Project1

Data Processing

Step 1

```
library(dplyr)
```

```
Warning: package 'dplyr' was built under R version 4.4.3


Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

    filter, lag

The following objects are masked from 'package:base':

    intersect, setdiff, setequal, union
```

```
library(tidyr)
```

```
Warning: package 'tidyr' was built under R version 4.4.3
```

```r
# Read in data
first_data <- read.csv('EDU01a.csv')

# Select columns
selected_columns <- first_data |>
  select(area_name = Area_name, STCOU, ends_with("D"))

head(selected_columns, n = 5)
```

```
      area_name STCOU EDU010187D EDU010188D EDU010189D EDU010190D EDU010191D
1 UNITED STATES     0   40024299   39967624   40317775   40737600   41385442
2       ALABAMA  1000     733735     728234     730048     728252     725541
3   Autauga, AL  1001       6829       6900       6920       6847       7008
4   Baldwin, AL  1003      16417      16465      16799      17054      17479
5   Barbour, AL  1005       5071       5098       5068       5156       5173
  EDU010192D EDU010193D EDU010194D EDU010195D EDU010196D
1   42088151   42724710   43369917   43993459   44715737
2     726150     728014     730509     727989     736825
3       7137       7152       7381       7568       7834
4      17983      18735      19384      19961      20699
5       5252       5135       5111       5017       5053
```

Step 2

```r
# Convert data into long format
pivoted_data <- selected_columns |>
  pivot_longer(cols=3:12,names_to="Enrollment", values_to ="Enrollment_Value") |>
  select(-STCOU)

head(pivoted_data, n = 5)
```

```
# A tibble: 5 x 3
  area_name     Enrollment Enrollment_Value
  <chr>         <chr>                 <int>
1 UNITED STATES EDU010187D         40024299
2 UNITED STATES EDU010188D         39967624
3 UNITED STATES EDU010189D         40317775
4 UNITED STATES EDU010190D         40737600
5 UNITED STATES EDU010191D         41385442
```

Step 3

```
# Separate enrollment variable
long_updated <- pivoted_data |>
   mutate(Survey = substr(Enrollment, 1,7), Year = as.numeric(substr(Enrollment, 8,9))) |>
  mutate(Year=ifelse(Year>80, 1900+Year,2000+Year)) |>
  select(area_name, Survey, Year, Enrollment_Value)

head(long_updated, n = 5)
```

```
# A tibble: 5 x 4
  area_name     Survey   Year Enrollment_Value
  <chr>         <chr>   <dbl>            <int>
1 UNITED STATES EDU0101  1987         40024299
2 UNITED STATES EDU0101  1988         39967624
3 UNITED STATES EDU0101  1989         40317775
4 UNITED STATES EDU0101  1990         40737600
5 UNITED STATES EDU0101  1991         41385442
```

Step 4

```
# Create two new data sets: county_tibble and state_tibble
county_tibble <- long_updated|>
  filter(grepl(",",area_name)) |>
  mutate(county=grep(pattern =", \\w\\w", area_name))

class(county_tibble) <- c("county", class(county_tibble))

head(county_tibble, n = 10)
```

```
# A tibble: 10 x 5
   area_name   Survey   Year Enrollment_Value county
   <chr>       <chr>   <dbl>            <int>  <int>
 1 Autauga, AL EDU0101  1987             6829      1
 2 Autauga, AL EDU0101  1988             6900      2
 3 Autauga, AL EDU0101  1989             6920      3
 4 Autauga, AL EDU0101  1990             6847      4
 5 Autauga, AL EDU0101  1991             7008      5
 6 Autauga, AL EDU0101  1992             7137      6
 7 Autauga, AL EDU0101  1993             7152      7
 8 Autauga, AL EDU0101  1994             7381      8
 9 Autauga, AL EDU0101  1995             7568      9
10 Autauga, AL EDU0101  1996             7834     10
```

```
state_tibble <- long_updated|>
  filter(!grepl(",",area_name))

class(state_tibble) <- c("state", class(state_tibble))

head(state_tibble, n = 10)
```

```
# A tibble: 10 x 4
   area_name     Survey   Year Enrollment_Value
   <chr>         <chr>   <dbl>            <int>
 1 UNITED STATES EDU0101  1987         40024299
 2 UNITED STATES EDU0101  1988         39967624
 3 UNITED STATES EDU0101  1989         40317775
 4 UNITED STATES EDU0101  1990         40737600
 5 UNITED STATES EDU0101  1991         41385442
 6 UNITED STATES EDU0101  1992         42088151
 7 UNITED STATES EDU0101  1993         42724710
 8 UNITED STATES EDU0101  1994         43369917
 9 UNITED STATES EDU0101  1995         43993459
10 UNITED STATES EDU0101  1996         44715737
```

Step 5

```
# Creating a new variable that describes which state one of these county measurements corres
county_tibble <-county_tibble |>
  mutate(state = substr(area_name, nchar(area_name)-2, nchar(area_name)))
```

