DA5020 - Week 6 Assignment Tidy and Relational Data Operations

2019-10-15

Github

https://github.com/ajb7/R-workbooks/tree/master/workbook6 (https://github.com/ajb7/R-workbooks/tree/master/workbook6)

Read the data

```
# Installing dplyr library and importing dataset
# using read.csv to read csv data and read_excel to read data from xls file
#install.packages("dplyr")
library("dplyr")
library("stringr")
library("lubridate")
library("tidyverse")
```

```
## Warning: package 'tidyverse' was built under R version 3.5.3
```

```
setwd("D:/UNIVERSITY/Assignments/DA 5020/Assignments/hw6")
edu <- read.csv("FipsEducationsDA5020.csv", header = T, sep = ",")
unemp <- read.csv("FipsUnemploymentDA5020.csv", header = T, sep = ",")
```

Questions

1. (20 points) Download the unemployment and education data files from blackboard and save the files to your working directory folder. Load both the unemployment data and the education data into R. Review the education data. Identify where variable names are actually values for a specific variable. Identify when multiple rows are data for the same entity. Identify when specific columns contain more than one atomic value. Tidy up the education data using spread, gather and separate.

Answer: In education dataset, FIPS column represents each county. We observe that multiple rows have same FIPS values. This means, multiple rows are same entity. The only difference is in percent_measure and percent value. County_State column contains concatenated value of County and State. That is, the column/variable does not represent a specific value.

We can tidy up the data in following steps: Step 1: Seperate county and state names using “seperate” Step 2: Use “spread”“, to convert percent_measure and percent values into specific variables

```
edu_spread <- spread(edu, key = percent_measure, value = percent)

edu_spread_sep <- separate(edu_spread, county_state, into = c("state", "county"))
```

2. (15 points) Break apart the education data into three distinct tibbles. One tibble named education contains the education data, another tibble named fips, contains the fips number definition, and the third tibble named rural_urban_code contains the textual description of the 9 different urban to rural data descriptions. These three tibbles must be linked together to represent the relationships between the tibbles. For example, the fips table will contain 3,192 rows, where each row represents the definition of a fips number (County, State). Each row in the education table will contain the educational attainment of a spcific county. It also will contain a fips number since this data is specific to a county within a state.

Answer: In our dataset, each row can be uniquely identified by FIPS and year columns. We create following tibbles

1. education: contains educational attainments of a specific county, fips, year, percent_four_plus_years_college, percent_has_some_college, percent_hs_diploma, percent_less than_hs_diploma
2. fips: contains fips info. FIPS, County, State
3. rural_urban_code: rural urban code and fips relationship.
4. rural_urban_code_contains: textual description. rural_urban_cont_code, description

```
education <- edu_spread_sep[, -which(names(edu_spread_sep) %in% c("county", "state",
"rural_urban_cont_code", "description"))]

temp_ruc <- group_by(edu_spread_sep, fips, rural_urban_cont_code) %>% summarize(count=
n())
rural_urban_code <- temp_ruc[, -which(names(temp_ruc) %in% c("count"))]

temp_fips <- group_by(edu_spread_sep, fips, county, state) %>% summarize(count=n())
fips <- temp_fips[, -which(names(temp_fips) %in% c("count"))]

temp_desc <- group_by(edu_spread_sep, rural_urban_cont_code, description) %>% summariz
e(count=n())
rural_urban_code_contains <- temp_desc[, -which(names(temp_desc) %in% c("count"))]
```

3. (5 points) Answer the following questions about your tibbles: The fips column in the education table - is it a foreign or a primary key for the education tibble? What is the primary key for your education tibble? The rural_urban code tibble should only contain 9 rows. What is its primary key?

Answer:

The “FIPS” column in education tibble is a foreign key. As “FIPS” is a primary key in “fips” tibble, in another table it will be a foreign key. In education tibble, combination of “FIPS” and “YEAR” column uniqually identifies each row, and hence are the primary key combined.

In “rural_urban_code” tibble, “rural_urban_cont_code” uniqually identifies each row and hence is the primary key.

4. (50 points) Write expressions to answer the following queries:

- 4.0 In the year 1970, what is the percent of the population not attaining a high school diploma for the Nantucket county in Massachusetts? What about the year 2015?

Answer: We select fips, year, percent_less than_hs_diploma from “education” tibble, where state = “MA” and county = “Nantucket” for year = 1970

```
out0_1970 <- education %>% select("fips", "year", "percent_less than_hs_diploma") %>%
left_join(fips, by = "fips") %>% filter(county=="Nantucket", state=="MA", year==1970)
out0_2015 <- education %>% select("fips", "year", "percent_less than_hs_diploma") %>%
left_join(fips, by = "fips") %>% filter(county=="Nantucket", state=="MA", year==2015)

out0 <- str_c("For year 1970: ", out0_1970["percent_less than_hs_diploma"], "% and for
year 2015: ",out0_2015["percent_less than_hs_diploma"], "%")
print(out0)
```

```
## [1] "For year 1970: 33.7% and for year 2015: 5.2%"
```

- 4.1 What is the average percentage not receiving a high school diploma for the counties in Alabama for the year 2015?

Answer: We join education and fips, and select percent_less than_hs_diploma where state = “AL” and year = 2015. We group by each state and finally get the mean through summarize.

```
out1_2015 <- education %>% select("fips", "year", "percent_less than_hs_diploma") %>%
left_join(fips, by = "fips") %>% filter(state=="AL", year==2015) %>% group_by(state) %
>% summarize(avg_per = mean(`percent_less than_hs_diploma`, na.rm = TRUE))

out1 <- str_c("For year 2015, Alabama has `percent_less than_hs_diploma`: ", out1_2015
["avg_per"], "%")
print(out1)
```

```
## [1] "For year 2015, Alabama has `percent_less than_hs_diploma`: 19.7588235294118%"
```

- 4.2 What is the average percentage of college graduates for the counties in the state of Massachusetts for the year 2015?

Answer: We take the join between education and fips, where state = “MA” and year = 2015. We group by each state and summarize the rows.

```
out2_2015 <- education %>% select("fips", "year", "percent_has_some_college") %>% left
_join(fips, by = "fips") %>% filter(state=="MA", year==2015) %>% group_by(state) %>% s
ummarize(avg_per = mean(`percent_has_some_college`, na.rm = TRUE))

out2 <- str_c("For year 2015, MA has `percent_has_some_college`: ", out2_2015["avg_pe
r"], "%")
print(out2)
```

```
## [1] "For year 2015, MA has `percent_has_some_college`: 25.9133333333333%"
```

- 4.3 Determine the average percentage of population not attaining a high school diploma for the counties in Alabama for each year within the dataset. The result should return the calendar year and the average percentage not attaining a high school diploma for that year.

Answer: We take the left join between fips and education, where state = “AL”. We group by each year and summarize to get mean of percent_less than_hs_diploma for each year.

```
out3_alabama <- education %>% select("fips", "year", "percent_less than_hs_diploma") %
>% left_join(fips, by = "fips") %>% filter(state=="AL") %>% group_by(year) %>% summari
ze(avg_per = mean(`percent_less than_hs_diploma`, na.rm = TRUE))

print(out3_alabama)
```

```
## # A tibble: 5 x 2
##    year avg_per
##   <int>   <dbl>
## 1  1970    65.2
## 2  1980    50.6
## 3  1990    40.1
## 4  2000    30.3
## 5  2015    19.8
```

- 4.4 What is the most common rural_urban code for the U.S. counties?

Answer: We group by all the rural_urban_cont_code values in rural_urban_code tibble, and count number of times they appear. We pick the maximum value using top_n(1). We use left join on this final tibble on “rural_urban_cont_code” tibble to get the description of this code. We observe that “Urban population of 2,500 to 9,999 adjaent to a metro area” is the most occuring code.

```
code_count <- rural_urban_code %>% group_by(rural_urban_cont_code) %>% summarize(count
=n()) %>% top_n(1) %>% left_join(rural_urban_code_contains, by = "rural_urban_cont_cod
e")

print(code_count)
```

```
## # A tibble: 1 x 3
##   rural_urban_cont_co~ count description
##   <fct>                <int> <fct>
## 1 6                      593 Urban population of 2,500 to 19,999, adjacen~
```

- 4.5 Which counties have not been coded with a rural urban code? Return a result that contains two fields: County, State for the counties that have not been assigned a rural urban code. Do not return duplicate values in the result. Order the result alphabetically by state. What does this result set represent?

Answer: We look for all the “NULL” values in rural_urban_cont_code column of rural_urban_code tibble. Once we find the desired rows, we left join the result with fips tibble to get county and state name by value in ips column. We use arrange() to sort the tibble output by “state”. Finally we output the county and state of tibble.

The output tibble represents all the counties which has “NULL” in their column values, which represents missing values.

```
out5_fips <- rural_urban_code %>% filter(rural_urban_cont_code == "NULL") %>% left_joi
n(fips, by="fips") %>% select(county, state) %>% arrange(state)

print(out5_fips[, c("county", "state")])
```

```
## # A tibble: 51 x 2
##    county      state
##    <chr>       <chr>
##  1 Alaska      AK
##  2 Alabama     AL
##  3 Arkansas    AR
##  4 Arizona     AZ
##  5 California  CA
##  6 Colorado    CO
##  7 Connecticut CT
##  8 District    DC
##  9 Delaware    DE
## 10 Florida     FL
## # ... with 41 more rows
```

- 4.6 What is the minimal percentage of college graduates for the counties in the state of Mississippi for the year 2010? What does the result represent?

