Analyzing the 2016 US Presidential Election

Introduction

We analyze returns from the 2012 and 2016 elections in order to understand the social and demographic trends that may have contributed to Donald Trump's victory in 2016.

We will first examine how Republican vote share at the county level has changed from 2012 to 2016. Then, we will look at four variables that were prominent in the discourse around the election – race, education, unemployment, and immigration – to see how well they predict GOP electoral gains at the county level.

We will be working with the data set `uselection.csv` which has one observation per county and contains the following variables (note that some counties including those of Alaska are missing from the data):

Name	Description
`FIPS`	FIPS code (unique county identifier)
`state`	State abbreviation
`county`	County name
`votes_dem_12`	Number of votes cast for Democratic candidate, 2012 election
`votes_gop_12`	Number of votes cast for Republican candidate, 2012 election
`votes_total_12`	Total number of votes cast in 2012 election
`votes_dem_16`	Number of votes cast for Democratic candidate, 2016 election
`votes_gop_16`	Number of votes cast for Republican candidate, 2016 election
`votes_total_16`	Total number of votes cast in 2016 election
`pct_for_born15`	Percent of county's population that is "foreign born" according to the U.S. Census, meaning anyone who is not a U.S. citizen at birth (measured over 2011-2015)
`pct_bach_deg15`	Percent of county population holding a Bachelor's degree or above (2011-2015)
`pct_non_white15`	Percent of county population that is not white (2011-2015)
`pct_unemp12`	Percent of county population that is unemployed, BLS estimates (average, Jan-Oct 2012)
`pct_unemp16`	Percent of county population that is unemployed, BLS estimates (average, Jan-Oct 2016)

Question 1: Reading data into R

We first need to load the data into R and make it a `tibble` object, which is a version of a dataset that is easier to manipulate and display using `tidyverse` commands. Load the `tidyverse` package, read the data using the `read_csv()` function and save it as `elec` (using `read_csv()` will automatically make `elec` a tibble).

How many counties are there included in `elec`?

Answer 1

```r
# load tidyverse
library(tidyverse)
```

```
## -- Attaching core tidyverse packages -------------------------------------------- tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.0     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```
# read data
elec <- read_csv("data/uselection.csv")
```

```
## Rows: 3112 Columns: 14
## -- Column specification -----------------------------------------------------------------------
## Delimiter: ","
## chr  (2): state, county
## dbl (12): FIPS, votes_dem_12, votes_gop_12, votes_total_12, votes_dem_16, votes_gop_16, votes_to...
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
# check the data
elec
```

```
## # A tibble: 3,112 x 14
##     FIPS state county   votes_dem_12 votes_gop_12 votes_total_12 votes_dem_16 votes_gop_16
##    <dbl> <chr> <chr>           <dbl>        <dbl>          <dbl>        <dbl>        <dbl>
##  1  1001 AL    Autauga          6354        17366          23909         5908        18110
##  2  1003 AL    Baldwin         18329        65772          84988        18409        72780
##  3  1005 AL    Barbour          5873         5539          11459         4848         5431
##  4  1007 AL    Bibb             2200         6131           8391         1874         6733
##  5  1009 AL    Blount           2961        20741          23980         2150        22808
##  6  1011 AL    Bullock          4058         1250           5318         3530         1139
##  7  1013 AL    Butler           4367         5081           9483         3716         4891
##  8  1015 AL    Calhoun         15500        30272          46240        13197        32803
##  9  1017 AL    Chambers         6853         7596          14562         5763         7803
## 10  1019 AL    Cherokee         2126         7494           9761         1524         8809
## # i 3,102 more rows
## # i 6 more variables: votes_total_16 <dbl>, pct_for_born15 <dbl>, pct_bach_deg15 <dbl>,
## #   pct_non_white15 <dbl>, pct_unemp12 <dbl>, pct_unemp16 <dbl>
```

There are 3112 counties in the data.