Step 6

```
# Creating a variable called division for non-county level tibble
state_tibble <- state_tibble |>
  mutate(division = case_when(
    area_name %in% c("CONNECTICUT","MAINE","MASSACHUSETTS","NEW HAMPSHIRE","RHODE ISLAND","VI
    area_name %in% c("NEW JERSEY","NEW YORK","PENNSYLVANIA") ~ "Mid-Atlantic",
    area_name %in% c("ILLINOIS","INDIANA","MICHIGAN","OHIO","WISCONSIN") ~ "East North Centr
    area_name %in% c("IOWA","KANSAS","MINNESOTA","MISSOURI","NEBRASKA","NORTH DAKOTA","SOUTH
    area_name %in% c("DELAWARE","DISTRICT OF COLUMBIA","FLORIDA","GEORGIA","MARYLAND","NORTH
    area_name %in% c("ALABAMA","KENTUCKY","MISSISSIPPI","TENNESSEE") ~ "East South Central",
    area_name %in% c("ARKANSAS","LOUISIANA","OKLAHOMA","TEXAS") ~ "West South Central",
    area_name %in% c("ARIZONA","COLORADO","IDAHO","MONTANA","NEVADA","NEW MEXICO","UTAH","WY
    area_name %in% c("ALASKA","CALIFORNIA","HAWAII","OREGON","WASHINGTON") ~ "Pacific",
    TRUE ~ "ERROR"
    )
  )
```

Data Processing Function Writing

```
# Function for reading in code
read_csv_code <- function(filename,column_name){
  library(dplyr)
  library(tidyr)
  first_data <- read.csv(filename)
  return(first_data)
}

# Function for steps 1 and 2
function_for_steps_1_2 <- function(first_data, column_name){
  selected_columns <- first_data |>
    select(area_name = Area_name, STCOU, ends_with("D"))
  pivoted_data <- selected_columns |>
    pivot_longer(cols=3:12,names_to=column_name, values_to ="Enrollment_Value") |>
    select(-STCOU)
  print(pivoted_data)
  return(pivoted_data)
}

# Function taking in the output from step 2 and executing step 3
function_for_step_3 <- function(pivoted_data,column_name){
  long_updated <- pivoted_data |>
    mutate(Survey = substr(pivoted_data[[column_name]], 1,7), Year = as.numeric(substr(pivot
    mutate(Year=ifelse(Year>80, 1900+Year,2000+Year)) |>
    select(area_name, Survey, Year, Enrollment_Value)
  return(long_updated)
```

```
}

# Function for step 4
function_for_step_4 <- function(long_updated){
  county_tibble <- long_updated|>
    filter(grepl(",",area_name)) |>
    mutate(county=grep(pattern =", \\w\\w", area_name))
  class(county_tibble) <- c("county", class(county_tibble))
  state_tibble <- long_updated|>
    filter(!grepl(",",area_name))
  class(state_tibble) <- c("state", class(state_tibble))
  return(county_tibble, state_tibble)
}

# Function for step 5
function_for_step_5 <- function(county_tibble){
  county_tibble <-county_tibble |>
  mutate(state = substr(area_name, nchar(area_name)-2, nchar(area_name)))
  return(county_tibble)
}

# Function for step 6
function_for_step_6 <- function(state_tibble){
  state_tibble <- state_tibble |>
  mutate(division = case_when(
    area_name %in% c("CONNECTICUT","MAINE","MASSACHUSETTS","NEW HAMPSHIRE","RHODE ISLAND","V
    area_name %in% c("NEW JERSEY","NEW YORK","PENNSYLVANIA") ~ "Mid-Atlantic",
    area_name %in% c("ILLINOIS","INDIANA","MICHIGAN","OHIO","WISCONSIN") ~ "East North Centr
    area_name %in% c("IOWA","KANSAS","MINNESOTA","MISSOURI","NEBRASKA","NORTH DAKOTA","SOUTH
    area_name %in% c("DELAWARE","DISTRICT OF COLUMBIA","FLORIDA","GEORGIA","MARYLAND","NORTH
    area_name %in% c("ALABAMA","KENTUCKY","MISSISSIPPI","TENNESSEE") ~ "East South Central",
    area_name %in% c("ARKANSAS","LOUISIANA","OKLAHOMA","TEXAS") ~ "West South Central",
    area_name %in% c("ARIZONA","COLORADO","IDAHO","MONTANA","NEVADA","NEW MEXICO","UTAH","WY
    area_name %in% c("ALASKA","CALIFORNIA","HAWAII","OREGON","WASHINGTON") ~ "Pacific",
    TRUE ~ "ERROR"
    )
  )
  return(state_tibble)
}

# Function for steps 4, 5, 6
function_for_steps_4_5_6 <- function(long_updated){
  county_tibble <- long_updated|>
    filter(grepl(",",area_name)) |>
    mutate(county=grep(pattern =", \\w\\w", area_name))
  class(county_tibble) <- c("county", class(county_tibble))
  state_tibble <- long_updated|>
    filter(!grepl(",",area_name))
  class(state_tibble) <- c("state", class(state_tibble))
  results5 <- function_for_step_5(county_tibble)
  results6 <- function_for_step_6(state_tibble)
  return(list=c(county_data =results5, state_data =results6))
}


# Wrapper function
processing_wrapper <- function(url,column_name){
  result <- read_csv_code(url) |>
    (\(data)function_for_steps_1_2(data,column_name))() |>
    (\(data)function_for_step_3(data,column_name))() |>
    function_for_steps_4_5_6()

  return(result)
}

# Test wrapper function on EDU01a and EDU01b data
results1 <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01b.csv",'Enro
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES EDU010197D         44534459
 2 UNITED STATES EDU010198D         46245814
 3 UNITED STATES EDU010199D         46368903
 4 UNITED STATES EDU010200D         46818690
 5 UNITED STATES EDU010201D         47127066
 6 UNITED STATES EDU010202D         47606570
 7 UNITED STATES EDU015203D         48506317
 8 UNITED STATES EDU015204D         48693287
 9 UNITED STATES EDU015205D         48978555
10 UNITED STATES EDU015206D         49140702
# i 31,970 more rows
```

```r
results2 <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01a.csv",'Enro
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES EDU010187D         40024299
 2 UNITED STATES EDU010188D         39967624
 3 UNITED STATES EDU010189D         40317775
 4 UNITED STATES EDU010190D         40737600
 5 UNITED STATES EDU010191D         41385442
 6 UNITED STATES EDU010192D         42088151
 7 UNITED STATES EDU010193D         42724710
 8 UNITED STATES EDU010194D         43369917
 9 UNITED STATES EDU010195D         43993459
10 UNITED STATES EDU010196D         44715737
# i 31,970 more rows
```

```r
# Combining Function
CombiningFunction <- function(data1,data2){
  county_data <- bind_rows(data1[1:6],data2[1:6])
  noncounty_data <- bind_rows(data1[7:11],data2[7:11])
    combined <- list(county_data=tibble(county_data),
                     noncounty_data=tibble(noncounty_data))
  return(combined)
}

# Test Combining Function on EDU01a and EDU01b data processed above
Data_Combined<-CombiningFunction(results1,results2)
class(Data_Combined)
```

```
[1] "list"
```

```r
class(Data_Combined$county_data)
```

```
[1] "tbl_df"     "tbl"        "data.frame"
```