Answer: As 2010 does not exist in database, I am considering year 2015. We select all rows in education for column “percent_has_some_college”, where state = MS and year = 2015. We arrange them in ascending order of percent values. Finally we output the first row to get the minimum value. We observe that in the year 2015, Issaquena county in Mississippi has the lowest percent of people graduating from college.This means that Issaquena county has most people graduating and hence developed in that sense.

```
out6_2015 <- education %>% select(fips, year, percent_has_some_college) %>% left_join
(fips, by = "fips") %>% filter(state=="MS", year==2015) %>% arrange(percent_has_some_c
ollege)

out6_2015[1,]
```

	fips <int>	year <int>	percent_has_some_college <dbl>	county <chr>	state <chr>
1	28055	2015	18.4	Issaquena	MS

1 row

- 4.7 In the year 2015, which fip counties, are above the average unemployment rate? Provide the county name, U.S. state name and the unemployment rate in the result. Sort in descending order by unemployment rate.

Answer: We first calculate average percent unemployment rate. For all rows in unemployment dataset, get the rows where year is 2015. We left join the resulting dataset with fips dataset to get the county name and state names. We calculate average by summing all the percent unemployed and dividing with number of rows. Finally we filter all the dataset where percent_unemployed is greater than this average.

```
temp7 <- filter(unemp, year==2015) %>% left_join(fips, by="fips") %>% select(county, s
tate, percent_unemployed) %>% arrange(desc(percent_unemployed))

avg_unemp = sum(temp7["percent_unemployed"])/nrow(temp7)

out7 <- filter(temp7, percent_unemployed > avg_unemp)

print(out7)
```

```
##             county state percent_unemployed
## 1          Imperial    CA               24.0
## 2          Kusilvak    AK               23.2
## 3              Yuma    AZ               21.8
## 4             Yukon    AK               18.0
## 5              Luna    NM               17.6
## 6         Issaquena    MS               16.9
## 7         Northwest    AK               15.5
## 8            Colusa    CA               15.3
## 9            Hoonah    AK               15.0
## 10        Jefferson    MS               14.9
## 11           Wilcox    AL               14.7
## 12         Magoffin    KY               14.7
## 13           Bethel    AK               14.4
## 14             East    LA               13.9
## 15            Starr    TX               13.6
## 16           Apache    AZ               13.4
## 17             West    LA               13.3
## 18          Willacy    TX               13.1
## 19            Mingo    WV               13.1
## 20         McDowell    WV               13.0
## 21        Claiborne    MS               12.9
## 22        Humphreys    MS               12.9
## 23             Lake    AK               12.7
## 24           Prince    AK               12.5
## 25          Calhoun    WV               12.5
## 26           Holmes    MS               12.1
## 27           Graham    NC               12.1
## 28          Russell    KY               11.9
## 29           Clarke    AL               11.8
## 30             Nome    AK               11.7
## 31           Tulare    CA               11.7
## 32           Harlan    KY               11.7
## 33          Lowndes    AL               11.6
## 34           Oglala    SD               11.6
## 35          Skagway    AK               11.5
## 36            Santa    AZ               11.5
## 37            Dewey    SD               11.5
## 38            Roane    WV               11.5
## 39           Merced    CA               11.4
## 40        Allendale    SC               11.4
## 41            Logan    WV               11.4
## 42             Clay    GA               11.3
## 43          Letcher    KY               11.2
## 44             Clay    WV               11.2
## 45           Zavala    TX               11.1
## 46           Greene    AL               11.0
## 47        Morehouse    LA               10.9
```

```
## 48          Leflore    MS              10.9
## 49             Cape    NJ              10.9
## 50        Southeast    AK              10.8
## 51           Sutter    CA              10.8
## 52           Leslie    KY              10.8
## 53          Quitman    MS              10.8
## 54        Sunflower    MS              10.8
## 55         Presidio    TX              10.8
## 56         Buchanan    VA              10.8
## 57          Wheeler    GA              10.7
## 58         Scotland    NC              10.7
## 59       Orangeburg    SC              10.7
## 60         Maverick    TX              10.7
## 61        Worcester    MD              10.6
## 62        Wilkinson    MS              10.6
## 63            Kings    CA              10.5
## 64           Madera    CA              10.5
## 65       Washington    MS              10.5
## 66          Mineral    NV              10.5
## 67          Bamberg    SC              10.5
## 68           Plumas    CA              10.4
## 69           Owsley    KY              10.4
## 70      Schoolcraft    MI              10.4
## 71           Kemper    MS              10.4
## 72           Hendry    FL              10.3
## 73          Coahoma    MS              10.3
## 74             Wirt    WV              10.3
## 75           Fresno    CA              10.2
## 76             Kern    CA              10.2
## 77           Ferry    WA              10.2
## 78          Monroe    AL              10.1
## 79           Wolfe    KY              10.1
## 80         Rolette    ND              10.1
## 81        Marlboro    SC              10.1
## 82       Dickenson    VA              10.1
## 83           Perry    AL              10.0
## 84         Hancock    GA              10.0
## 85          Carter    KY              10.0
## 86         Elliott    KY              10.0
## 87         Lincoln    MT              10.0
## 88          Monroe    OH              10.0
## 89          Marion    SC              10.0
## 90         Hancock    TN              10.0
## 91          Brooks    TX              10.0
## 92          Wetzel    WV              10.0
## 93           Knott    KY               9.9
## 94         Noxubee    MS               9.9
## 95         Sharkey    MS               9.9
## 96       Menominee    WI               9.9
```

```
## 97          Presque    MI              9.8
## 98       Dillingham    AK              9.7
## 99           Haines    AK              9.7
## 100          Navajo    AZ              9.7
## 101            Clay    KY              9.7
## 102          Tensas    LA              9.7
## 103        McKinley    NM              9.7
## 104            Mora    NM              9.7
## 105         Lincoln    WV              9.7
## 106         Wyoming    WV              9.7
## 107          Dallas    AL              9.6
## 108          Martin    KY              9.6
## 109     Montmorency    MI              9.6
## 110            Clay    MS              9.6
## 111       Edgecombe    NC              9.6
## 112          Wilson    NC              9.6
## 113           Scott    TN              9.6
## 114           Boone    WV              9.6
## 115      Stanislaus    CA              9.5
## 116       Breathitt    KY              9.5
## 117            Pike    KY              9.5
## 118        Franklin    LA              9.5
## 119            Pend    WA              9.5
## 120          Chicot    AR              9.4
## 121        Siskiyou    CA              9.4
## 122           Floyd    KY              9.4
## 123        Lawrence    KY              9.4
## 124            Lyon    NV              9.4
## 125        Atlantic    NJ              9.4
## 126         Tyrrell    NC              9.4
## 127          Sabine    TX              9.4
## 128           Tyler    WV              9.4
## 129     Mississippi    AR              9.3
## 130          Taylor    GA              9.3
## 131       Catahoula    LA              9.3
## 132         Madison    LA              9.3
## 133        Mackinac    MI              9.3
## 134            Taos    NM              9.3
## 135         Conecuh    AL              9.2
## 136         Bristol    AK              9.2
## 137            Yuba    CA              9.2
## 138      Clearwater    MN              9.2
## 139          Tunica    MS              9.2
## 140    Williamsburg    SC              9.2
## 141             San    TX              9.2
## 142         Choctaw    AL              9.1
## 143        Bleckley    GA              9.1
## 144          Twiggs    GA              9.1
## 145        Pemiscot    MO              9.1
```

```
## 146          Sierra    NM              9.1
## 147            Hyde    NC              9.1
## 148      Lauderdale    TN              9.1
## 149         Pacific    WA              9.1
## 150       Wahkiakum    WA              9.1
## 151        Nicholas    WV              9.1
## 152          Sierra    CA              9.0
## 153             Ben    GA              9.0
## 154        Randolph    GA              9.0
## 155         Pulaski    IL              9.0
## 156       Ontonagon    MI              9.0
## 157         Glacier    MT              9.0
## 158        Torrance    NM              9.0
## 159            Clay    TN              9.0
## 160            Lamb    TX              9.0
## 161     Petersburg    VA              9.0
## 162         Braxton    WV              9.0
## 163         Barbour    AL              8.9
## 164      Washington    AL              8.9
## 165     Petersburg    AK              8.9
## 166             San    CA              8.9
## 167       Jefferson    GA              8.9
## 168           Macon    GA              8.9
## 169         Webster    GA              8.9
## 170           Perry    KY              8.9
## 171              St    LA              8.9
## 172         Halifax    NC              8.9
## 173           Grant    OR              8.9
## 174        Barnwell    SC              8.9
## 175         Houston    TN              8.9
## 176           Obion    TN              8.9
## 177          Morris    TX              8.9
## 178           Wayne    UT              8.9
## 179           Grays    WA              8.9
## 180            Iron    WI              8.9
## 181          Valdez    AK              8.8
## 182           Modoc    CA              8.8
## 183   Chattahoochee    GA              8.8
## 184          Baraga    MI              8.8
## 185       Cheboygan    MI              8.8
## 186       Roscommon    MI              8.8
## 187          Panola    MS              8.8
## 188      Washington    NC              8.8
## 189            Lake    TN              8.8
## 190    Martinsville    VA              8.8
## 191         Stevens    WA              8.8
## 192          Denali    AK              8.7
## 193           Glenn    CA              8.7
## 194         Menifee    KY              8.7
```

```