Question 2: Preprocessing the data

Before we investigate the data, let's create some new variables: called `gop_vs_12`, `gop_vs_16`, and `gop_vs_diff`. Compute the following and add each to `elec` as a new column:

- `gop_vs_12`: compute the Republican vote share as a proportion of total votes in 2012 (Number of votes for the Republican party in the 2012 election/ Total number of votes in the 2012 election).
- `gop_vs_16`: compute the Republican vote share as a proportion of total votes in 2016 (Number of votes for the Republican party in the 2016 election/ Total number of votes in the 2016 election).
- `gop_vs_diff`: compute the *percent difference* in this Republican vote share variable from the 2012 to 2016 election (i.e., `(gop_vs_16 - gop_vs_12)/gop_vs_12 * 100`).

Hint: Use the `mutate()` function and the pipe operator (`|>`). Check the coding cheat sheets and previous section materials for some details.

Answer 2

```r
# Create new columns, and save those to original object for future use
elec <- elec |>
  mutate(gop_vs_12 = votes_gop_12/votes_total_12,
         gop_vs_16 = votes_gop_16/votes_total_16) |>
  mutate(gop_vs_diff = (gop_vs_16 - gop_vs_12)/gop_vs_12 * 100)
```

Question 3

Once you created the columns, print the `head` of the `elec` dataframe for *only* those three new columns (`gop_vs_12`, `gop_vs_16`, and `gop_vs_diff`). To do this use the `select()` function which subsets your data to only the variables passed into the `select()` function. Lastly use the `knitr::kable()` function on your subsetted data to produce a nicely formatted table.

Answer 3

```r
# Print three new columns
elec |>
  head() |>
  select(gop_vs_12, gop_vs_16, gop_vs_diff) |>
  knitr::kable()
```

gop_vs_12	gop_vs_16	gop_vs_diff
0.7263374	0.7343579	1.1042431
0.7738975	0.7735147	-0.0494602
0.4833755	0.5227141	8.1383178
0.7306638	0.7696616	5.3373152
0.8649291	0.8985188	3.8835142
0.2350508	0.2422889	3.0793789

Question 4: Subsetting the data

Subset your `elec` data to just the "battleground" states: Florida (FL), North Carolina (NC), Ohio (OH), Pennsylvania (PA), New Hampshire (NH), Michigan (MI), Wisconsin (WI), Iowa (IA), Nevada (NV), Colorado (CO), and Virginia (VA). To do this, utilize the `filter()` function which takes as it's argument a logical statement that is either `TRUE` or `FALSE` depending on the row. The function will then keep only those rows for which the statement is `TRUE`. Save this subset as a new `tibble` object called `elec_battle`.

Hint: You may want to create a new vector (a list created with `c()`) that contains all the 2-letter abbreviations of battleground states: `battlestates_abb <- c(...)`. Then, use `filter()` and `%in%` to subset the data to the battleground states with `state` column.

Answer 4

```r
# 2-letter abbreviations of battleground states
battlestates_abb <- c("FL", "NC", "OH", "PA", "NH", "MI", "WI", "IA", "NV", "CO", "VA")

# subset of data
elec_battle <- elec |>
```

```
  filter(state %in% battlestates_abb)

elec_battle
```

```
## # A tibble: 800 x 17
##     FIPS state county     votes_dem_12 votes_gop_12 votes_total_12 votes_dem_16 votes_gop_16
##    <dbl> <chr> <chr>             <dbl>        <dbl>          <dbl>        <dbl>        <dbl>
##  1  8001 CO    Adams             90843        66531         161495        86471        73807
##  2  8003 CO    Alamosa            3782         2693           6671         3168         3031
##  3  8005 CO    Arapahoe         135433       114232         254746       148365       109638
##  4  8007 CO    Archuleta          2637         3831           6646         2489         4234
##  5  8009 CO    Baca                462         1554           2096          278         1716
##  6  8011 CO    Bent                778         1053           1881          581         1166
##  7  8013 CO    Boulder          120485        48526         173207       124715        38766
##  8  8014 CO    Broomfield        16653        14765          32191        19530        14272
##  9  8015 CO    Chaffee            4967         4949          10217         4773         5283
## 10  8017 CO    Cheyenne            162          858           1045          127          905
## # i 790 more rows
## # i 9 more variables: votes_total_16 <dbl>, pct_for_born15 <dbl>, pct_bach_deg15 <dbl>,
## #   pct_non_white15 <dbl>, pct_unemp12 <dbl>, pct_unemp16 <dbl>, gop_vs_12 <dbl>, gop_vs_16 <dbl>,
## #   gop_vs_diff <dbl>
```