Writing a Generic Function for Summarizing

Plot Function for State Data

```
#Plot function for state data
library(ggplot2)
```

```
Warning: package 'ggplot2' was built under R version 4.4.3
```

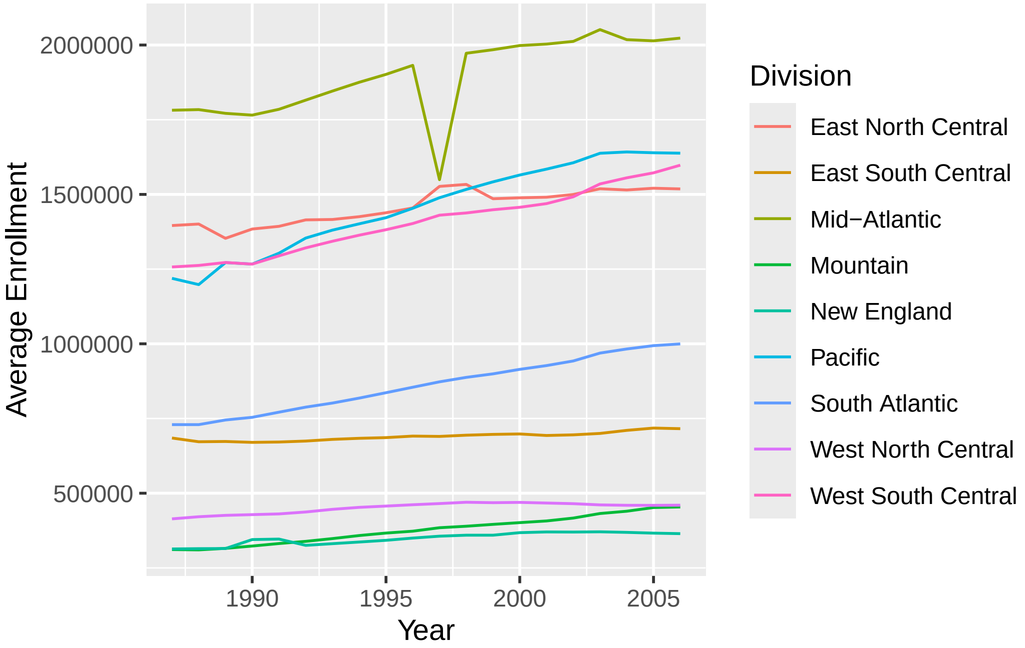
```
plot.state <- function(df,var_name="state_data.Enrollment_Value"){
  plot_data <- df|> group_by(state_data.division, state_data.Year)|>
    summarize(y_axis=mean(get(var_name))) |>
    filter(state_data.division != 'ERROR')

  print(plot_data)
  ggplot(data=plot_data, aes(x=state_data.Year,y= y_axis,color=state_data.division)) + geom_
    labs(y="Average Enrollment", x="Year", color="Division")
}

plot.state(Data_Combined[[2]],)
```

```
`summarise()` has grouped output by 'state_data.division'. You can override
using the `.groups` argument.
```

```
# A tibble: 180 x 3
# Groups:   state_data.division [9]
   state_data.division state_data.Year   y_axis
   <chr>                         <dbl>    <dbl>
 1 East North Central             1987 1395868.
 2 East North Central             1988 1400830.
 3 East North Central             1989 1352998.
 4 East North Central             1990 1384188.
 5 East North Central             1991 1393162.
 6 East North Central             1992 1414759.
 7 East North Central             1993 1416112.
 8 East North Central             1994 1425489
 9 East North Central             1995 1438632
10 East North Central             1996 1454695.
# i 170 more rows
```