## 195         Webster    LA              8.7
## 196        Keweenaw    MI              8.7
## 197       Jefferson    MS              8.7
## 198             Nye    NV              8.7
## 199      Cumberland    NJ              8.7
## 200          Dillon    SC              8.7
## 201         McNairy    TN              8.7
## 202        Garfield    UT              8.7
## 203             Del    CA              8.6
## 204       Alexander    IL              8.6
## 205         Johnson    IL              8.6
## 206         Jackson    KY              8.6
## 207           Lewis    KY              8.6
## 208       Concordia    LA              8.6
## 209        Richland    LA              8.6
## 210          Arenac    MI              8.6
## 211         Harding    NM              8.6
## 212           Vance    NC              8.6
## 213         Carroll    TN              8.6
## 214         Haywood    TN              8.6
## 215         Emanuel    GA              8.5
## 216         Telfair    GA              8.5
## 217          Toombs    GA              8.5
## 218            Bell    KY              8.5
## 219             Lee    KY              8.5
## 220         Robeson    NC              8.5
## 221           Crook    OR              8.5
## 222           Curry    OR              8.5
## 223         Hampton    SC              8.5
## 224             Lee    SC              8.5
## 225         Fayette    WV              8.5
## 226           Mason    WV              8.5
## 227       Pleasants    WV              8.5
## 228      Montgomery    GA              8.4
## 229         Johnson    KY              8.4
## 230          Oscoda    MI              8.4
## 231         Carroll    MS              8.4
## 232         Winston    MS              8.4
## 233          Warren    NC              8.4
## 234        McIntosh    OK              8.4
## 235      Georgetown    SC              8.4
## 236        Marshall    WV              8.4
## 237        Bayfield    WI              8.4
## 238         Yakutat    AK              8.3
## 239           Dodge    GA              8.3
## 240         Clinton    KY              8.3
## 241            Knox    KY              8.3
## 242        McCreary    KY              8.3
## 243              St    LA              8.3
```

```
## 244           Winn    LA              8.3
## 245       Somerset    MD              8.3
## 246          Meigs    OH              8.3
## 247        Chester    SC              8.3
## 248           Wise    VA              8.3
## 249          Lewis    WA              8.3
## 250        Jenkins    GA              8.2
## 251       McDuffie    GA              8.2
## 252         Marion    GA              8.2
## 253         Sumter    GA              8.2
## 254       Treutlen    GA              8.2
## 255       Franklin    IL              8.2
## 256         Hardin    IL              8.2
## 257      Bienville    LA              8.2
## 258       Caldwell    LA              8.2
## 259          Alger    MI              8.2
## 260           Lake    MI              8.2
## 261       Walthall    MS              8.2
## 262          Yazoo    MS              8.2
## 263        Mineral    MT              8.2
## 264        Sanders    MT              8.2
## 265      Henderson    TN              8.2
## 266            Van    TN              8.2
## 267          Duval    TX              8.2
## 268          Lewis    WV              8.2
## 269     Pocahontas    WV              8.2
## 270          Macon    AL              8.1
## 271       Monterey    CA              8.1
## 272          Irwin    GA              8.1
## 273        Screven    GA              8.1
## 274     Taliaferro    GA              8.1
## 275          Wayne    KY              8.1
## 276    Koochiching    MN              8.1
## 277          Adams    MS              8.1
## 278        Shannon    MO              8.1
## 279           Hoke    NC              8.1
## 280       Campbell    TN              8.1
## 281        Decatur    TN              8.1
## 282         Unicoi    TN              8.1
## 283         Sumter    AL              8.0
## 284           Gila    AZ              8.0
## 285         Mohave    AZ              8.0
## 286         Ashley    AR              8.0
## 287         Tehama    CA              8.0
## 288          Burke    GA              8.0
## 289         Putnam    GA              8.0
## 290       Seminole    GA              8.0
## 291     Clearwater    ID              8.0
## 292         Morgan    KY              8.0
```

```
## 293          Benton    MS              8.0
## 294          Clarke    MS              8.0
## 295           Perry    MS              8.0
## 296           Wayne    MS              8.0
## 297         Dunklin    MO              8.0
## 298           Taney    MO              8.0
## 299          Catron    NM              8.0
## 300             Rio    NM              8.0
## 301          Bladen    NC              8.0
## 302         Klamath    OR              8.0
## 303       Fairfield    SC              8.0
## 304         Jackson    TN              8.0
## 305         Clallam    WA              8.0
## 306          Yakima    WA              8.0
## 307          Upshur    WV              8.0
## 308         Colbert    AL              7.9
## 309        Greenlee    AZ              7.9
## 310       Lafayette    AR              7.9
## 311        Phillips    AR              7.9
## 312          Alpine    CA              7.9
## 313           Peach    GA              7.9
## 314              De    LA              7.9
## 315          Iberia    LA              7.9
## 316              St    LA              7.9
## 317         Bolivar    MS              7.9
## 318          Greene    MS              7.9
## 319          Jasper    MS              7.9
## 320      Montgomery    MS              7.9
## 321           Ozark    MO              7.9
## 322          Ripley    MO              7.9
## 323          Cibola    NM              7.9
## 324        Richmond    NC              7.9
## 325           Swain    NC              7.9
## 326           Adams    OH              7.9
## 327         Latimer    OK              7.9
## 328       Josephine    OR              7.9
## 329         Wallowa    OR              7.9
## 330         Bledsoe    TN              7.9
## 331           Cocke    TN              7.9
## 332          Grundy    TN              7.9
## 333         Stewart    TN              7.9
## 334         Hidalgo    TX              7.9
## 335             Jim    TX              7.9
## 336          Sawyer    WI              7.9
## 337         Bullock    AL              7.8
## 338            Hale    AL              7.8
## 339           Kenai    AK              7.8
## 340       Matanuska    AK              7.8
## 341        Wrangell    AK              7.8
```

```
## 342         Jackson    AR              7.8
## 343          Shasta    CA              7.8
## 344         Trinity    CA              7.8
## 345         Baldwin    GA              7.8
## 346      Meriwether    GA              7.8
## 347        Spalding    GA              7.8
## 348           Towns    GA              7.8
## 349           Union    IL              7.8
## 350            Bath    KY              7.8
## 351         Greenup    KY              7.8
## 352      Assumption    LA              7.8
## 353    Natchitoches    LA              7.8
## 354       Chickasaw    MS              7.8
## 355        Franklin    MS              7.8
## 356            Iron    MO              7.8
## 357           Stone    MO              7.8
## 358      Rutherford    NC              7.8
## 359            Lake    OR              7.8
## 360       Clarendon    SC              7.8
## 361           Union    SC              7.8
## 362          Benton    TN              7.8
## 363        Hardeman    TN              7.8
## 364           Meigs    TN              7.8
## 365         Pickett    TN              7.8
## 366             San    UT              7.8
## 367          Gilmer    WV              7.8
## 368         Hancock    WV              7.8
## 369        Lawrence    AL              7.7
## 370         Marengo    AL              7.7
## 371            Lake    CA              7.7
## 372        Huerfano    CO              7.7
## 373       Dougherty    GA              7.7
## 374          Warren    GA              7.7
## 375        Shoshone    ID              7.7
## 376          Fulton    IL              7.7
## 377      Montgomery    IL              7.7
## 378          Saline    IL              7.7
## 379          Fulton    KY              7.7
## 380          Vernon    LA              7.7
## 381       Baltimore    MD              7.7
## 382          Alcona    MI              7.7
## 383           Amite    MS              7.7
## 384          Attala    MS              7.7
## 385             San    NM              7.7
## 386           Bronx    NY              7.7
## 387          Martin    NC              7.7
## 388          Scioto    OH              7.7
## 389       McCurtain    OK              7.7
## 390         Douglas    OR              7.7
```

```
## 391          Forest    PA              7.7
## 392           Mason    WA              7.7
## 393         Webster    WV              7.7
## 394         Winston    AL              7.6
## 395              La    AZ              7.6
## 396           Desha    AR              7.6
## 397             San    CA              7.6
## 398           Lamar    GA              7.6
## 399          Talbot    GA              7.6
## 400          Wilcox    GA              7.6
## 401           Adams    ID              7.6
## 402           Adair    KY              7.6
## 403      Washington    LA              7.6
## 404          Oceana    MI              7.6
## 405          George    MS              7.6
## 406    Tallahatchie    MS              7.6
## 407         Socorro    NM              7.6
## 408        Columbus    NC              7.6
## 409     Northampton    NC              7.6
## 410         Haskell    OK              7.6
## 411      Pushmataha    OK              7.6
## 412            Coos    OR              7.6
## 413          Gibson    TN              7.6
## 414          Morgan    TN              7.6
## 415            Rhea    TN              7.6
## 416          Zapata    TX              7.6
## 417         Cowlitz    WA              7.6
## 418           Grant    WV              7.6
## 419          Butler    AL              7.5
## 420              St    AR              7.5
## 421           Santa    CA              7.5
## 422          Sumter    FL              7.5
## 423         Clayton    GA              7.5
## 424           Dooly    GA              7.5
## 425         Laurens    GA              7.5
## 426          Wilkes    GA              7.5
## 427          Neosho    KS              7.5
## 428              St    LA              7.5
## 429        Crawford    MI              7.5
## 430          Lapeer    MI              7.5
## 431          Ogemaw    MI              7.5
## 432          Monroe    MS              7.5
## 433           Stone    MS              7.5
## 434          Carter    MO              7.5
## 435        Valencia    NM              7.5
## 436            Dare    NC              7.5
## 437         Jackson    OH              7.5
## 438           Lewis    TN              7.5
## 439          Jasper    TX              7.5
```

```
