Homework 8

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This homework is due on April 19, 2021 at 11:00pm. Please submit as a pdf file on Canvas.

In this homework, we will work with two datasets, `US_counties` and `US_census`. The dataset `US_counties` contains the geometry of each county in the US and thus can be used for drawing maps. The dataset `US_census` contains numerous pieces of information about US counties obtained from the US census. Both datasets have a column `FIPS` which can be used to uniquely identify each county in each dataset.

```
# data preparation
US_counties <- readRDS(url("https://wilkelab.org/SDS375/datasets/US_counties.rds")) %>%
  rename(FIPS = GEOID)

# workaround for missing rgdal on edupod
st_crs(US_counties) <- NA

US_census <- read_csv(
  "https://wilkelab.org/SDS375/datasets/US_census.csv",
  col_types = cols(FIPS = "c")
)
```

```
US_counties
```

```
## Simple feature collection with 3142 features and 11 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -3683715 ymin: -2839538 xmax: 2258154 ymax: 1558935
## CRS:            NA
## First 10 features:
##    STATEFP COUNTYFP COUNTYNS       AFFGEOID  FIPS          NAME LSAD      ALAND
## 1       06      075 00277302 0500000US06075 06075 San Francisco   06  121485107
## 2       25      025 00606939 0500000US25025 25025       Suffolk   06  150855462
## 3       31      007 00835826 0500000US31007 31007        Banner   06 1932676697
## 4       37      181 01008591 0500000US37181 37181         Vance   06  653705784
## 5       48      421 01383996 0500000US48421 48421       Sherman   06 2390651189
## 6       50      011 01461762 0500000US50011 50011      Franklin   06 1641633748
## 7       51      680 01498429 0500000US51680 51680     Lynchburg   25  126842531
## 8       05      099 00069169 0500000US05099 05099        Nevada   06 1600192985
## 9       08      014 01945881 0500000US08014 08014    Broomfield   06   85478932
## 10      16      065 00394803 0500000US16065 16065       Madison   06 1215396379
##       AWATER           name state_code                       geometry
## 1  479107241     California         CA MULTIPOLYGON (((-2283315 35...
## 2  160479920  Massachusetts         MA MULTIPOLYGON (((2009657 799...
## 3     397069       Nebraska         NE MULTIPOLYGON (((-664543.3 4...
## 4   42187365 North Carolina         NC MULTIPOLYGON (((1544259 321...
## 5     428754          Texas         TX MULTIPOLYGON (((-546533.1 -...
## 6  150930318        Vermont         VT MULTIPOLYGON (((1780210 102...
## 7    1428787       Virginia         VA MULTIPOLYGON (((1458790 122...
## 8    7254365       Arkansas         AR MULTIPOLYGON (((232307.6 -4...
```

```
## 9    1411395       Colorado         CO MULTIPOLYGON (((-775389.1 3...
## 10  10500827          Idaho         ID MULTIPOLYGON (((-1272146 82...
```

```
US_census
```

```
## # A tibble: 3,143 x 53
##    state name  FIPS  pop2010 pop2000 age_under_5 age_under_18 age_over_65 female
##    <chr> <chr> <chr>   <dbl>   <dbl>       <dbl>        <dbl>       <dbl>  <dbl>
##  1 Alab~ Auta~ 01001   54571   43671         6.6         26.8        12     51.3
##  2 Alab~ Bald~ 01003  182265  140415         6.1         23          16.8   51.1
##  3 Alab~ Barb~ 01005   27457   29038         6.2         21.9        14.2   46.9
##  4 Alab~ Bibb~ 01007   22915   20826         6           22.7        12.7   46.3
##  5 Alab~ Blou~ 01009   57322   51024         6.3         24.6        14.7   50.5
##  6 Alab~ Bull~ 01011   10914   11714         6.8         22.3        13.5   45.8
##  7 Alab~ Butl~ 01013   20947   21399         6.5         24.1        16.7   53
##  8 Alab~ Calh~ 01015  118572  112249         6.1         22.9        14.3   51.8
##  9 Alab~ Cham~ 01017   34215   36583         5.7         22.5        16.7   52.2
## 10 Alab~ Cher~ 01019   25989   23988         5.3         21.4        17.9   50.4
## # ... with 3,133 more rows, and 44 more variables: white <dbl>, black <dbl>,
## #   native <dbl>, asian <dbl>, pac_isl <dbl>, two_plus_races <dbl>,
## #   hispanic <dbl>, white_not_hispanic <dbl>, no_move_in_one_plus_year <dbl>,
## #   foreign_born <dbl>, foreign_spoken_at_home <dbl>, hs_grad <dbl>,
## #   bachelors <dbl>, veterans <dbl>, mean_work_travel <dbl>,
## #   housing_units <dbl>, home_ownership <dbl>, housing_multi_unit <dbl>,