Plot Function for County Data

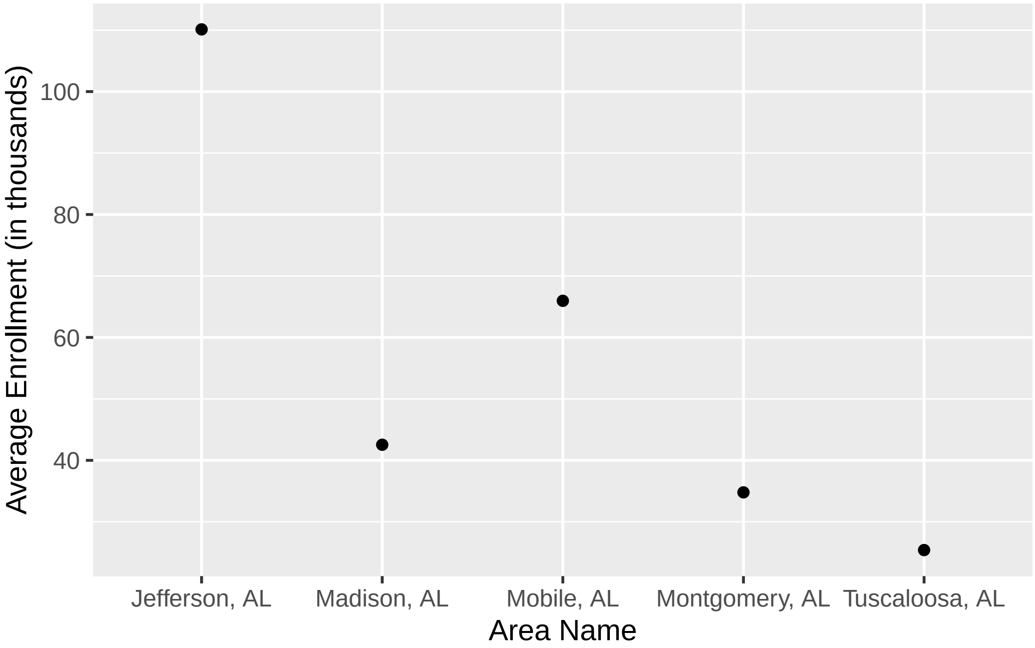
```
#Plot function for county data
plot.county <- function(df,var_name="county_data.Enrollment_Value", state = ' AL' ,order='Top
  plot_data <- df |>
    filter(county_data.state== state) |>
    group_by(county_data.area_name) |>
    summarize(y_axis=mean(get(var_name)))

  if(order=='Top'){
    plot_data2 <- plot_data |>
      arrange(desc(y_axis)) |>
      slice_head(n= n)
  }
  else {
    plot_data2 <- plot_data |>
      arrange(y_axis)|>
      slice_head(n= n)
  }

  print(plot_data2)
  ggplot(data=plot_data2, aes(x=county_data.area_name,y= y_axis/1000)) + geom_point() + labs
  )
}

plot.county(Data_Combined[[1]])
```

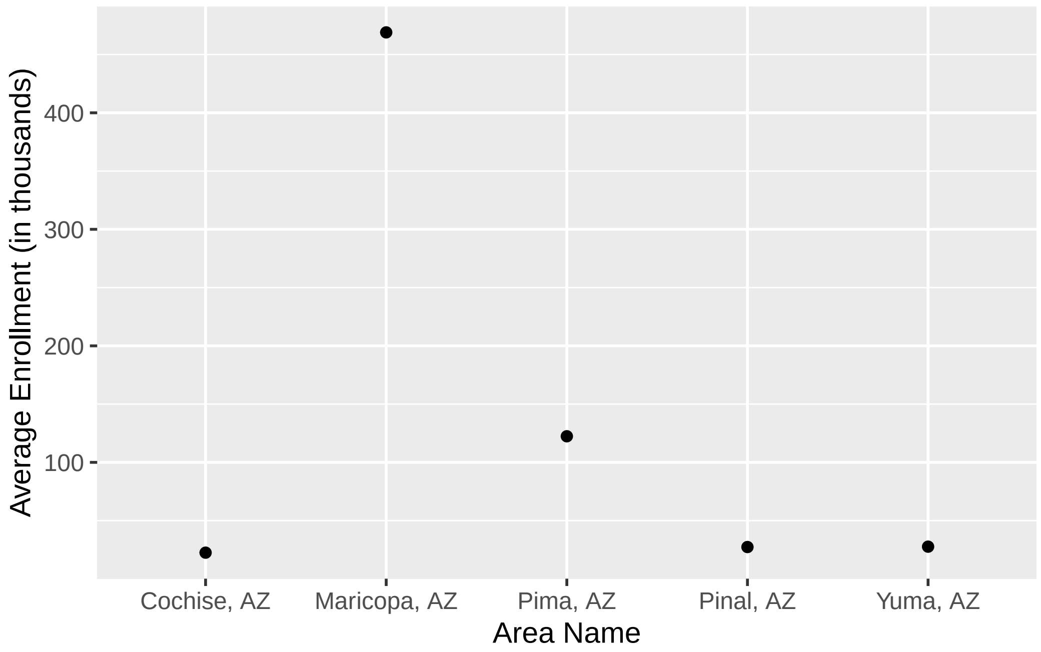
```
# A tibble: 5 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Jefferson, AL         110119.
2 Mobile, AL             65952.
3 Madison, AL            42537.
4 Montgomery, AL         34789.
5 Tuscaloosa, AL         25402
```



```
plot.county(Data_Combined[[1]],state = ' AZ')
```