## 440         Newton    TX              7.5
## 441       Tazewell    VA              7.5
## 442       Hopewell    VA              7.5
## 443      Lexington    VA              7.5
## 444       Franklin    WA              7.5
## 445          Hardy    WV              7.5
## 446         Forest    WI              7.5
## 447        Cochise    AZ              7.4
## 448         Graham    AZ              7.4
## 449         Dallas    AR              7.4
## 450       Randolph    AR              7.4
## 451         Citrus    FL              7.4
## 452      Highlands    FL              7.4
## 453         Elbert    GA              7.4
## 454         Murray    GA              7.4
## 455       Muscogee    GA              7.4
## 456        Terrell    GA              7.4
## 457      Wilkinson    GA              7.4
## 458         Massac    IL              7.4
## 459     Livingston    KY              7.4
## 460      Avoyelles    LA              7.4
## 461     Evangeline    LA              7.4
## 462     Dorchester    MD              7.4
## 463       Chippewa    MI              7.4
## 464          Clare    MI              7.4
## 465       Lawrence    MS              7.4
## 466         Marion    MS              7.4
## 467           Pike    MS              7.4
## 468            DoÃ    NM              7.4
## 469     Cumberland    NC              7.4
## 470     Pasquotank    NC              7.4
## 471      Jefferson    OH              7.4
## 472          Noble    OH              7.4
## 473           Pike    OH              7.4
## 474       Choctaw    OK              7.4
## 475          Coal    OK              7.4
## 476      Jefferson    OR              7.4
## 477     Darlington    SC              7.4
## 478        Buffalo    SD              7.4
## 479          Todd    SD              7.4
## 480       Fentress    TN              7.4
## 481         Hardin    TN              7.4
## 482          Wayne    TN              7.4
## 483       Barbour    WV              7.4
## 484         Adams    WI              7.4
## 485         Lassen    CA              7.3
## 486          Baker    GA              7.3
## 487       Brantley    GA              7.3
## 488       Richmond    GA              7.3
```

```
## 489          Wayne    GA              7.3
## 490       Claiborne    LA              7.3
## 491        Lincoln     LA              7.3
## 492             St     LA              7.3
## 493        Kalkaska    MI              7.3
## 494          Wayne     MI              7.3
## 495         Copiah     MS              7.3
## 496        Marshall    MS              7.3
## 497         Webster    MS              7.3
## 498          Storey    NV              7.3
## 499          Carson    NV              7.3
## 500          Bertie    NC              7.3
## 501             Lee    NC              7.3
## 502           Nash     NC              7.3
## 503          Morgan    OH              7.3
## 504          Harney    OR              7.3
## 505       Claiborne    TN              7.3
## 506            Dyer    TN              7.3
## 507         Overton    TN              7.3
## 508          Tipton    TN              7.3
## 509        Duchesne    UT              7.3
## 510        Danville    VA              7.3
## 511        Skamania    WA              7.3
## 512          Brooke    WV              7.3
## 513          Mercer    WV              7.3
## 514         Mineral    WV              7.3
## 515         Raleigh    WV              7.3
## 516          Walker    AL              7.2
## 517        Cleburne    AR              7.2
## 518       Jefferson    AR              7.2
## 519           Butte    CA              7.2
## 520        Mariposa    CA              7.2
## 521          Putnam    FL              7.2
## 522           Mason    IL              7.2
## 523           Perry    IL              7.2
## 524          Powell    KY              7.2
## 525           Grant    LA              7.2
## 526      Tangipahoa    LA              7.2
## 527          Antrim    MI              7.2
## 528           Iosco    MI              7.2
## 529         Jackson    MS              7.2
## 530            Tate    MS              7.2
## 531           Quay     NM              7.2
## 532          Oswego    NY              7.2
## 533       Brunswick    NC              7.2
## 534          Chowan    NC              7.2
## 535          Hughes    OK              7.2
## 536        Columbia    OR              7.2
## 537         Fayette    PA              7.2
```

```
## 538        Cherokee    SC              7.2
## 539       McCormick    SC              7.2
## 540      Cumberland    TN              7.2
## 541             Jim    TX              7.2
## 542             Lee    VA              7.2
## 543         Jackson    WV              7.2
## 544       Covington    AL              7.1
## 545            Drew    AR              7.1
## 546           Sharp    AR              7.1
## 547        Tuolumne    CA              7.1
## 548          Glades    FL              7.1
## 549         Appling    GA              7.1
## 550          Thomas    GA              7.1
## 551           Upson    GA              7.1
## 552            Clay    IL              7.1
## 553        Lawrence    IL              7.1
## 554           Macon    IL              7.1
## 555       Vermilion    IL              7.1
## 556       Winnebago    IL              7.1
## 557      Vermillion    IN              7.1
## 558         Ballard    KY              7.1
## 559        Edmonson    KY              7.1
## 560      Muhlenberg    KY              7.1
## 561           Caddo    LA              7.1
## 562       Iberville    LA              7.1
## 563          Sabine    LA              7.1
## 564        Allegany    MD              7.1
## 565              St    MI              7.1
## 566         Lowndes    MS              7.1
## 567       Yalobusha    MS              7.1
## 568           Clark    MO              7.1
## 569           Salem    NJ              7.1
## 570       Guadalupe    NM              7.1
## 571           Lewis    NY              7.1
## 572        Hertford    NC              7.1
## 573      Perquimans    NC              7.1
## 574         Cameron    TX              7.1
## 575          Cottle    TX              7.1
## 576           Tyler    TX              7.1
## 577           Grant    WA              7.1
## 578       Jefferson    WA              7.1
## 579       Klickitat    WA              7.1
## 580         Burnett    WI              7.1
## 581           Vilas    WI              7.1
## 582         Calhoun    AL              7.0
## 583        Escambia    AL              7.0
## 584         Fayette    AL              7.0
## 585          Marion    AL              7.0
## 586          Mobile    AL              7.0
```

```
## 587      Montgomery    AR              7.0
## 588             Van    AR              7.0
## 589         Gadsden    FL              7.0
## 590         Berrien    GA              7.0
## 591          Greene    GA              7.0
## 592         Johnson    GA              7.0
## 593           Lemhi    ID              7.0
## 594         LaSalle    IL              7.0
## 595            Pope    IL              7.0
## 596           Wayne    IL              7.0
## 597            Boyd    KY              7.0
## 598         Whitley    KY              7.0
## 599           Union    LA              7.0
## 600         Gogebic    MI              7.0
## 601        Reynolds    MO              7.0
## 602       Churchill    NV              7.0
## 603             San    NM              7.0
## 604         Cameron    PA              7.0
## 605         Calhoun    SC              7.0
## 606        Colleton    SC              7.0
## 607           Horry    SC              7.0
## 608          DeKalb    TN              7.0
## 609           Perry    TN              7.0
## 610         Weakley    TN              7.0
## 611       Jefferson    TX              7.0
## 612         Emporia    VA              7.0
## 613          Norton    VA              7.0
## 614        Randolph    WV              7.0
## 615         Ritchie    WV              7.0
## 616         Summers    WV              7.0
## 617           Wayne    WV              7.0
## 618      Lauderdale    AL              6.9
## 619            Clay    AR              6.9
## 620           Izard    AR              6.9
## 621             Lee    AR              6.9
## 622        District    DC              6.9
## 623        District    DC              6.9
## 624           Crisp    GA              6.9
## 625      Washington    GA              6.9
## 626        Gallatin    IL              6.9
## 627          Marion    IL              6.9
## 628          Peoria    IL              6.9
## 629         Lincoln    KY              6.9
## 630           Union    KY              6.9
## 631           Allen    LA              6.9
## 632           Dukes    MA              6.9
## 633           Emmet    MI              6.9
## 634         Gladwin    MI              6.9
## 635        Marshall    MN              6.9
```

```
## 636           Linn    MO              6.9
## 637             St    MO              6.9
## 638        Passaic    NJ              6.9
## 639             St    NY              6.9
## 640       Mitchell    NC              6.9
## 641          Baker    OR              6.9
## 642        Jackson    OR              6.9
## 643           Linn    OR              6.9
## 644   Philadelphia    PA              6.9
## 645      Abbeville    SC              6.9
## 646         Sumter    SC              6.9
## 647      Humphreys    TN              6.9
## 648         Marion    TN              6.9
## 649          Union    TN              6.9
## 650           Cass    TX              6.9
## 651        Liberty    TX              6.9
## 652           Page    VA              6.9
## 653       Okanogan    WA              6.9
## 654         Marion    WV              6.9
## 655          Henry    AL              6.8
## 656        Pickens    AL              6.8
## 657      Ketchikan    AK              6.8
## 658       Columbia    AR              6.8
## 659       Hernando    FL              6.8
## 660         Indian    FL              6.8
## 661         Clinch    GA              6.8
## 662          Early    GA              6.8
## 663        Calhoun    IL              6.8
## 664         Grundy    IL              6.8
## 665      Jefferson    IL              6.8
## 666       Kankakee    IL              6.8
## 667         Greene    IN              6.8
## 668           Lake    IN              6.8
## 669        Grayson    KY              6.8
## 670            Red    LA              6.8
## 671      Vermilion    LA              6.8
## 672       Wicomico    MD              6.8
## 673        Hampden    MA              6.8
## 674        Kanabec    MN              6.8
## 675         Warren    MS              6.8
## 676        Douglas    MO              6.8
## 677          Clark    NV              6.8
## 678        Douglas    NV              6.8
## 679       Pershing    NV              6.8
## 680       Hamilton    NY              6.8
## 681        Lincoln    OR              6.8
## 682     Huntingdon    PA              6.8
## 683          Potter    PA              6.8
## 684       Grainger    TN              6.8
```

```
