## [72] "Two or More Races!!Population of five races!!White; Black or African American; Asian; Native Ha
## [73] "Two or More Races!!Population of five races!!White; American Indian and Alaska Native; Asian;
## [74] "Two or More Races!!Population of five races!!Black or African American; American Indian and Ala
## [75] "Two or More Races!!Population of six races"
## [76] "Two or More Races!!Population of six races!!White; Black or African American; American Indian a
## [77] "Population of one race!!White"
## [78] "Population of one race!!Black or African American"
## [79] "Population of one race!!American Indian and Alaska Native"
## [80] "Population of one race!!Asian"
## [81] "Population of one race!!Asian!!Asian Indian"
## [82] "Population of one race!!Asian!!Chinese (including Taiwanese)"
## [83] "Population of one race!!Asian!!Filipino"
## [84] "Population of one race!!Asian!!Japanese"
## [85] "Population of one race!!Asian!!Korean"
## [86] "Population of one race!!Asian!!Vietnamese"
## [87] "Population of one race!!Asian!!Other Asian"
## [88] "Population of one race!!Native Hawaiian and Other Pacific Islander"
## [89] "Population of one race!!Native Hawaiian and Other Pacific Islander!!Native Hawaiian"
## [90] "Population of one race!!Native Hawaiian and Other Pacific Islander!!Guamanian or Chamorro"
## [91] "Population of one race!!Native Hawaiian and Other Pacific Islander!!Samoan"
## [92] "Population of one race!!Native Hawaiian and Other Pacific Islander!!Other Pacific Islander"
## [93] "Population of one race!!Some Other Race"
## [94] "Population of Two or More Races"
## [95] "Population of Two or More Races!!White; American Indian and Alaska Native"
## [96] "Population of Two or More Races!!White; Asian"
## [97] "Population of Two or More Races!!White; Black or African American"
## [98] "Population of Two or More Races!!White; Some Other Race"
## [99] ""
```

```
### If the race is an empty string "", that's the total population
census_race1$race <- ifelse(census_race1$race == "", "Total", census_race1$race)
### Filter to a subset of races
races <- census_race1%>%
  filter(
  race %in% c("White alone",
              "Black alone",
              "American Indian and Alaska Native alone",
              "Asian alone",
              "Native Hawaiian and Other Pacific Islander alone",
              "Some Other Race alone",
              ### Also include people who are two or more races
              "Two or More Races",
              "Total"))

#### Find the total hispanic or latino origin
race_hl <- census_var[grepl("^HISPANIC OR LATINO ORIGIN BY RACE", census_var$concept), ]
```

```
total_hl <- race_hl[grepl("^Total$", race_hl$label), ]
### Change the label to be "TotalHispanicLatino", to separate from the total population
total_hl$label <- "TotalHispanicLatino"
total_hl$race <- c("Hispanic or Latino")
all_races <- rbind(races, total_hl) ###
race_codes <- all_races[,1]
### These are the variables we want to select from the Census API
race_codes <- as.vector(unlist(race_codes))
```

```
### Get the variables for the ACS census; this is different from the decenniel data
census_var_acs <- load_variables(year = 2010, dataset = 'acs5', cache=T)
# All races except for hispanic or latino
census_race <- census_var_acs[grepl("^RACE$", census_var_acs$concept), ]
### as well as "Total!!", which are the different demographic groups
census_race1 <- census_race[grepl("^Estimate!!Total!!", census_race$label), ]
### Include the "Total" population
census_race1 <- rbind(census_race1, census_race%>%filter(label == "Estimate!!Total")) ###
### Create a variable with the race
census_race1$race <- substring(census_race1$label, 18)
### Only include the races alone, and "Two or more races", and the total
census_race1$race[census_race1$race == ""] <- "TotalAll"
### Remove the more specific "Two or more races" variables
census_race1 <- census_race1 %>%
  filter(!race %in% c("Two or more races!!Two races including Some other race", "Two or more races!!Two
```

```
#### Find the total hispanic or latino origin
race_hl <- census_var_acs[grepl("^HISPANIC OR LATINO ORIGIN BY RACE", census_var_acs$concept), ]
total_hl <- race_hl[grepl("^Estimate!!Total$", race_hl$label), ]
### Change the label to be "TotalHispanicLatino", to separate from the total population
total_hl$label <- "TotalHispanicLatino"
total_hl$race <- c("Hispanic or Latino")
all_races <- rbind(census_race1, total_hl) ###
race_codes <- all_races[,1]
### These are the variables we want to select from the Census API
race_codes <- as.vector(unlist(race_codes))
```

Functions to extract data

```
pop_func <- function(x,y){
  tryCatch(
    expr = {
       df <- get_decennial(geography = "county",
                                  variables = c(race_codes),
                                  year = y, state = x,
                                  geometry = TRUE)
      df <- df %>% group_by(NAME, variable) %>% summarize(population = value)
      if(str_detect(x, "^[:upper:]+$") == FALSE){stop("State abbreviations are two capital letters")}
      else{return(df)}
      },
    error = {
```

```
      if (nchar(x) != 2){"The function only accepts state abbreviations"}
      if(is.character(x) == FALSE){"State abbreviations are two letter strings"}
      if (nchar(y) != 4 | is.numeric(y) == FALSE){"Years must be four digits long"}
      }
    )
}
```

```
### Alternate population function:
population_func <- function(year, state){
  ### Error checking for the inputs
  ### Verify year is a numeric
  if (!is.numeric(year)){
    stop("Year must be a numeric value, not a character.")
  }
  ### Verify that the year is between 2005 and 2021
  if (year < 2005 | year > 2021){
    stop("American Community Survey Data is only available between 2005 and 2020.")
  }
  ### Check that state is a character
  if (!is.character(state)){
    stop("State must be a character.")
  }
  ### State must be a two-letter code, all caps
  if (!state %in% state.abb){
    stop("The state must be a two-letter code, with both letters capitalized.")
  }

  ### These are the codes for the race variables; see above for how they were extracted from all variab
   race_var <- c("B02001_002",
                 "B02001_003",
                 "B02001_004",
                 "B02001_005",
                 "B02001_006",
                 "B02001_007",
                 "B02001_008",
                 "B02001_001",
                 "B03002_001")
   ### Use the acs survey, not the decenniel survey
   data <- get_acs(geography = "county",
                   variables = c(race_var),
                   year = year,
                   state = state,
                   geometry = TRUE)
   ### Create a column with the demographic group
   data$race <- case_when(
     data$variable == "B02001_002" ~ "Total White alone",
     data$variable == "B02001_003" ~ "Total Black or African American alone",
     data$variable == "B02001_004" ~ "Total American Indian and Alaska Native alone",
    data$variable == "B02001_005" ~ "Total Asian alone",
     data$variable == "B02001_006" ~ "Total Native Hawaiian and Other Pacific Islander alone",
     data$variable == "B02001_007" ~ "Total some other race alone",
     data$variable == "B02001_008" ~ "Total two or more races",
     data$variable == "B02001_001" ~ "Total population",
```

```
    data$variable == "B03002_001" ~ "Total hispanic latino"
  )
  return(data)

}
```

```
head(population_func(2009, "MI"), n = 15)
```

```
## Getting data from the 2005-2009 5-year ACS

## Downloading feature geometry from the Census website.  To cache shapefiles for use in future sessions

##   |                                                                              |
```