## #   median_val_owner_occupied <dbl>, households <dbl>,
## #   persons_per_household <dbl>, per_capita_income <dbl>,
## #   median_household_income <dbl>, poverty <dbl>,
## #   private_nonfarm_establishments <dbl>, private_nonfarm_employment <dbl>,
## #   percent_change_private_nonfarm_employment <dbl>,
## #   nonemployment_establishments <dbl>, firms <dbl>, black_owned_firms <dbl>,
## #   native_owned_firms <dbl>, asian_owned_firms <dbl>,
## #   pac_isl_owned_firms <dbl>, hispanic_owned_firms <dbl>,
## #   women_owned_firms <dbl>, manufacturer_shipments_2007 <dbl>,
## #   mercent_whole_sales_2007 <dbl>, sales <dbl>, sales_per_capita <dbl>,
## #   accommodation_food_service <dbl>, building_permits <dbl>,
## #   fed_spending <dbl>, area <dbl>, density <dbl>
```

Problem 1: (6 pts) Make a choropleth map of the percent home-ownership (column `home_ownership` in `US_census`) for all counties in the US. Choose an appropriate color scale and design for this plot. You may notice that there is one county in Alaska for which home-ownership data is not available. Write data analysis code to identify this county.

Hints:

1. Use `theme_void()` as your theme
2. You will have to join `US_counties` and `US_census`. Join them by the `FIPS` column.
3. To make nice percent labels, you can use `label = scales::label_percent(scale = 1)` in your color scale function.
4. To find rows with missing data, you may want to use the function `is.na()`.

Grade breakdown: 2pt for the plot, 2pt for the plot design, and 2pt for identifying the county in Alaska for which home ownership data is not available.

```
# your code goes here
US_data <- US_counties %>% left_join(US_census, by = "FIPS")
```

```
US_data
```

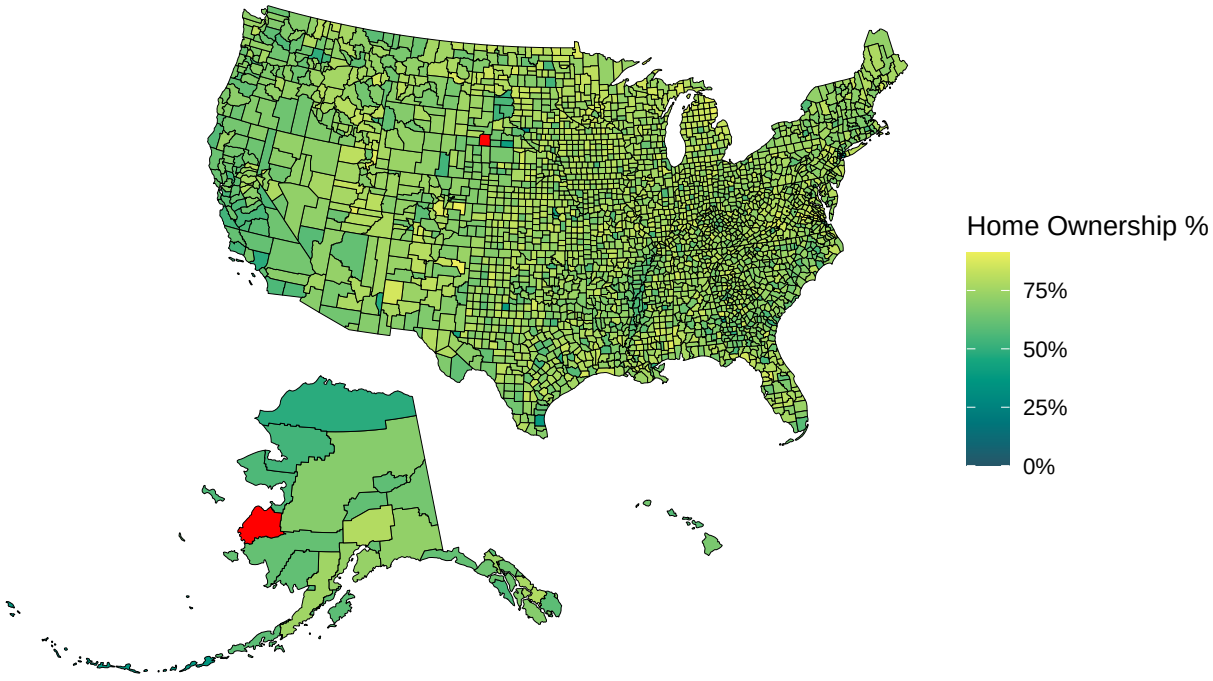
```
## Simple feature collection with 3142 features and 63 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -3683715 ymin: -2839538 xmax: 2258154 ymax: 1558935
## CRS:            NA
## First 10 features:
##    STATEFP COUNTYFP COUNTYNS       AFFGEOID  FIPS          NAME LSAD      ALAND
## 1       06      075 00277302 0500000US06075 06075 San Francisco   06  121485107
## 2       25      025 00606939 0500000US25025 25025       Suffolk   06  150855462
## 3       31      007 00835826 0500000US31007 31007        Banner   06 1932676697
## 4       37      181 01008591 0500000US37181 37181         Vance   06  653705784
## 5       48      421 01383996 0500000US48421 48421       Sherman   06 2390651189
## 6       50      011 01461762 0500000US50011 50011      Franklin   06 1641633748
## 7       51      680 01498429 0500000US51680 51680     Lynchburg   25  126842531
## 8       05      099 00069169 0500000US05099 05099        Nevada   06 1600192985
## 9       08      014 01945881 0500000US08014 08014    Broomfield   06   85478932
## 10      16      065 00394803 0500000US16065 16065       Madison   06 1215396379
##       AWATER         name.x state_code          state               name.y
## 1  479107241     California         CA     California San Francisco County
## 2  160479920  Massachusetts         MA  Massachusetts       Suffolk County
## 3     397069       Nebraska         NE       Nebraska        Banner County
## 4   42187365 North Carolina         NC North Carolina         Vance County
## 5     428754          Texas         TX          Texas       Sherman County
## 6  150930318        Vermont         VT        Vermont      Franklin County
## 7    1428787       Virginia         VA       Virginia       Lynchburg city
## 8    7254365       Arkansas         AR       Arkansas        Nevada County
## 9    1411395       Colorado         CO       Colorado    Broomfield County
## 10  10500827          Idaho         ID          Idaho       Madison County
##    pop2010 pop2000 age_under_5 age_under_18 age_over_65 female white black
## 1   805235  776733         4.4         13.4        13.6   49.3  48.5   6.1
## 2   722023  689807         5.5         17.5        10.5   51.8  56.0  21.6
## 3      690     819         5.2         22.3        19.7   48.7  95.7   0.0
## 4    45422   42954         6.8         25.4        14.1   53.1  44.2  49.9
## 5     3034    3186         7.1         30.2        13.3   49.0  88.3   0.5
## 6    47746   45417         6.3         24.7        12.2   50.4  95.6   0.4
## 7    75568   65269         6.1         19.6        14.0   53.1  