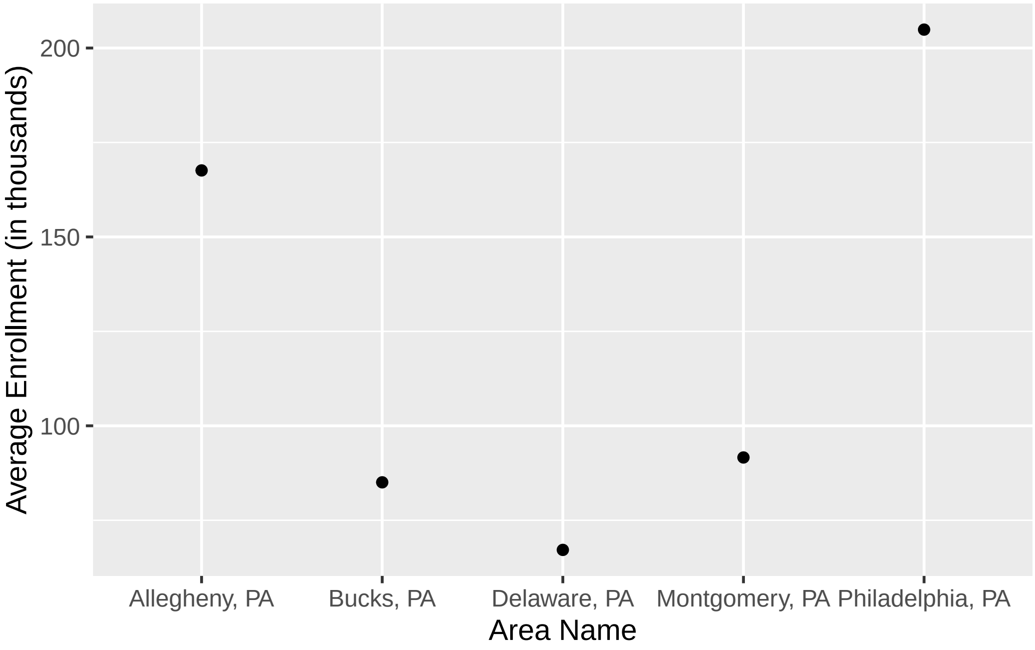
```
# A tibble: 5 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Maricopa, AZ          469015.
```

```
2 Pima, AZ                122384.
3 Yuma, AZ                 27648.
4 Pinal, AZ                27310.
5 Cochise, AZ              22491.
```



```
plot.county(Data_Combined[[1]],state = ' PA')
```

```
# A tibble: 5 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Philadelphia, PA      204874.
2 Allegheny, PA         167602.
3 Montgomery, PA         91621.
4 Bucks, PA              85044.
5 Delaware, PA           67154.
```



Putting it Together

Running Original Enrollment Data

```
EDU01a <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01a.csv",'Enroll
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES EDU010187D         40024299
 2 UNITED STATES EDU010188D         39967624
 3 UNITED STATES EDU010189D         40317775
 4 UNITED STATES EDU010190D         40737600
 5 UNITED STATES EDU010191D         41385442
 6 UNITED STATES EDU010192D         42088151
 7 UNITED STATES EDU010193D         42724710
 8 UNITED STATES EDU010194D         43369917
 9 UNITED STATES EDU010195D         43993459
10 UNITED STATES EDU010196D         44715737
# i 31,970 more rows
```

```r
EDU01b <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01b.csv",'Enroll
```