Question 5: State-level summarize

Now let's create a state-level summary of this subset, `elec_battle` with `group_by()` and `summarize()`. `group_by()` as the name suggests groups the data by the variable(s) passed into it as arguments and `summarize()` then creates a new dataset with statistics calculated *within* those groups. Create a state-level average of socio-demographic variables (`pct_for_born15`, `pct_bach_deg15`, `pct_non_white15`, `pct_non_white15`, `pct_unemp12`, `pct_unemp16`) and vote share variables (`gop_vs_12`, `gop_vs_16`, `gop_vs_diff`).

Hint: Review `group_by()`, `select()` and `summarize()` functions in Coding Cheat Sheet 3: Data Wrangling!

Answer 5

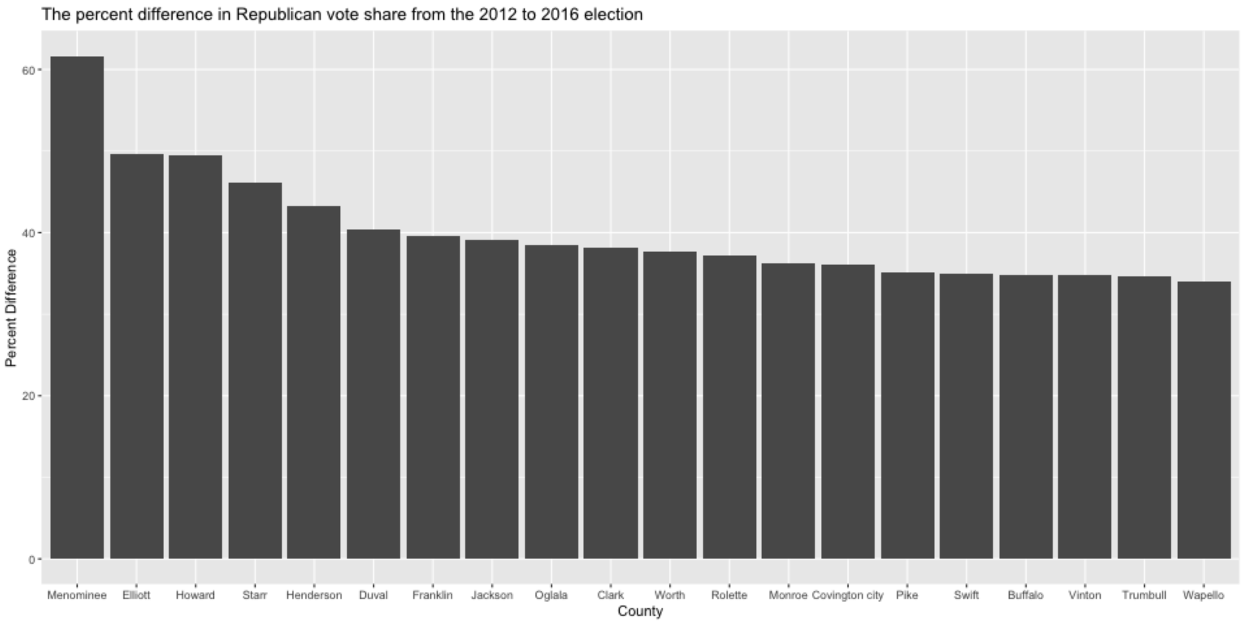
```
elec_battle |>
  group_by(state) |>
  select(pct_for_born15:gop_vs_diff) |>
  summarize(across(where(is.numeric), mean, na.rm = TRUE))
```

```
## Adding missing grouping variables: `state`
```

```
## Warning: There was 1 warning in `summarize()`.
## i In argument: `across(where(is.numeric), mean, na.rm = TRUE)`.
## i In group 1: `state = "CO"`.
## Caused by warning:
## ! The `...` argument of `across()` is deprecated as of dplyr 1.1.0.
## Supply arguments directly to `.fns` through an anonymous function instead.
##
##   # Previously
##   across(a:b, mean, na.rm = TRUE)
##
##   # Now
##   across(a:b, \(x) mean(x, na.rm = TRUE))
## # A tibble: 11 x 9
##    state pct_for_born15 pct_bach_deg15 pct_non_white15 pct_unemp12 pct_unemp16 gop_vs_12 gop_vs_16
##    <chr>          <dbl>          <dbl>           <dbl>       <dbl>       <dbl>     <dbl>     <dbl>
##  1 CO              6.43           30.0            9.65        7.20        3.11     0.548     0.560
##  2 FL              9.54           20.5           20.8         8.36        5.20     0.595     0.620
##  3 IA              2.93           20.3            4.99        4.42        3.42     0.515     0.613
##  4 MI              2.62           20.4            9.30        8.56        4.83     0.526     0.586
##  5 NC              4.93           20.3           27.7         9.65        5.36     0.550     0.579
##  6 NH              4.42           31.9            5.10        5.02        2.3      0.444     0.473
##  7 NV              8.68           17.6           15.2         9.31        5.29     0.639     0.667
##  8 OH              1.93           18.8            7.82        7.36        4.91     0.560     0.648
##  9 PA              3.30           21.6            8.94        7.57        5.68     0.578     0.635
## 10 VA              5.25           25.1           24.7         6.58        4.63     0.530     0.550
## 11 WI              2.62           21.7            8.03        6.26        3.64     0.482     0.549
## # i 1 more variable: gop_vs_diff <dbl>
```