## 685        Lawrence    TN              6.8
## 686            Polk    TN              6.8
## 687       Matagorda    TX              6.8
## 688           Essex    VT              6.8
## 689       Brunswick    VA              6.8
## 690          Sussex    VA              6.8
## 691           Adams    WA              6.8
## 692            Door    WI              6.8
## 693        Florence    WI              6.8
## 694           Coosa    AL              6.7
## 695            Pike    AL              6.7
## 696    Independence    AR              6.7
## 697        Woodruff    AR              6.7
## 698             Los    CA              6.7
## 699       Riverside    CA              6.7
## 700          Hardee    FL              6.7
## 701         Decatur    GA              6.7
## 702         Quitman    GA              6.7
## 703         Stewart    GA              6.7
## 704        Marshall    IL              6.7
## 705      Stephenson    IL              6.7
## 706          Wilson    KS              6.7
## 707          Acadia    LA              6.7
## 708         LaSalle    LA              6.7
## 709              St    LA              6.7
## 710            Iron    MI              6.7
## 711            Cass    MN              6.7
## 712      Lauderdale    MS              6.7
## 713         Hickory    MO              6.7
## 714          Morgan    MO              6.7
## 715          Nevada    NV              6.7
## 716           Essex    NJ              6.7
## 717        Sandoval    NM              6.7
## 718       Jefferson    NY              6.7
## 719      Montgomery    NY              6.7
## 720         Harnett    NC              6.7
## 721          Person    NC              6.7
## 722              Le    OK              6.7
## 723         Clinton    PA              6.7
## 724           Henry    TN              6.7
## 725      Sequatchie    TN              6.7
## 726       Lancaster    VA              6.7
## 727         Franklin    VA              6.7
## 728          Skagit    WA              6.7
## 729            West    WV              6.7
## 730            Bibb    AL              6.6
## 731         Jackson    AL              6.6
## 732       Talladega    AL              6.6
## 733        Coconino    AZ              6.6
```

```
## 734        Ouachita    AR              6.6
## 735          Amador    CA              6.6
## 736          Taylor    FL              6.6
## 737            Bibb    GA              6.6
## 738         Carroll    GA              6.6
## 739          Coffee    GA              6.6
## 740            Cook    GA              6.6
## 741           Floyd    GA              6.6
## 742        Glascock    GA              6.6
## 743          Lanier    GA              6.6
## 744         Lincoln    GA              6.6
## 745        Mitchell    GA              6.6
## 746          Newton    GA              6.6
## 747           Rabun    GA              6.6
## 748          Schley    GA              6.6
## 749         Benewah    ID              6.6
## 750          Custer    ID              6.6
## 751           Boone    IL              6.6
## 752       Christian    IL              6.6
## 753              St    IL              6.6
## 754           Stark    IL              6.6
## 755      Montgomery    KY              6.6
## 756      Rockcastle    KY              6.6
## 757          Taylor    KY              6.6
## 758        Ouachita    LA              6.6
## 759              St    LA              6.6
## 760        Somerset    ME              6.6
## 761      Washington    ME              6.6
## 762          Benzie    MI              6.6
## 763            Luce    MI              6.6
## 764         Hancock    MS              6.6
## 765        Stoddard    MO              6.6
## 766           Texas    MO              6.6
## 767      Washington    MO              6.6
## 768             Big    MT              6.6
## 769             New    NM              6.6
## 770           Grant    NM              6.6
## 771          Fulton    NY              6.6
## 772        Schuyler    NY              6.6
## 773           Anson    NC              6.6
## 774        Beaufort    NC              6.6
## 775      Rockingham    NC              6.6
## 776           Huron    OH              6.6
## 777          Ottawa    OH              6.6
## 778          Vinton    OH              6.6
## 779        Seminole    OK              6.6
## 780        Somerset    PA              6.6
## 781        Florence    SC              6.6
## 782         Bedford    TN              6.6
```

```
## 783          Carter    TN              6.6
## 784        Crockett    TN              6.6
## 785          Greene    TN              6.6
## 786           Roane    TN              6.6
## 787          Shelby    TN              6.6
## 788          Kinney    TX              6.6
## 789          Uintah    UT              6.6
## 790          Benton    WA              6.6
## 791          Alaska    AK              6.5
## 792           Stone    AR              6.5
## 793           White    AR              6.5
## 794       Calaveras    CA              6.5
## 795             San    CA              6.5
## 796        Costilla    CO              6.5
## 797            Polk    GA              6.5
## 798         Pulaski    GA              6.5
## 799        Stephens    GA              6.5
## 800          Turner    GA              6.5
## 801          Bureau    IL              6.5
## 802         Fayette    IL              6.5
## 803            Rock    IL              6.5
## 804         Fayette    IN              6.5
## 805        Lawrence    IN              6.5
## 806      Montgomery    KS              6.5
## 807       Robertson    KY              6.5
## 808         Orleans    LA              6.5
## 809          Pointe    LA              6.5
## 810         Garrett    MD              6.5
## 811           Delta    MI              6.5
## 812         Wexford    MI              6.5
## 813          Itasca    MN              6.5
## 814     Mississippi    MS              6.5
## 815          Benton    MO              6.5
## 816          Camden    MO              6.5
## 817          Lander    NV              6.5
## 818        Franklin    NY              6.5
## 819         Orleans    NY              6.5
## 820        Cherokee    NC              6.5
## 821       Cleveland    NC              6.5
## 822          Gallia    OH              6.5
## 823           Perry    OH              6.5
## 824        Trumbull    OH              6.5
## 825         Gilliam    OR              6.5
## 826         Malheur    OR              6.5
## 827        Umatilla    OR              6.5
## 828         Laurens    SC              6.5
## 829         Hawkins    TN              6.5
## 830       Jefferson    TN              6.5
## 831          McMinn    TN              6.5
```

```
## 832          Marion    TX              6.5
## 833          Orange    TX              6.5
## 834             San    TX              6.5
## 835           Henry    VA              6.5
## 836          Prince    VA              6.5
## 837         Russell    VA              6.5
## 838           Smyth    VA              6.5
## 839      Greenbrier    WV              6.5
## 840            Dale    AL              6.4
## 841        Franklin    AL              6.4
## 842      Crittenden    AR              6.4
## 843          Sevier    AR              6.4
## 844           Union    AR              6.4
## 845            Yolo    CA              6.4
## 846          Marion    FL              6.4
## 847           Butts    GA              6.4
## 848         Colquitt    GA              6.4
## 849            Jeff    GA              6.4
## 850        McIntosh    GA              6.4
## 851        Rockdale    GA              6.4
## 852            Ware    GA              6.4
## 853           Worth    GA              6.4
## 854           Edgar    IL              6.4
## 855         Hancock    IL              6.4
## 856          Putnam    IL              6.4
## 857            Linn    KS              6.4
## 858         Bracken    KY              6.4
## 859       Christian    KY              6.4
## 860            Ohio    KY              6.4
## 861         Rapides    LA              6.4
## 862         Tuscola    MI              6.4
## 863         Forrest    MS              6.4
## 864          Tippah    MS              6.4
## 865      Tishomingo    MS              6.4
## 866          Howell    MO              6.4
## 867         Laclede    MO              6.4
## 868          Chaves    NM              6.4
## 869         Steuben    NY              6.4
## 870         Caswell    NC              6.4
## 871          Lenoir    NC              6.4
## 872           Atoka    OK              6.4
## 873        Johnston    OK              6.4
## 874        Okmulgee    OK              6.4
## 875       Armstrong    PA              6.4
## 876         Cambria    PA              6.4
## 877      Clearfield    PA              6.4
## 878      Providence    RI              6.4
## 879       Edgefield    SC              6.4
## 880         Fayette    TN              6.4
```

```
## 881          Monroe    TN              6.4
## 882            Hale    TX              6.4
## 883             Red    TX              6.4
## 884           Piute    UT              6.4
## 885         Halifax    VA              6.4
## 886           Clark    WA              6.4
## 887        Columbia    WA              6.4
## 888         Spokane    WA              6.4
## 889        Harrison    WV              6.4
## 890        Waushara    WI              6.4
## 891           Lamar    AL              6.3
## 892           Pinal    AZ              6.3
## 893          Conway    AR              6.3
## 894        Lawrence    AR              6.3
## 895         Lincoln    AR              6.3
## 896          Monroe    AR              6.3
## 897           Perry    AR              6.3
## 898             Rio    CO              6.3
## 899        Franklin    GA              6.3
## 900        Haralson    GA              6.3
## 901         Liberty    GA              6.3
## 902       Whitfield    GA              6.3
## 903           Clark    IL              6.3
## 904          Jasper    IL              6.3
## 905          Jersey    IL              6.3
## 906       McDonough    IL              6.3
## 907        Macoupin    IL              6.3
## 908        Tazewell    IL              6.3
## 909       Whiteside    IL              6.3
## 910         LaPorte    IN              6.3
## 911         Fleming    KY              6.3
## 912          Graves    KY              6.3
## 913          Laurel    KY              6.3
## 914       Louisiana    LA              6.3
## 915     Beauregard     LA              6.3
## 916     Barnstable     MA              6.3
## 917         Bristol    MA              6.3
## 918        Manistee    MI              6.3
## 919       Missaukee    MI              6.3
## 920          Sanilac    MI              6.3
## 921         Calhoun    MS              6.3
## 922           Leake    MS              6.3
## 923       Oktibbeha    MS              6.3
## 924           Pearl    MS              6.3
## 925          Oregon    MO              6.3
## 926          Camden    NJ              6.3
## 927         Hidalgo    NM              6.3
## 928        Herkimer    NY              6.3
## 929        Caldwell    NC              6.3
```