64.4  29.3
## 8     8997    9955         6.6         23.7        17.7   51.0  65.9  30.7
## 9    55889      NA         7.1         26.2         9.9   50.4  86.1   1.1
## 10   37536   27467         9.6         26.0         5.6   51.6  93.9   0.5
##    native asian pac_isl two_plus_races hispanic white_not_hispanic
## 1     0.5  33.3     0.4           4.7     15.1               41.9
## 2     0.4   8.2     0.0           3.9     19.9               48.1
## 3     0.4   0.0     0.0           0.7      3.8               95.1
## 4     0.3   0.4      NA           1.3      6.7               42.1
## 5     0.8   0.2     0.0           1.5     40.4               58.1
## 6     1.0   0.5      NA           2.1      1.2               94.9
## 7     0.3   2.5     0.0           2.2      3.0               63.0
## 8     0.3   0.3     0.0           1.4      2.4               65.1
## 9     0.6   6.1      NA           2.8     11.1               79.4
## 10    0.3   0.9     0.1           1.5      5.9               91.2
##    no_move_in_one_plus_year foreign_born foreign_spoken_at_home hs_grad
```

```
## 1                    84.0         35.6                  45.4    85.7
## 2                    76.7         27.7                  36.8    83.1
## 3                    91.3          3.8                   3.3    94.1
## 4                    86.9          3.9                   6.7    72.6
## 5                    83.9         17.9                  31.9    74.4
## 6                    88.1          3.2                   4.8    87.8
## 7                    76.9          4.2                   6.3    83.1
## 8                    84.7          0.4                   1.0    78.3
## 9                    82.8          8.0                  12.4    95.3
## 10                   58.1          3.0                   9.7    95.2
##    bachelors veterans mean_work_travel housing_units home_ownership
## 1       51.2    33078              29.4        376942           37.5
## 2       38.9    25698              28.5        315522           36.5
## 3       25.1       49              25.6           369           66.3
## 4       10.7     3272              23.1         20082           65.2
## 5       19.1      233              16.4          1252           78.7
## 6       21.2     4054              26.6         21588           74.8
## 7       28.3     6213              16.3         31992           56.3
## 8       10.7      758              23.8          4563           71.3
## 9       44.4     4257              26.8         22646           74.4
## 10      30.0     1079              15.2         11280           52.0
##    housing_multi_unit median_val_owner_occupied households
## 1                66.6                    785200     335956
## 2                80.7                    384500     283954
## 3                 7.2                     76900        320
## 4                 9.6                     98100      16473
## 5                 4.0                     80800        971
## 6                16.9                    202800      18482
## 7                29.8                    139100      27875
## 8                 5.9                     62300       3782
## 9                21.7                    270500      20116
## 10               42.2                    169700       9868
##    persons_per_household per_capita_income median_household_income poverty
## 1                   2.31             45478                  71304    11.9
## 2                   2.33             30720                  50597    20.6
## 3                   2.25             22042                  34063    16.1
## 4                   2.67             17622                  34025    27.5
## 5                   3.09             21587                  50069    12.9
## 6                   2.54             24767                  53623    10.5
## 7                   2.35             21586                  37058    22.7
## 8                   2.38             21020                  38375    20.0
## 9                   2.63             35836                  75590     5.5
## 10                  3.49             13735                  35461    32.2
##    private_nonfarm_establishments private_nonfarm_employment
## 1                           30490                     492689
## 2                           19210                     562929
## 3                               6                          0
## 4                             878                      13177
## 5                              56                        263
## 6                            1028                      11745
## 7                            2255                      54809
## 8                             134                       1842
## 9                            1677                      29760
## 10                            780                      14136
```