Question 6: Barplot

Create a barplot for the top 20 counties in terms of the difference in GOP vote share between the 2012 and 2016 elections (`gop_vs_diff`), using `elec` data. Order the bars based on the values of vote share difference. The result looks like the following:



Hint: Sample codes using `geom_bar()`

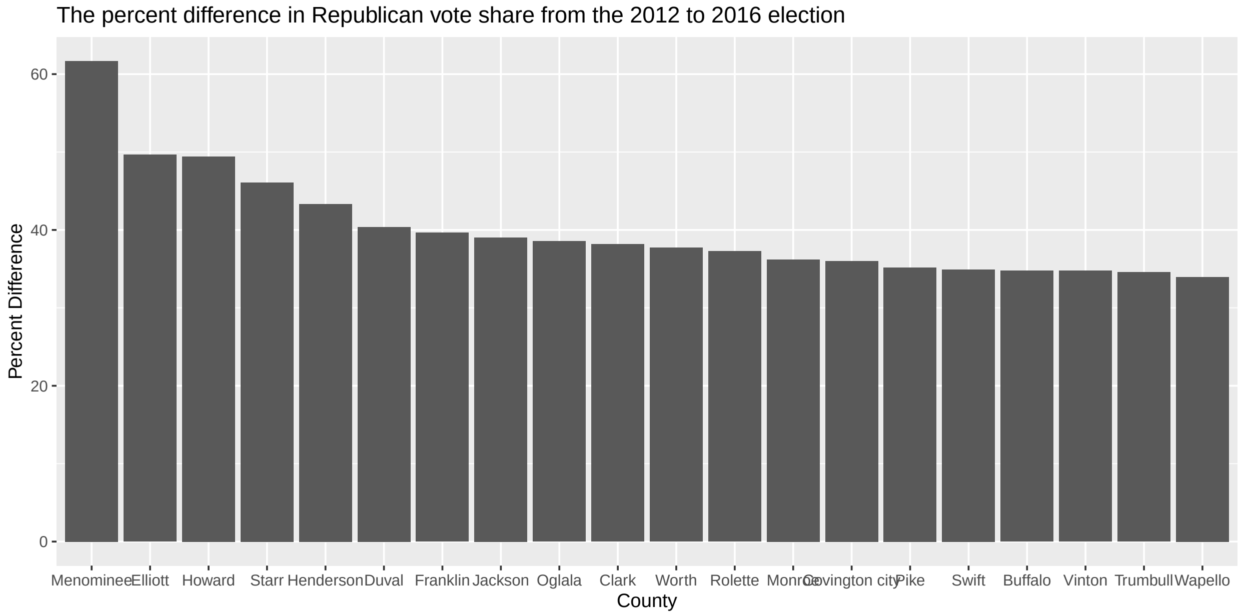
```
# TODO: Choose either option 1 or option 2, and replace <...>

# Option 1 (geom_bar)
## geom_bar() uses stat_count() by default: it counts the number of cases at each x position.
## for the purpose of this question, we need to change stat argument (see below).
<data> |>
  slice_max(<variable1>, n = 20) |>
  ggplot(aes(x = fct_reorder(<variable2>, desc(<variable1>)), y = <variable1>)) +
  geom_bar(stat = "identity") +
  labs(title = <title>,
       x = <xlab>, y = <ylab>)
```