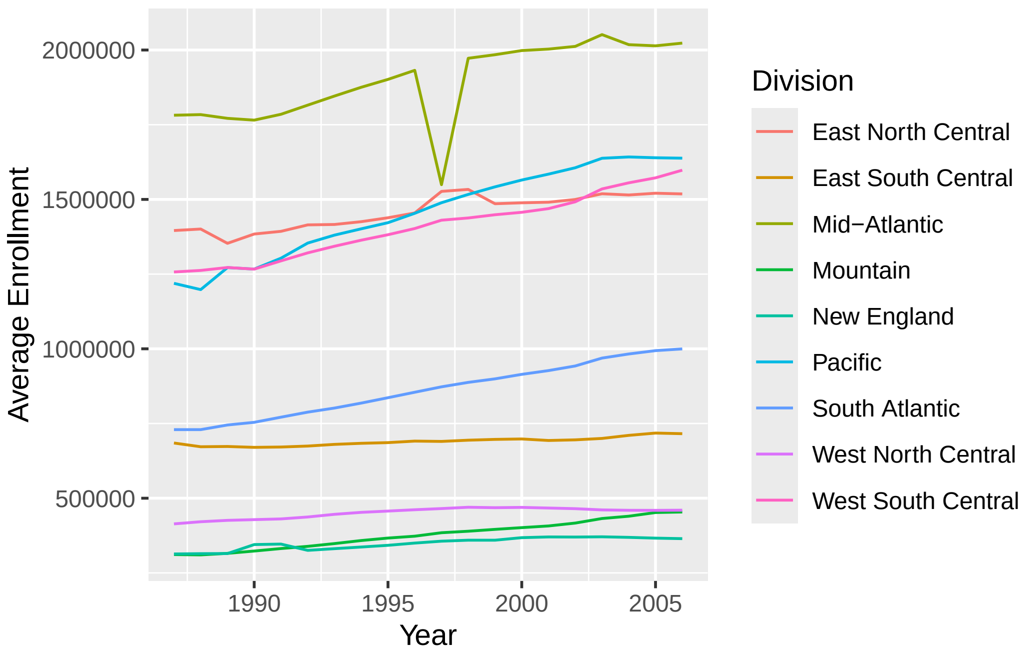
```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES EDU010197D         44534459
 2 UNITED STATES EDU010198D         46245814
 3 UNITED STATES EDU010199D         46368903
 4 UNITED STATES EDU010200D         46818690
 5 UNITED STATES EDU010201D         47127066
 6 UNITED STATES EDU010202D         47606570
 7 UNITED STATES EDU015203D         48506317
 8 UNITED STATES EDU015204D         48693287
 9 UNITED STATES EDU015205D         48978555
10 UNITED STATES EDU015206D         49140702
# i 31,970 more rows
```

```r
EDU01ab<-CombiningFunction(EDU01a, EDU01b)

plot.state(EDU01ab[[2]])
```

```
`summarise()` has grouped output by 'state_data.division'. You can override
using the `.groups` argument.
```

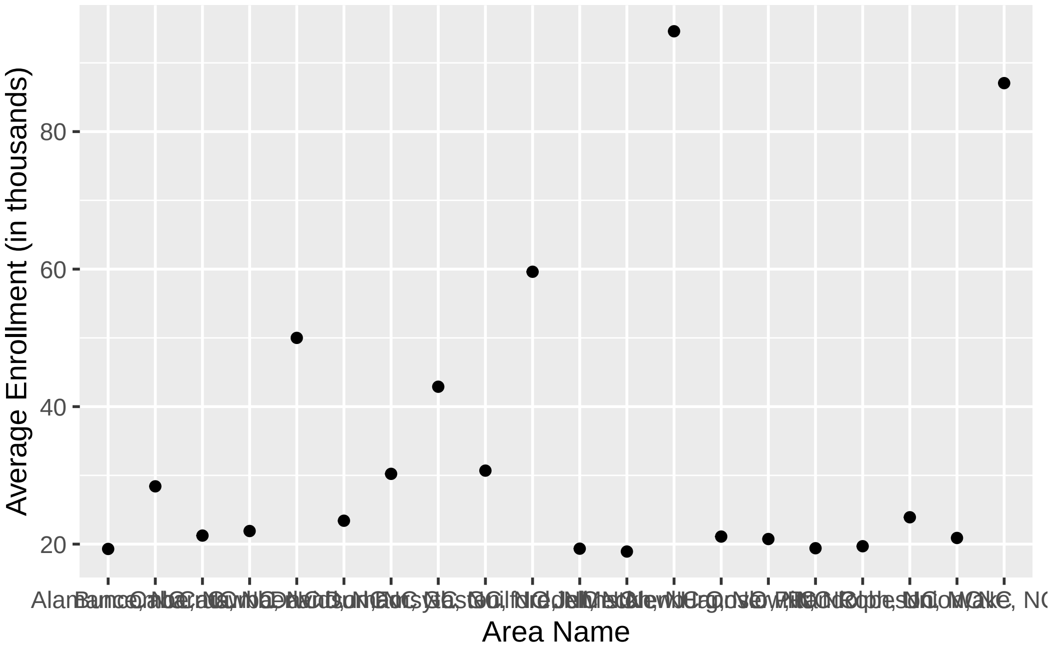
```
# A tibble: 180 x 3
# Groups:   state_data.division [9]
   state_data.division state_data.Year   y_axis
   <chr>                         <dbl>    <dbl>
 1 East North Central             1987 1395868.
 2 East North Central             1988 1400830.
 3 East North Central             1989 1352998.
 4 East North Central             1990 1384188.
 5 East North Central             1991 1393162.
 6 East North Central             1992 1414759.
 7 East North Central             1993 1416112.
 8 East North Central             1994 1425489
 9 East North Central             1995 1438632
10 East North Central             1996 1454695.
# i 170 more rows
```



```
plot.county(EDU01ab[[1]], state =' NC', order = 'Top', n = 20)
```