```
##    percent_change_private_nonfarm_employment nonemployment_establishments
## 1                                      -11.3                         78347
## 2                                       -1.4                         41757
## 3                                         NA                            48
## 4                                      -10.4                          2198
## 5                                      -56.9                           217
## 6                                        0.9                          3521
## 7                                       -4.7                          3556
## 8                                       -6.3                           423
## 9                                         NA                          4181
## 10                                      15.5                          2195
##     firms black_owned_firms native_owned_firms asian_owned_firms
## 1  105030              2.7                 NA              24.0
## 2   55613             11.0                0.7               7.8
## 3      39               NA                 NA                NA
## 4    3089             25.9                 NA                NA
## 5     138               NA                 NA                NA
## 6    4754               NA                 NA                NA
## 7    4794             11.6                 NA               2.0
## 8     622               NA                 NA                NA
## 9    6284              1.3                 NA               3.9
## 10   2942               NA                 NA                NA
##    pac_isl_owned_firms hispanic_owned_firms women_owned_firms
## 1                  0.2                 6.6              30.1
## 2                  0.1                 8.3              29.5
## 3                   NA                  NA                NA
## 4                   NA                  NA              28.5
## 5                   NA                  NA                NA
## 6                   NA                  NA              23.6
## 7                   NA                  NA              26.4
## 8                   NA                  NA                NA
## 9                   NA                 2.0                NA
## 10                  NA                  NA              15.2
##    manufacturer_shipments_2007 mercent_whole_sales_2007    sales
## 1                      2077457                10562176 12399960
## 2                      3703400                 8914822  7565785
## 3                            0                       0        0
## 4                       639233                      NA   582116
## 5                            0                      NA    10079
## 6                           NA                  413283   545346
## 7                      2801602                  541451  1665130
## 8                           NA                      NA   136792
## 9                      2255472                      NA  1139808
## 10                          NA                  161967   407686
##    sales_per_capita accommodation_food_service building_permits fed_spending
## 1             15516                    5039171              779     10707798
## 2             10381                    3795879              480     16051877
## 3                 0                          0                0         8130
## 4             13553                      53898               83       408868
## 5              3486                         NA                8        39026
## 6             11383                      39606              161       415662
## 7             23171                     189961              144      1264105
## 8             14660                       3228                1        98360
## 9             21240                     163445              232       442693
```