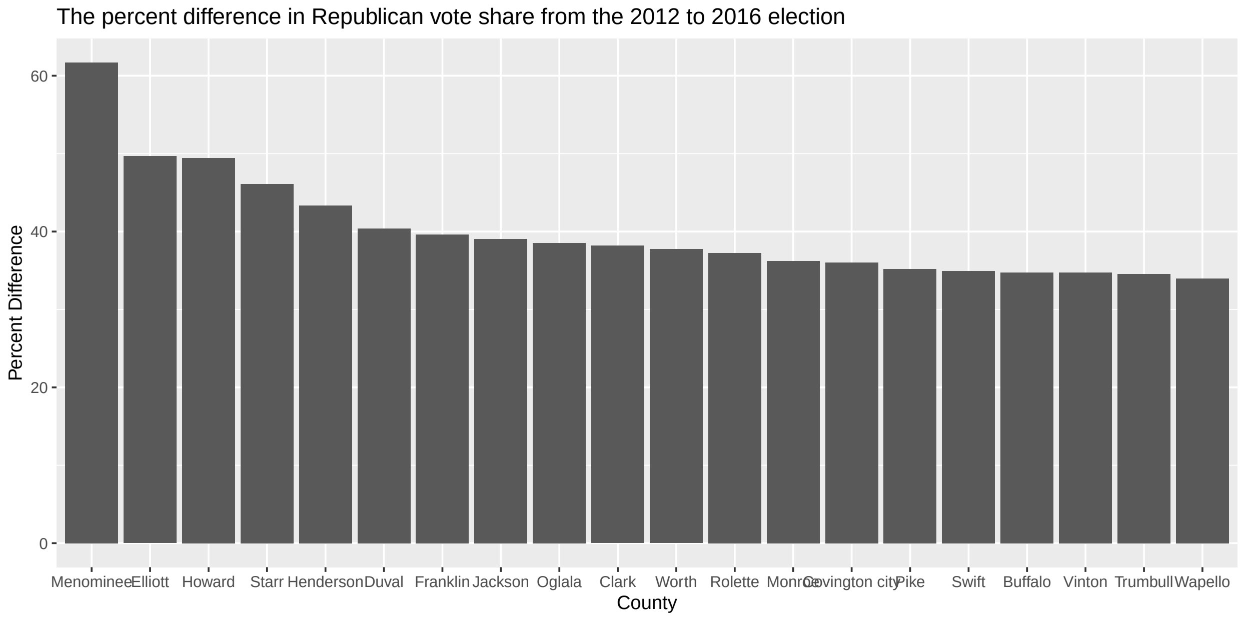
```r
# Option 2 (geom_col)
## geom_col() uses stat_identity(): it leaves the data as is.
<data> |>
  slice_max(<variable1>, n = 20) |>
  ggplot(aes(x = fct_reorder(<variable2>, desc(<variable1>)), y = <variable1>)) +
  geom_col() +
  labs(title = <title>,
       x = <xlab>, y = <ylab>)
```

Answer 6

```r
# Option 1 (geom_bar)
## geom_bar() uses stat_count() by default: it counts the number of cases at each x position.
## for the purpose of this question, we need to change stat argument (see below).
elec |>
  slice_max(gop_vs_diff, n = 20) |>
  ggplot(aes(x = fct_reorder(county, desc(gop_vs_diff)), y = gop_vs_diff)) +
  geom_bar(stat = "identity") +
  labs(title = "The percent difference in Republican vote share from the 2012 to 2016 election",
       x = "County", y = "Percent Difference")
```



```r
# Option 2 (geom_col)
## geom_col() uses stat_identity(): it leaves the data as is.
elec |>
  slice_max(gop_vs_diff, n = 20) |>
  ggplot(aes(x = fct_reorder(county, desc(gop_vs_diff)), y = gop_vs_diff)) +
  geom_col() +
  labs(title = "The percent difference in Republican vote share from the 2012 to 2016 election",
       x = "County", y = "Percent Difference")
```