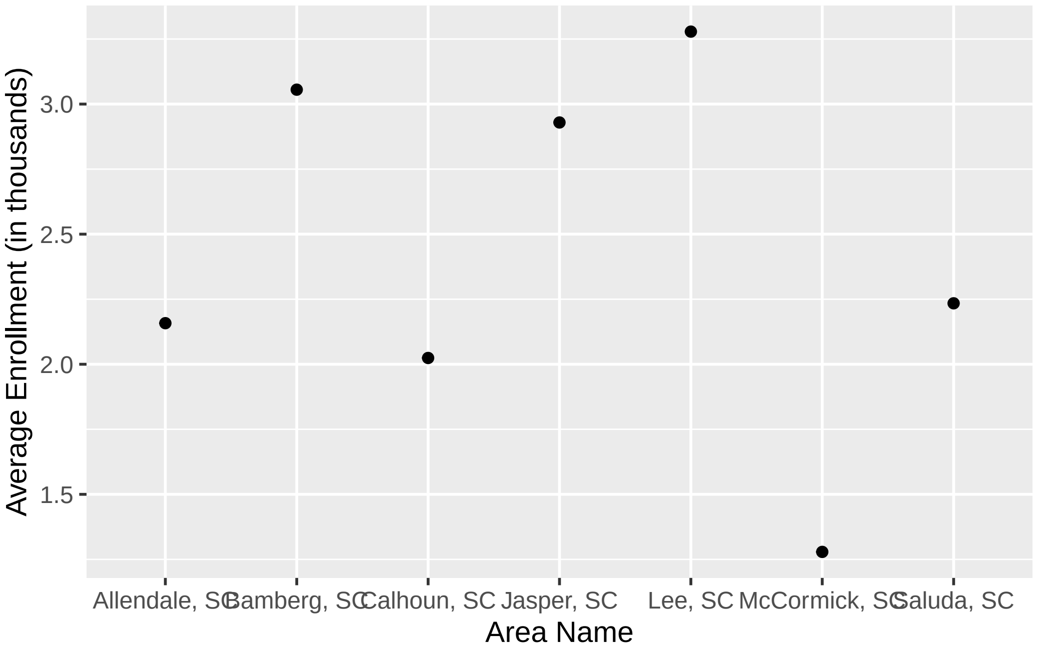
```
# A tibble: 20 x 2
   county_data.area_name y_axis
   <chr>                  <dbl>
 1 Mecklenburg, NC       94598.
 2 Wake, NC              87053.
 3 Guilford, NC          59615.
 4 Cumberland, NC        49999.
 5 Forsyth, NC           42897.
 6 Gaston, NC            30694.
 7 Durham, NC            30223.
 8 Buncombe, NC          28411.
 9 Robeson, NC           23909.
10 Davidson, NC          23405.
11 Catawba, NC           21907.
12 Cabarrus, NC          21244.
13 New Hanover, NC       21103.
14 Union, NC             20900.
15 Onslow, NC            20744.
16 Randolph, NC          19697.
17 Pitt, NC              19407.
```

```
18 Iredell, NC           19341.
19 Alamance, NC          19303.
20 Johnston, NC          18926.
```



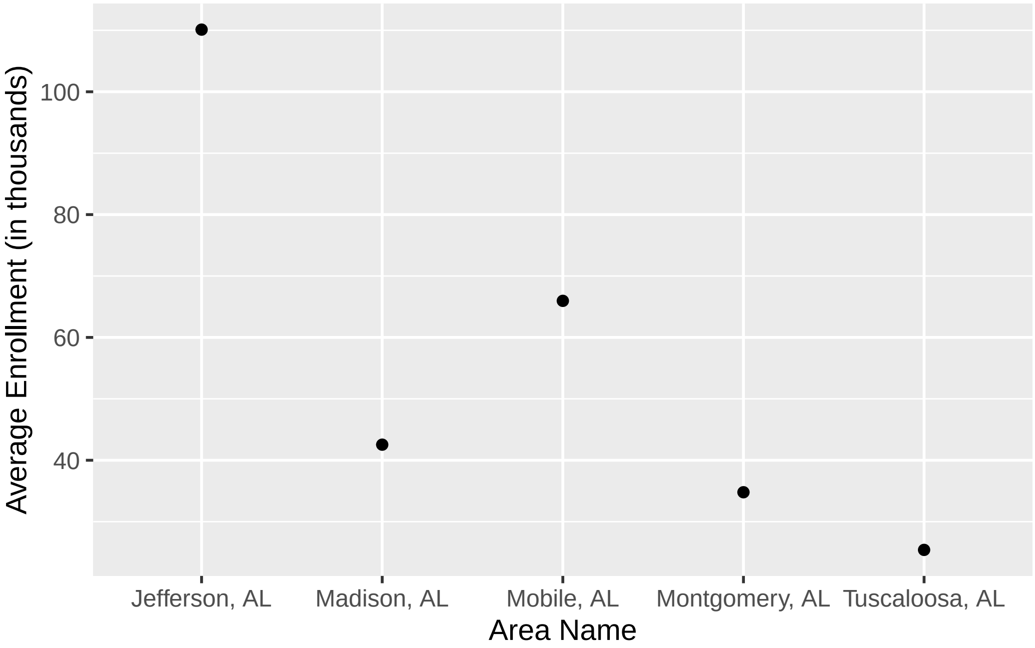
```
plot.county(EDU01ab[[1]], state = ' SC', order = 'Bottom', n = 7)
```

```
# A tibble: 7 x 2
  county_data.area_name y_axis
  <chr>                  <dbl>
1 McCormick, SC          1279.
2 Calhoun, SC            2024.
3 Allendale, SC          2158.
4 Saluda, SC             2234.
5 Jasper, SC             2929.
6 Bamberg, SC            3055.
7 Lee, SC                3278.
```