```
## 10           10971                       32041             249       121324
##      area density                       geometry
## 1   46.87 17179.1 MULTIPOLYGON (((-2283315 35...
## 2   58.15 12415.7 MULTIPOLYGON (((2009657 799...
## 3  746.11     0.9 MULTIPOLYGON (((-664543.3 4...
## 4  253.52   179.2 MULTIPOLYGON (((1544259 321...
## 5  923.04     3.3 MULTIPOLYGON (((-546533.1 -...
## 6  633.71    75.3 MULTIPOLYGON (((1780210 102...
## 7   49.13  1538.2 MULTIPOLYGON (((1458790 122...
## 8  617.84    14.6 MULTIPOLYGON (((232307.6 -4...
## 9   33.03  1691.9 MULTIPOLYGON (((-775389.1 3...
## 10 469.21    80.0 MULTIPOLYGON (((-1272146 82...
```

```r
ggplot(US_data) +
  geom_sf(
    aes(fill= home_ownership),
    color = "black", size = 0.1
    ) +
  scale_fill_continuous_sequential(palette = "ag_GrnYl",
                                   rev = FALSE,
                                   na.value = "Red",
                                   label = scales::label_percent(scale = 1),
                                    name = "Home Ownership %") +
  coord_sf() +
  theme_void()
```




```r
US_missing <- US_data %>%
  filter(name.x == "Alaska") %>%
  filter(is.na(home_ownership))
```

```
US_missing$NAME
```

```
## [1] Kusilvak
## 1910 Levels: Abbeville Acadia Accomack Ada Adair Adams Addison ... Ziebach
```

```
#the county in Alaska for which home ownership data is not available: Kusilvak
```

Problem 2: (4 pts) Make a choropleth map of the percent foreign born (column `foreign_born` in `US_census`) for the counties in Texas only. Use a different color scale than you used for Problem 1 and use a theme that shows longitude and latitude (nearly any theme other than `theme_void()` will work).

Grade breakdown: 3pt for the plot, 1pt for the plot design

```
# your code goes here

US_data_fb_TX <- US_counties %>%
                 left_join(US_census, by = "FIPS") %>%
                 filter(state == "Texas")
US_data_fb_TX
```

```
## Simple feature collection with 254 features and 63 fields
## geometry type:  MULTIPOLYGON
## dimension:      XY
## bbox:           xmin: -999736.2 ymin: -1295598 xmax: 235280.5 ymax: -88854.17
## CRS:            NA
## First 10 features:
##    STATEFP COUNTYFP COUNTYNS       AFFGEOID  FIPS      NAME LSAD      ALAND
## 1       48      421 01383996 0500000US48421 48421   Sherman   06 2390651189
## 2       48      493 01384032 0500000US48493 48493    Wilson   06 2081662847
## 3       48      115 01383843 0500000US48115 48115    Dawson   06 2331781556
## 4       48      069 01383820 0500000US48069 48069    Castro   06 2316573415
## 5       48      279 01383926 0500000US48279 48279      Lamb   06 2631897577
## 6       48      385 01383978 0500000US48385 48385      Real   06 1810812906
## 7       48      359 01383965 0500000US48359 48359    Oldham   06 3886337121
## 8       48      127 01383849 0500000US48127 48127    Dimmit   06 3441795365
## 9       48      305 01383938 0500000US48305 48305      Lynn   06 2309924845
## 10      48      171 01383871 0500000US48171 48171 Gillespie   06 2740716834
##      AWATER name.x state_code state           name.y pop2010 pop2000
## 1    428754  Texas         TX Texas   Sherman County    3034    3186
## 2  12111367  Texas         TX Texas    Wilson County   42918   32408
## 3   4720730  Texas         TX Texas    Dawson County   13833   14985
## 4  12584396  Texas         TX Texas    Castro County    8062    8285
## 5   3973764  Texas         TX Texas      Lamb County   13977   14709
## 6   2346258  Texas         TX Texas      Real County    3309    3047
## 7   2339716  Texas         TX Texas    Oldham County    2052    2185
## 8  14576538  Texas         TX Texas    Dimmit County    9996   10248
## 9   4169719  Texas         TX Texas      Lynn County    5915    6550
## 10  9015052  Texas         TX Texas Gillespie County   24837   20814
##    age_under_5 age_under_18 age_over_65 female white black native asian pac_isl
## 1          7.1         30.2        13.3   49.0  88.3   0.5    0.8   0.2     0.0
## 2          6.2         26.4        12.6   50.2  89.1   1.6    0.7   0.4      NA
## 3          7.6         24.7        14.0   43.5  76.7   6.5    0.7   0.4     0.1
## 4          8.7         31.3        13.4   49.3  68.6   2.0    0.9    NA     0.0
## 5          8.1         29.3        15.9   50.2  74.4   4.3    0.9   0.1     0.0
## 6          4.9         19.9        25.8   50.5  90.5   0.7    1.1   0.1      NA
```

```