```
## 930         Belmont    OH               6.3
## 931       Coshocton    OH               6.3
## 932        Guernsey    OH               6.3
## 933        Harrison    OH               6.3
## 934        Highland    OH               6.3
## 935         Sherman    OR               6.3
## 936           Union    OR               6.3
## 937         Luzerne    PA               6.3
## 938          Monroe    PA               6.3
## 939            Pike    PA               6.3
## 940           Tioga    PA               6.3
## 941       Greenwood    SC               6.3
## 942       Lancaster    SC               6.3
## 943         Hamblen    TN               6.3
## 944             Bee    TX               6.3
## 945    Williamsburg    VA               6.3
## 946         Douglas    WA               6.3
## 947          Pierce    WA               6.3
## 948         Ashland    WI               6.3
## 949            Clay    AL               6.2
## 950         Houston    AL               6.2
## 951      Montgomery    AL               6.2
## 952         Bradley    AR               6.2
## 953            Pike    AR               6.2
## 954      California    CA               6.2
## 955         Fremont    CO               6.2
## 956         Windham    CT               6.2
## 957         Flagler    FL               6.2
## 958          Holmes    FL               6.2
## 959         Madison    FL               6.2
## 960      Okeechobee    FL               6.2
## 961            Polk    FL               6.2
## 962              St    FL               6.2
## 963        Charlton    GA               6.2
## 964       Chattooga    GA               6.2
## 965         Douglas    GA               6.2
## 966           Heard    GA               6.2
## 967            Tift    GA               6.2
## 968           Boise    ID               6.2
## 969           Coles    IL               6.2
## 970          Greene    IL               6.2
## 971           Henry    IL               6.2
## 972            Knox    IL               6.2
## 973          Mercer    IL               6.2
## 974            Ogle    IL               6.2
## 975      Williamson    IL               6.2
## 976            Owen    IN               6.2
## 977        Sullivan    IN               6.2
## 978           Geary    KS               6.2
```

```
## 979          Estill    KY              6.2
## 980       Jefferson    LA              6.2
## 981         Osceola    MI              6.2
## 982         Choctaw    MS              6.2
## 983         Lincoln    MS              6.2
## 984         Neshoba    MS              6.2
## 985          Newton    MS              6.2
## 986          Butler    MO              6.2
## 987          Dallas    MO              6.2
## 988             New    MO              6.2
## 989          Wright    MO              6.2
## 990         Lincoln    NV              6.2
## 991          Washoe    NV              6.2
## 992             Lea    NM              6.2
## 993           Otero    NM              6.2
## 994     Cattaraugus    NY              6.2
## 995         Niagara    NY              6.2
## 996       Alleghany    NC              6.2
## 997           Macon    NC              6.2
## 998          Athens    OH              6.2
## 999           Brown    OH              6.2
## 1000          White    TN              6.2
## 1001           Camp    TX              6.2
## 1002    Mecklenburg    VA              6.2
## 1003 Northumberland    VA              6.2
## 1004     Portsmouth    VA              6.2
## 1005        Preston    WV              6.2
## 1006           Wood    WV              6.2
## 1007       Langlade    WI              6.2
## 1008      Marquette    WI              6.2
## 1009        Alabama    AL              6.1
## 1010         Etowah    AL              6.1
## 1011     Tallapoosa    AL              6.1
## 1012        Arizona    AZ              6.1
## 1013           Mono    CA              6.1
## 1014         Solano    CA              6.1
## 1015       Saguache    CO              6.1
## 1016             New    CT              6.1
## 1017        Calhoun    FL              6.1
## 1018          Dixie    FL              6.1
## 1019          Miami    FL              6.1
## 1020        Calhoun    GA              6.1
## 1021       Crawford    GA              6.1
## 1022           Hart    GA              6.1
## 1023         Pierce    GA              6.1
## 1024          Idaho    ID              6.1
## 1025         Valley    ID              6.1
## 1026           Cook    IL              6.1
## 1027        Madison    IL              6.1
```

```
## 1028          Vigo    IN              6.1
## 1029      Atchison    KS              6.1
## 1030     Wyandotte    KS              6.1
## 1031   Breckinridge    KY              6.1
## 1032         Mason    KY              6.1
## 1033        Macomb    MI              6.1
## 1034       Hubbard    MN              6.1
## 1035       Grenada    MS              6.1
## 1036      Harrison    MS              6.1
## 1037         Hinds    MS              6.1
## 1038         Jones    MS              6.1
## 1039      Prentiss    MS              6.1
## 1040            St    MO              6.1
## 1041            St    MO              6.1
## 1042       Granite    MT              6.1
## 1043        Colfax    NM              6.1
## 1044    Chautauqua    NY              6.1
## 1045         Essex    NY              6.1
## 1046          Clay    NC              6.1
## 1047        Craven    NC              6.1
## 1048       Jackson    NC              6.1
## 1049       Pamlico    NC              6.1
## 1050        Pender    NC              6.1
## 1051          Pitt    NC              6.1
## 1052         Wayne    NC              6.1
## 1053       Clinton    OH              6.1
## 1054      Mahoning    OH              6.1
## 1055     Muskingum    OH              6.1
## 1056      Sequoyah    OK              6.1
## 1057        Marion    OR              6.1
## 1058       Indiana    PA              6.1
## 1059      Lawrence    PA              6.1
## 1060    Schuylkill    PA              6.1
## 1061   Chesterfield    SC              6.1
## 1062       Chester    TN              6.1
## 1063       Madison    TN              6.1
## 1064        Sevier    TN              6.1
## 1065          Polk    TX              6.1
## 1066           Val    TX              6.1
## 1067    Northampton    VA              6.1
## 1068     Covington    VA              6.1
## 1069      Garfield    WA              6.1
## 1070      Kittitas    WA              6.1
## 1071        Tucker    WV              6.1
## 1072      Chambers    AL              6.0
## 1073      Cleburne    AL              6.0
## 1074      Crenshaw    AL              6.0
## 1075        DeKalb    AL              6.0
## 1076       Russell    AL              6.0
```

```
## 1077        Johnson    AR              6.0
## 1078           Polk    AR              6.0
## 1079     Sacramento    CA              6.0
## 1080         DeSoto    FL              6.0
## 1081        Bulloch    GA              6.0
## 1082         Fannin    GA              6.0
## 1083          Glynn    GA              6.0
## 1084          Grady    GA              6.0
## 1085          Henry    GA              6.0
## 1086       Tattnall    GA              6.0
## 1087          Troup    GA              6.0
## 1088          Lewis    ID              6.0
## 1089       Crawford    IL              6.0
## 1090        Edwards    IL              6.0
## 1091       Richland    IL              6.0
## 1092         Shelby    IL              6.0
## 1093           Will    IL              6.0
## 1094      Blackford    IN              6.0
## 1095       Crawford    IN              6.0
## 1096         Orange    IN              6.0
## 1097          Butler    KY              6.0
## 1098     Cumberland    KY              6.0
## 1099       Nicholas    KY              6.0
## 1100        Pulaski    KY              6.0
## 1101          Rowan    KY              6.0
## 1102        Jackson    LA              6.0
## 1103      Aroostook    ME              6.0
## 1104          Cecil    MD              6.0
## 1105       Houghton    MI              6.0
## 1106            Van    MI              6.0
## 1107         Aitkin    MN              6.0
## 1108          Swift    MN              6.0
## 1109          Bates    MO              6.0
## 1110       Crawford    MO              6.0
## 1111         Miller    MO              6.0
## 1112         Eureka    NV              6.0
## 1113          Ocean    NJ              6.0
## 1114         Broome    NY              6.0
## 1115       Delaware    NY              6.0
## 1116           Ashe    NC              6.0
## 1117          Avery    NC              6.0
## 1118         Gaston    NC              6.0
## 1119         Onslow    NC              6.0
## 1120          Rowan    NC              6.0
## 1121        Sampson    NC              6.0
## 1122      Ashtabula    OH              6.0
## 1123     Washington    OH              6.0
## 1124      Deschutes    OR              6.0
## 1125         Fulton    PA              6.0
```

```
## 1126       Sullivan    PA              6.0
## 1127          Rhode    RI              6.0
## 1128          South    SC              6.0
## 1129        Kershaw    SC              6.0
## 1130       Anderson    TN              6.0
## 1131     Montgomery    TN              6.0
## 1132         Putnam    TN              6.0
## 1133        Kleberg    TX              6.0
## 1134         Sutton    TX              6.0
## 1135        Trinity    TX              6.0
## 1136          Emery    UT              6.0
## 1137          Grand    UT              6.0
## 1138        Hampton    VA              6.0
## 1139         Island    WA              6.0
## 1140        Kanawha    WV              6.0
## 1141         Taylor    WV              6.0
## 1142         Coffee    AL              5.9
## 1143         Geneva    AL              5.9
## 1144       Randolph    AL              5.9
## 1145          Logan    AR              5.9
## 1146      Mendocino    CA              5.9
## 1147       Hartford    CT              5.9
## 1148        Brevard    FL              5.9
## 1149      Charlotte    FL              5.9
## 1150     Washington    FL              5.9
## 1151        Georgia    GA              5.9
## 1152         Brooks    GA              5.9
## 1153         Clarke    GA              5.9
## 1154         DeKalb    GA              5.9
## 1155           Long    GA              5.9
## 1156        Lowndes    GA              5.9
## 1157         Bonner    ID              5.9
## 1158       Illinois    IL              5.9
## 1159      Henderson    IL              5.9
## 1160       Schuyler    IL              5.9
## 1161       Fountain    IN              5.9
## 1162         Starke    IN              5.9
## 1163      McCracken    KY              5.9
## 1164          Trigg    KY              5.9
## 1165     Terrebonne    LA              5.9
## 1166         Alpena    MI              5.9
## 1167        Mecosta    MI              5.9
## 1168         Otsego    MI              5.9
## 1169         Wadena    MN              5.9
## 1170      Covington    MS              5.9
## 1171        Simpson    MS              5.9
## 1172        Carroll    MO              5.9
## 1173        Jackson    MO              5.9
## 1174    Mississippi    MO              5.9
```