Question 7: Republican gains in Democrat counties

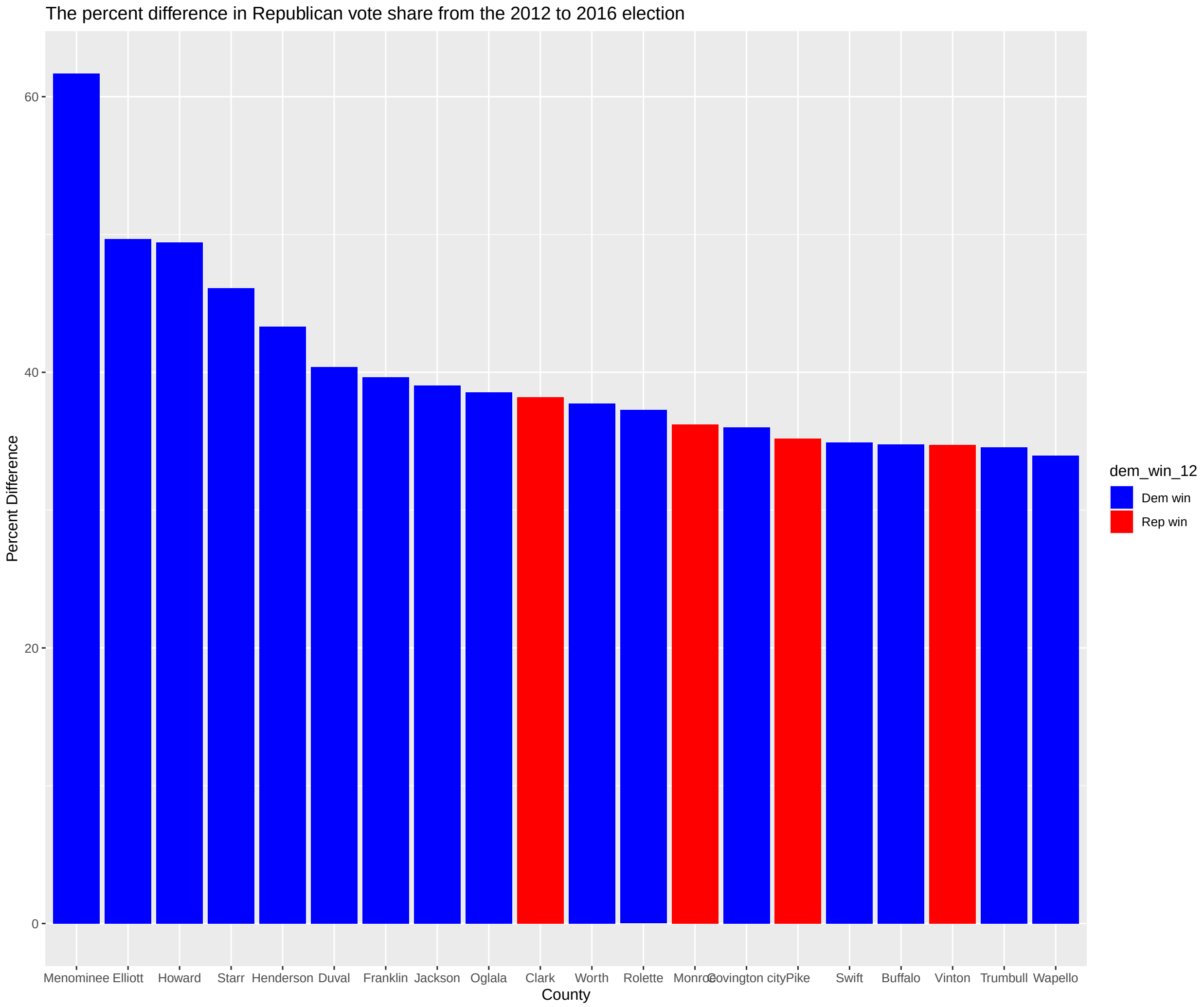
Some of the counties where the Republican party saw greater gains were counties where the Democratic party had the most votes in 2012. Run the following code to create a binary variable that takes the value of 1 whenever the Democrats had the most votes in 2012, and 0 otherwise.

```
elec <- elec |>
  mutate(dem_win_12 = dplyr::if_else(votes_dem_12 > votes_gop_12, "Dem win", "Rep win"))
```

Now repeat the plot in Question 5, adding `mapping = aes(fill = dem_win_12)` to the `geom_bar` function. What is your interpretation of this figure?