## 7          4.9         34.0        12.4   49.6  90.2   3.0    0.6   0.8      NA
## 8          8.2         30.0        14.2   51.6  88.6   1.0    0.3   0.6     0.0
## 9          7.4         27.8        15.8   50.2  80.3   2.1    1.2   0.1      NA
## 10         5.0         20.3        26.5   51.8  91.3   0.4    0.6   0.4      NA
##    two_plus_races hispanic white_not_hispanic no_move_in_one_plus_year
## 1             1.5     40.4               58.1                     83.9
## 2             2.1     38.2               58.7                     87.7
## 3             2.3     53.4               39.1                     85.9
## 4             1.6     59.9               37.3                     84.8
## 5             2.3     51.7               43.1                     83.1
## 6             2.0     24.6               72.5                     87.7
## 7             1.5     11.8               82.8                     85.5
## 8             1.6     86.2               12.2                     82.8
## 9             2.3     46.4               50.4                     84.7
## 10            1.2     20.0               78.4                     89.0
##    foreign_born foreign_spoken_at_home hs_grad bachelors veterans
## 1          17.9                  31.9    74.4      19.1      233
## 2           4.8                  26.1    84.5      18.2     4458
## 3           6.9                  37.8    67.0       8.7      633
## 4          18.2                  49.0    68.1      14.9      408
## 5          10.4                  37.4    71.9      13.8      813
## 6           5.5                  21.0    77.6      19.4      358
## 7           2.8                   8.7    82.3      29.8      127
## 8           9.6                  69.9    61.0      12.6      469
## 9           6.6                  34.5    74.2      15.9      312
## 10          6.2                  23.5    86.4      26.8     2997
##    mean_work_travel housing_units home_ownership housing_multi_unit
## 1              16.4          1252           78.7                4.0
## 2              32.5         16766           84.5                3.7
## 3              12.2          5220           75.7                6.6
## 4              18.1          3166           77.0                5.5
## 5              16.2          6128           75.1                6.1
## 6              20.2          2599           75.5                0.0
## 7              16.6           841           71.0                9.6
## 8              22.7          4350           69.5               10.6
## 9              16.8          2676           73.9                4.8
## 10             20.0         12778           75.5                7.0
##    median_val_owner_occupied households persons_per_household per_capita_income
## 1                      80800        971                  3.09             21587
## 2                     124100      14455                  2.82             25149
## 3                      48000       4424                  2.58             15288
## 4                      68300       2677                  2.90             16073
## 5                      50100       4804                  2.90             17553
## 6                      75300       1335                  2.39             15074
## 7                      86900        710                  2.72             22504
## 8                      49000       3600                  2.67             14045
## 9                      66900       2165                  2.77             19752
## 10                    191100      10413                  2.27             28072
##    median_household_income poverty private_nonfarm_establishments
## 1                    50069    12.9                             56
## 2                    60493     9.0                            500
## 3                    33623    19.1                            285
## 4                    35087    23.3                            179
## 5                    35458    17.9                            274
```

```
## 6                    29186    26.8                              84
## 7                    51111    13.4                              34
## 8                    25882    36.4                             164
## 9                    43672    16.9                              95
## 10                   52682     8.0                             890
##    private_nonfarm_employment percent_change_private_nonfarm_employment
## 1                         263                                    -56.9
## 2                        4647                                     49.0
## 3                        2743                                      7.7
## 4                        1093                                    -24.2
## 5                        2921                                      0.5
## 6                         539                                     