```
## 1175       Randolph    MO              5.9
## 1176       Schuyler    MO              5.9
## 1177       Sullivan    MO              5.9
## 1178       Humboldt    NV              5.9
## 1179     Gloucester    NJ              5.9
## 1180          Union    NJ              5.9
## 1181     Bernalillo    NM              5.9
## 1182        Chemung    NY              5.9
## 1183        Clinton    NY              5.9
## 1184       Cortland    NY              5.9
## 1185          Kings    NY              5.9
## 1186       Carteret    NC              5.9
## 1187     Currituck     NC              5.9
## 1188       Franklin    NC              5.9
## 1189       Guilford    NC              5.9
## 1190         Yancey    NC              5.9
## 1191        Carroll    OH              5.9
## 1192     Columbiana    OH              5.9
## 1193          Adair    OK              5.9
## 1194           Lane    OR              5.9
## 1195         Beaver    PA              5.9
## 1196        Bedford    PA              5.9
## 1197      Jefferson    PA              5.9
## 1198       Lycoming    PA              5.9
## 1199         McKean    PA              5.9
## 1200 Northumberland    PA              5.9
## 1201        Wyoming    PA              5.9
## 1202          Aiken    SC              5.9
## 1203       Sullivan    TN              5.9
## 1204      Trousdale    TN              5.9
## 1205       Crockett    TX              5.9
## 1206       Thurston    WA              5.9
## 1207        Whatcom    WA              5.9
## 1208       Crawford    WI              5.9
## 1209      Marinette    WI              5.9
## 1210         Oneida    WI              5.9
## 1211      Jefferson    AL              5.8
## 1212       Marshall    AL              5.8
## 1213         Morgan    AL              5.8
## 1214        Calhoun    AR              5.8
## 1215      Cleveland    AR              5.8
## 1216         Searcy    AR              5.8
## 1217           Inyo    CA              5.8
## 1218          Otero    CO              5.8
## 1219            New    CT              5.8
## 1220        Jackson    FL              5.8
## 1221      Jefferson    FL              5.8
## 1222          Pasco    FL              5.8
## 1223         Fulton    GA              5.8
```

```
## 1224         Gilmer    GA              5.8
## 1225        Houston    GA              5.8
## 1226         Walker    GA              5.8
## 1227           Kane    IL              5.8
## 1228          Scott    IL              5.8
## 1229          White    IL              5.8
## 1230         Jasper    IN              5.8
## 1231     Chautauqua    KS              5.8
## 1232        Labette    KS              5.8
## 1233       Carlisle    KY              5.8
## 1234        Carroll    KY              5.8
## 1235        Hickman    KY              5.8
## 1236           Lyon    KY              5.8
## 1237        Trimble    KY              5.8
## 1238           East    LA              5.8
## 1239    Piscataquis    ME              5.8
## 1240     Washington    MD              5.8
## 1241        Genesee    MI              5.8
## 1242          Mason    MI              5.8
## 1243          Mille    MN              5.8
## 1244            Red    MN              5.8
## 1245       Itawamba    MS              5.8
## 1246         Cooper    MO              5.8
## 1247           Dent    MO              5.8
## 1248        Madison    MO              5.8
## 1249        Pulaski    MO              5.8
## 1250          Wayne    MO              5.8
## 1251        Lincoln    NM              5.8
## 1252       Allegany    NY              5.8
## 1253       Richmond    NY              5.8
## 1254      Schoharie    NY              5.8
## 1255         Camden    NC              5.8
## 1256         Duplin    NC              5.8
## 1257          Jones    NC              5.8
## 1258          Moore    NC              5.8
## 1259       Crawford    OH              5.8
## 1260       Lawrence    OH              5.8
## 1261         Morrow    OR              5.8
## 1262      Tillamook    OR              5.8
## 1263         Carbon    PA              5.8
## 1264         Greene    PA              5.8
## 1265        Venango    PA              5.8
## 1266         Oconee    SC              5.8
## 1267        Pickens    SC              5.8
## 1268      Tennessee    TN              5.8
## 1269         Cannon    TN              5.8
## 1270        Johnson    TN              5.8
## 1271         Warren    TN              5.8
## 1272          Crane    TX              5.8
```

```
## 1273       Hudspeth    TX              5.8
## 1274          Titus    TX              5.8
## 1275        Orleans    VT              5.8
## 1276          Bland    VA              5.8
## 1277     Buckingham    VA              5.8
## 1278        Grayson    VA              5.8
## 1279        Lincoln    WA              5.8
## 1280          Walla    WA              5.8
## 1281      Milwaukee    WI              5.8
## 1282        Chilton    AL              5.7
## 1283         Baxter    AR              5.7
## 1284          Clark    AR              5.7
## 1285        Garland    AR              5.7
## 1286         Little    AR              5.7
## 1287       Poinsett    AR              5.7
## 1288             El    CA              5.7
## 1289        Ventura    CA              5.7
## 1290          Delta    CO              5.7
## 1291         Pueblo    CO              5.7
## 1292          Duval    FL              5.7
## 1293           Levy    FL              5.7
## 1294        Liberty    FL              5.7
## 1295        Osceola    FL              5.7
## 1296        Volusia    FL              5.7
## 1297         Bartow    GA              5.7
## 1298        Chatham    GA              5.7
## 1299         Gordon    GA              5.7
## 1300     Washington    ID              5.7
## 1301           Cass    IL              5.7
## 1302       Iroquois    IL              5.7
## 1303         Wabash    IL              5.7
## 1304       Delaware    IN              5.7
## 1305         Newton    IN              5.7
## 1306          Parke    IN              5.7
## 1307         Coffey    KS              5.7
## 1308          Boyle    KY              5.7
## 1309          Casey    KY              5.7
## 1310        Hopkins    KY              5.7
## 1311       Marshall    KY              5.7
## 1312      Jefferson    LA              5.7
## 1313             St    LA              5.7
## 1314        Hancock    ME              5.7
## 1315     Charlevoix    MI              5.7
## 1316      Marquette    MI              5.7
## 1317         Alcorn    MS              5.7
## 1318       Flathead    MT              5.7
## 1319         Greene    NY              5.7
## 1320        Madison    NY              5.7
## 1321        Wyoming    NY              5.7
```

```
## 1322          North    NC              5.7
## 1323          Burke    NC              5.7
## 1324         Madison    NC              5.7
## 1325     Montgomery    NC              5.7
## 1326       Randolph    NC              5.7
## 1327         Wilkes    NC              5.7
## 1328         Oliver    ND              5.7
## 1329       Okfuskee    OK              5.7
## 1330       Stephens    OK              5.7
## 1331         Oregon    OR              5.7
## 1332           Polk    OR              5.7
## 1333          Wasco    OR              5.7
## 1334       Bradford    PA              5.7
## 1335        Clarion    PA              5.7
## 1336     Lackawanna    PA              5.7
## 1337          Wayne    PA              5.7
## 1338       Richland    SC              5.7
## 1339    Spartanburg    SC              5.7
## 1340        Hickman    TN              5.7
## 1341         Loudon    TN              5.7
## 1342       Marshall    TN              5.7
## 1343          Smith    TN              5.7
## 1344     Washington    TN              5.7
## 1345           Gray    TX              5.7
## 1346       Mitchell    TX              5.7
## 1347            San    TX              5.7
## 1348        Winkler    TX              5.7
## 1349      Charlotte    VA              5.7
## 1350     Washington    WA              5.7
## 1351      Doddridge    WV              5.7
## 1352         Racine    WI              5.7
## 1353          North    AK              5.6
## 1354           Pima    AZ              5.6
## 1355        Yavapai    AZ              5.6
## 1356          Cross    AR              5.6
## 1357       Humboldt    CA              5.6
## 1358        Conejos    CO              5.6
## 1359            Las    CO              5.6
## 1360     Montezuma    CO              5.6
## 1361    Connecticut    CT              5.6
## 1362       Escambia    FL              5.6
## 1363       Atkinson    GA              5.6
## 1364        Candler    GA              5.6
## 1365      Habersham    GA              5.6
## 1366         Monroe    GA              5.6
## 1367           Pike    GA              5.6
## 1368         DeKalb    IL              5.6
## 1369             De    IL              5.6
## 1370        Jackson    IL              5.6
```

```
## 1371        Madison    IN              5.6
## 1372       Caldwell    KY              5.6
## 1373          Meade    KY              5.6
## 1374        Bossier    LA              5.6
## 1375      Lafayette    LA              5.6
## 1376           West    LA              5.6
## 1377       Caroline    MD              5.6
## 1378      Berkshire    MA              5.6
## 1379       Muskegon    MI              5.6
## 1380            Lee    MS              5.6
## 1381       Pontotoc    MS              5.6
## 1382          Adair    MO              5.6
## 1383      Bollinger    MO              5.6
## 1384            New    NJ              5.6
## 1385       Chenango    NY              5.6
## 1386          Tioga    NY              5.6
## 1387         Warren    NY              5.6
## 1388        Catawba    NC              5.6
## 1389           Erie    OH              5.6
## 1390          Henry    OH              5.6
## 1391       Richland    OH              5.6
## 1392         Pawnee    OK              5.6
## 1393        Clatsop    OR              5.6
## 1394        Mifflin    PA              5.6
## 1395         Coffee    TN              5.6
## 1396        Dickson    TN              5.6
## 1397       Angelina    TX              5.6
## 1398        Coleman    TX              5.6
## 1399          Floyd    TX              5.6
## 1400         Hardin    TX              5.6
## 1401         Carbon    UT              5.6
## 1402      Lynchburg    VA              5.6
## 1403        Norfolk    VA              5.6
## 1404        Radford    VA              5.6
## 1405         Monroe    WV              5.6
## 1406           Ohio    WV              5.6
## 1407           Rusk    WI              5.6
```