Answer 7

```
elec |>
  slice_max(gop_vs_diff, n = 20) |>
  ggplot(aes(x = fct_reorder(county, desc(gop_vs_diff)), y = gop_vs_diff)) +
  geom_bar(mapping = aes(fill = dem_win_12), stat = "identity") +
  labs(title = "The percent difference in Republican vote share from the 2012 to 2016 election",
       x = "County", y = "Percent Difference") +
  scale_fill_manual(values = c("blue", "red"))
```



Question 8: Table

Create a table for the top 20 counties in terms of the difference in GOP vote share between the 2012 and 2016 elections (`gop_vs_diff`), using `elec` data. Include `state`, `county`, socio-demographic variables (`pct_for_born15`, `pct_bach_deg15`, `pct_non_white15`, `pct_non_white15`, `pct_unemp12`, `pct_unemp16`) and vote share variables (`gop_vs_12`, `gop_vs_16`, `gop_vs_diff`) as columns. Order the rows based on the values of vote share difference.

Hint: Use `knitr::kable()` to produce a nicely formatted table. [Optional] To make the table neater, round off numbers to two decimal places and change the column names. See R documentation (`?kable`) for the arguments.

Answer 8

```
elec |>
  slice_max(gop_vs_diff, n = 20) |>
  select(state, county, pct_for_born15:gop_vs_diff) |>
  arrange(desc(gop_vs_diff)) |>
  knitr::kable(col.names = c("State", "County",
                             "Foreign born", "Degree", "Non-white", "Unemp. 2012", "Unemp. 2016",
                             "Rep. 2012", "Rep. 2016", "Rep. difference"),
               digits = 2)
```

State	County	Foreign born	Degree	Non-white	Unemp. 2012	Unemp. 2016	Rep. 2012	Rep. 2016	Rep. difference
WI	Menominee	2.85	16.11	88.99	14.2	6.4	0.13	0.21	61.68
KY	Elliott	0.21	7.48	2.91	12.5	10.2	0.47	0.70	49.67
IA	Howard	0.68	12.81	1.75	3.6	3.0	0.39	0.58	49.43
TX	Starr	33.11	9.10	5.07	13.1	11.7	0.13	0.19	46.10
IL	Henderson	0.99	13.91	2.37	7.5	5.0	0.43	0.62	43.33
TX	Duval	4.11	8.08	14.29	6.4	10.7	0.23	0.32	40.37
NY	Franklin	3.78	17.68	17.02	8.6	5.1	0.36	0.50	39.63
IA	Jackson	0.82	15.29	2.70	4.7	3.6	0.41	0.57	39.04
SD	Oglala	0.19	11.43	94.99	13.7	10.0	0.06	0.08	38.55
MO	Clark	0.16	12.80	2.30	7.2	6.6	0.54	0.74	38.18
IA	Worth	0.74	15.38	2.80	4.6	3.3	0.42	0.58	37.73
ND	Rolette	0.59	20.86	79.94	7.4	6.6	0.24	0.33	37.26
OH	Monroe	0.14	9.86	2.00	8.1	9.1	0.52	0.72	36.21
VA	Covington city	1.48	9.28	18.31	7.8	5.3	0.42	0.57	36.02
OH	Pike	0.58	11.83	3.71	11.9	6.9	0.49	0.67	35.18
MN	Swift	1.72	16.18	4.08	4.6	3.6	0.44	0.60	34.92
SD	Buffalo	0.00	9.51	81.50	10.3	8.0	0.26	0.35	34.76
OH	Vinton	0.18	9.15	2.84	10.3	6.2	0.52	0.70	34.74
OH	Trumbull	1.58	17.32	11.23	8.8	6.0	0.38	0.51	34.56
IA	Wapello	7.78	16.76	7.99	6.5	6.8	0.43	0.58	33.96