26.2
## 7                           0                                       NA
## 8                        1780                                     23.5
## 9                         704                                    -10.1
## 10                       8061                                     29.3
##    nonemployment_establishments firms black_owned_firms native_owned_firms
## 1                           217   138                NA                 NA
## 2                          2813  3222                NA                 NA
## 3                           645   887                NA                 NA
## 4                           474   534                NA                 NA
## 5                           708  1038                NA                 NA
## 6                           437    NA                NA                 NA
## 7                           184   114                NA                 NA
## 8                           798  1017                NA                 NA
## 9                           307    NA                NA                 NA
## 10                         3138  4379                NA                 NA
##    asian_owned_firms pac_isl_owned_firms hispanic_owned_firms women_owned_firms
## 1                 NA                  NA                   NA                NA
## 2                 NA                  NA                 22.6                NA
## 3                 NA                  NA                   NA                NA
## 4                 NA                  NA                  8.1                NA
## 5                 NA                  NA                   NA              15.9
## 6                 NA                  NA                   NA                NA
## 7                 NA                  NA                   NA                NA
## 8                 NA                  NA                   NA                NA
## 9                 NA                  NA                   NA                NA
## 10                NA                  NA                   NA              28.7
##    manufacturer_shipments_2007 mercent_whole_sales_2007  sales sales_per_capita
## 1                            0                       NA  10079             3486
## 2                            0                    48987 180452             4609
## 3                            0                    91324 148370            10747
## 4                            0                   154599  40007             5579
## 5                           NA                    84216  95775             6933
## 6                            0                       NA   9440             3128
## 7                            0                       NA  16797             8118
## 8                            0                       NA  74775             7658
## 9                            0                       NA  19743             3415
## 10                       88259                   100425 311100            13247
##    accommodation_food_service building_permits fed_spending    area density
## 1                          NA                8        39026  923.04     3.3
## 2                       20847               61       220705  803.73    53.4
## 3                       12466                1       143793  900.31    15.4
## 4                        2366                0        76493  894.43     9.0
```

```
## 5                          6963                0        137879 1016.18    13.8
## 6                          3662                0         34403  699.20     4.7
## 7                          2919                4         20356 1500.53     1.4
## 8                          8259                5        119429 1328.88     7.5
## 9                           795                1         85142  891.87     6.6
## 10                        52219               34        182308 1058.21    23.5
##                            geometry
## 1  MULTIPOLYGON (((-546533.1 -...
## 2  MULTIPOLYGON (((-234487.5 -...
## 3  MULTIPOLYGON (((-576468.3 -...
## 4  MULTIPOLYGON (((-592119.6 -...
## 5  MULTIPOLYGON (((-603646.3 -...
## 6  MULTIPOLYGON (((-389104.7 -...
## 7  MULTIPOLYGON (((-631641.1 -...
## 8  MULTIPOLYGON (((-402909.8 -...
## 9  MULTIPOLYGON (((-561102.7 -...
## 10 MULTIPOLYGON (((-316455 -77...
```

```r
ggplot(US_data_fb_TX) +
  geom_sf(aes(fill = foreign_born),
    color = "black", size = 0.1) +
  scale_fill_continuous_sequential(palette = "Blues",
                                   label = scales::label_percent(scale = 1),
                                   name = "Foreign Born %") +
  coord_sf() +
  theme_bw() +
  theme(axis.text.x = element_text(size = 7))
```