- 4.8 In the year 2015, which fip counties, U.S. states contain a higher percentage of unemployed citizens than the percentage of college graduates? List the county name and the state name. Order the result alphabetically by state.

Answer: We first left join unemployment dataset with education dataset by fips values for all the rows in unemployment dataset where year=2015, and arrange them alphabetically by State. Finally, in the output dataset, we filter all the rows where percent_unemployed value is greater than percent_has_some_college value in each row.

```
out8_df <- filter(unemp, year==2015) %>% left_join(education, by="fips") %>% left_join
(fips, by="fips") %>% select("county", "state", "percent_unemployed", "percent_has_som
e_college") %>% arrange(state)

head(out8_df[out8_df$percent_unemployed > out8_df$percent_has_some_college, c("count
y", "state")], 20)
```

	county <chr>	**state** <chr>
17	Bethel	AK
18	Bethel	AK
29	Dillingham	AK
65	Kusilvak	AK
66	Kusilvak	AK
67	Kusilvak	AK
68	Kusilvak	AK
70	Lake	AK
78	Nome	AK
83	North	AK

1-10 of 20 rows Previous **1** 2 Next

- 4.9 Return the county, U.S. state and year that contains the highest percentage of college graduates in this dataset?

Answer: We simply join education and fips dataset based on fips value. Finally we arrange the value in descending order of percent_has_some_college and show the first value using top_n(1) We see that New Hampshire state has most number of graduates with some college degree.

```
education %>% left_join(fips, by="fips") %>% select(county, state, year, percent_has_s
ome_college) %>% arrange(desc(percent_has_some_college)) %>% top_n(1)
```

county <chr>	**state** <chr>	**year** <int>	**percent_has_some_college** <dbl>
Banner	NE	2015	47.8

1 row

5. (10 points) *Open question*: explore the unemployment rate and the percent not attaining a high school diploma over the time period in common for the two datasets. What can you discover? Create a plot that supports your discovery.

Answer: We want to infer the relationship between unemployment rate and high school diploma. To do that, we create a dataframe that has all the values from unemployment and education tibbles. We join both tibbles based on “year” and “fips” columns. We group all rows by “state” to observe pattern across states. Next we sort the output tibble using arrange() by percent unemployed. We gather top 20 records, where unemployment rate is highest to observe the trend. Before plotting, we melt the dataset to have a catagory.

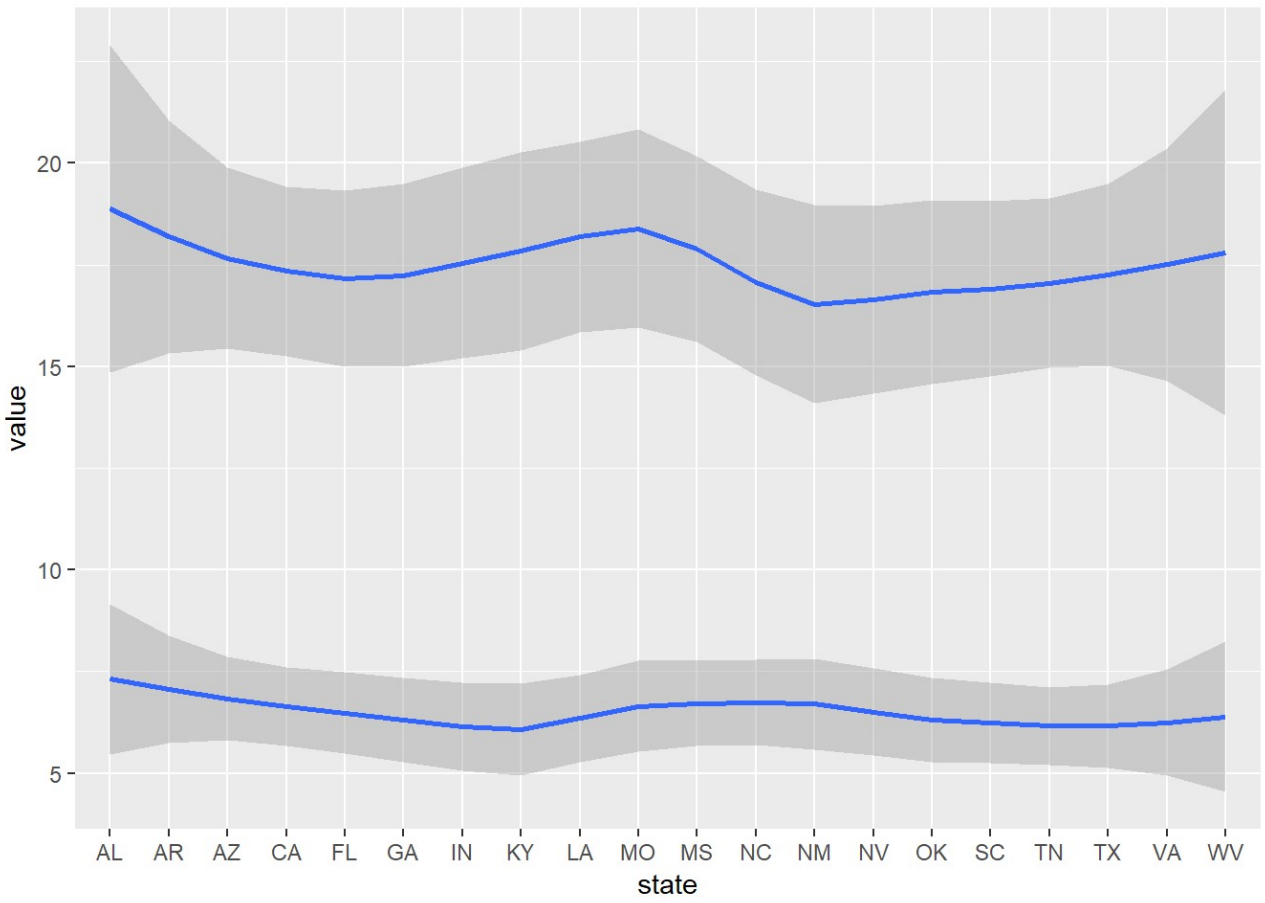
Finally we have a scatter plot which explains that has the percentage of non high school diploma goes high, unemployment rate in different states also goes high, except for in Texas.

```
mix_df <- unemp %>% left_join(education, by=c("fips", "year")) %>% filter(percent_has_
some_college != "") %>% select(fips, year, percent_unemployed, `percent_less than_hs_d
iploma`) %>% left_join(fips, by="fips") %>% group_by(state) %>% summarize(mean_per_une
m = mean(percent_unemployed), mean_per_no_hs = mean(`percent_less than_hs_diploma`)) %
>% arrange(desc(mean_per_unem))
```

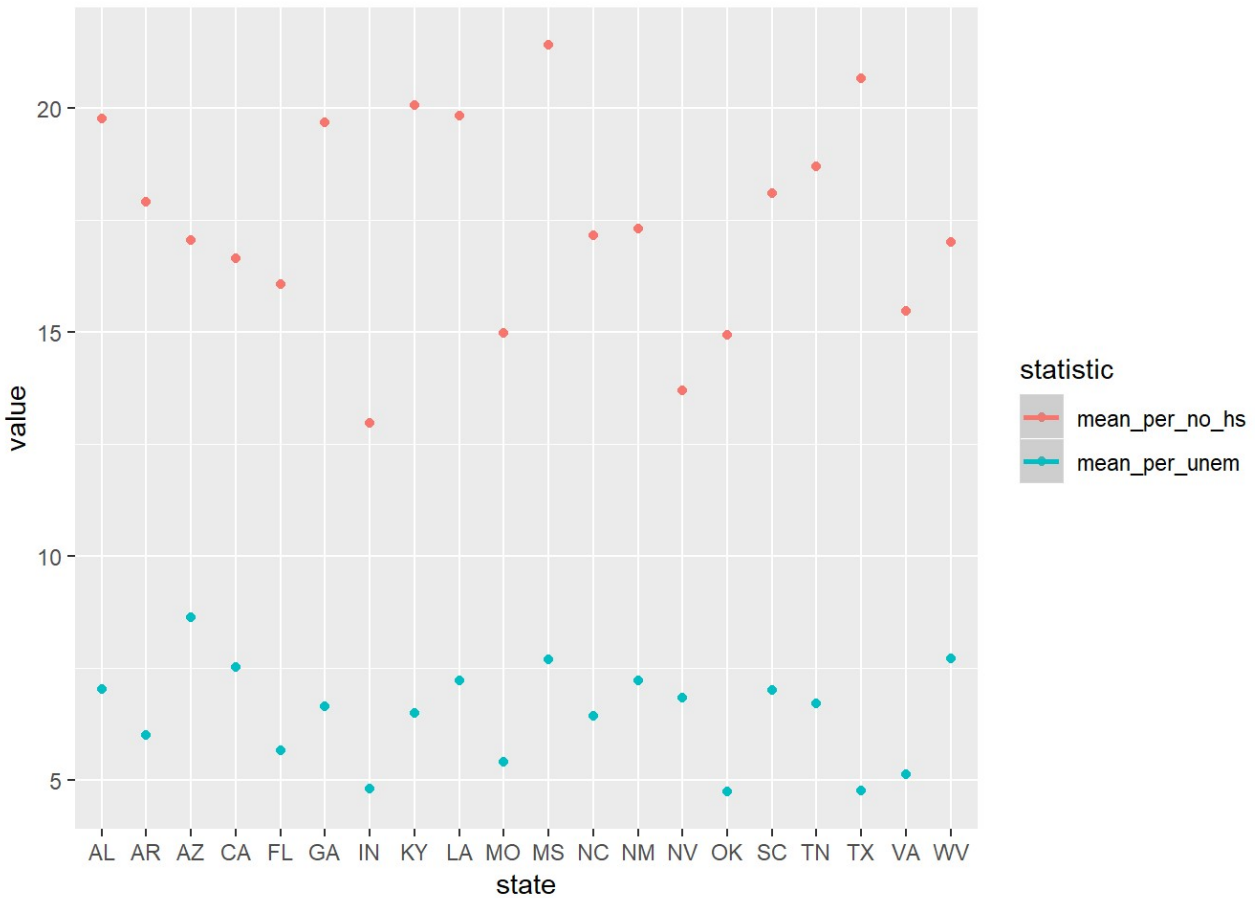
```
library(ggplot2)

mix_df_5 <- mix_df %>% top_n(20)
plot_df <- mix_df_5 %>% gather("mean_per_unem", "mean_per_no_hs", key="statistic", val
ue="value")


ggplot(data = plot_df) +
  geom_smooth(mapping = aes(x = state, y = value, group= statistic))
```




```
ggplot(data = plot_df) +
  geom_point(mapping = aes(x = state, y = value, color = statistic)) +
  geom_smooth(mapping = aes(x = state, y = value, color = statistic))
```



The above plot gives information about year 2015 only. Due to limitation in dataset, it is not possible to see how the education and unemployment trend has been over the years. The unemployment dataset and education dataset has only 2015 year in common, which does not give us much information.