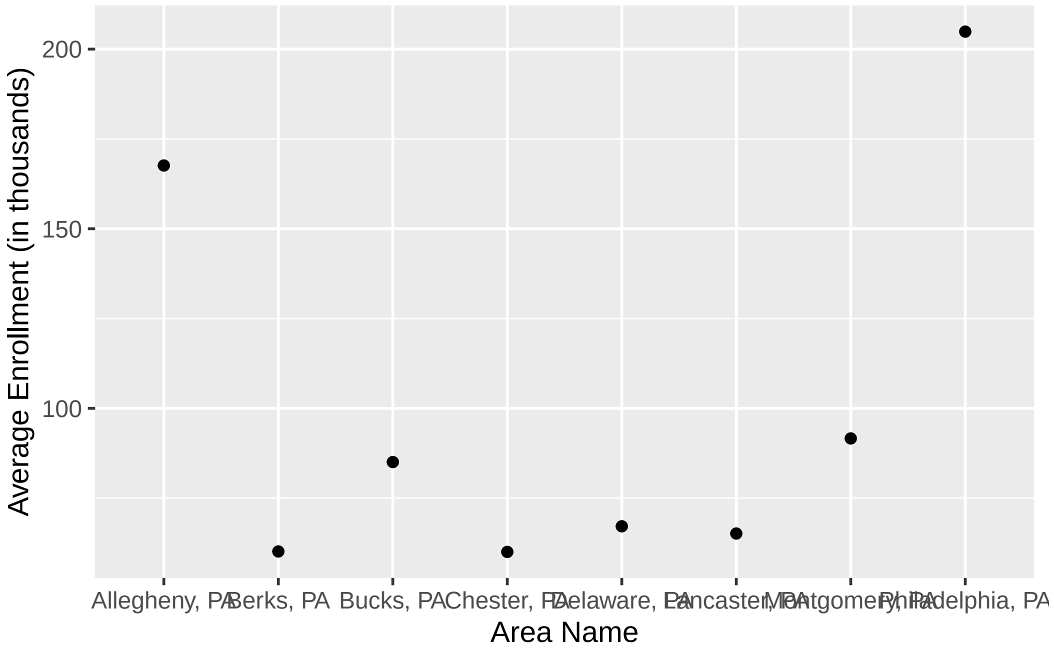
```
plot.county(EDU01ab[[1]])
```

```
# A tibble: 5 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Jefferson, AL         110119.
2 Mobile, AL             65952.
3 Madison, AL            42537.
4 Montgomery, AL         34789.
5 Tuscaloosa, AL         25402
```



```
plot.county(EDU01ab[[1]], state = ' PA', order = 'Top', n = 8)
```

```
# A tibble: 8 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Philadelphia, PA      204874.
2 Allegheny, PA         167602.
3 Montgomery, PA         91621.
4 Bucks, PA              85044.
5 Delaware, PA           67154.
6 Lancaster, PA          65147.
7 Berks, PA              60150.
8 Chester, PA            60029
```



Run Data Processing Function on Four Other Data Sets

```
PST01a <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01a.csv",'Enrol
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES PST015171D        206827028
 2 UNITED STATES PST015172D        209283904
 3 UNITED STATES PST015173D        211357490
 4 UNITED STATES PST015174D        213341552
 5 UNITED STATES PST015175D        215465246
 6 UNITED STATES PST015176D        217562728
 7 UNITED STATES PST015177D        219759860
 8 UNITED STATES PST015178D        222095080
 9 UNITED STATES PST015179D        224567234
10 UNITED STATES PST025181D        229466391
# i 31,970 more rows
```

```r
PST01b <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01b.csv",'Enrol
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES PST025182D        231665106
 2 UNITED STATES PST025183D        233792697
 3 UNITED STATES PST025184D        235825544
 4 UNITED STATES PST025185D        237924311
 5 UNITED STATES PST025186D        240133472
 6 UNITED STATES PST025187D        242289738
 7 UNITED STATES PST025188D        244499776
 8 UNITED STATES PST025189D        246819839
 9 UNITED STATES PST030190D        248790925
10 UNITED STATES PST035190D        249622814
# i 31,970 more rows
```

```r
PST01c <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01c.csv",'Enrol
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES PST035191D        252980941
 2 UNITED STATES PST035192D        256514224
 3 UNITED STATES PST035193D        259918588
 4 UNITED STATES PST035194D        263125821
 5 UNITED STATES PST035195D        266278393
 6 UNITED STATES PST035196D        269394284
 7 UNITED STATES PST035197D        272646925
 8 UNITED STATES PST035198D        275854104
 9 UNITED STATES PST035199D        279040168
10 UNITED STATES PST040200D        281424602
# i 31,970 more rows
```

```r
PST01d <- processing_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01d.csv",'Enrol
```

```
# A tibble: 31,980 x 3
   area_name     Enrollment Enrollment_Value
   <chr>         <chr>                 <int>
 1 UNITED STATES PST045200D        282171957
 2 UNITED STATES PST045201D        285081556
 3 UNITED STATES PST045202D        287803914
 4 UNITED STATES PST045203D        290326418
 5 UNITED STATES PST045204D        293045739
 6 UNITED STATES PST045205D        295753151
 7 UNITED STATES PST045206D        298593212
 8 UNITED STATES PST045207D        301579895
 9 UNITED STATES PST045208D        304374846
10 UNITED STATES PST045209D        307006550
# i 31,970 more rows
```

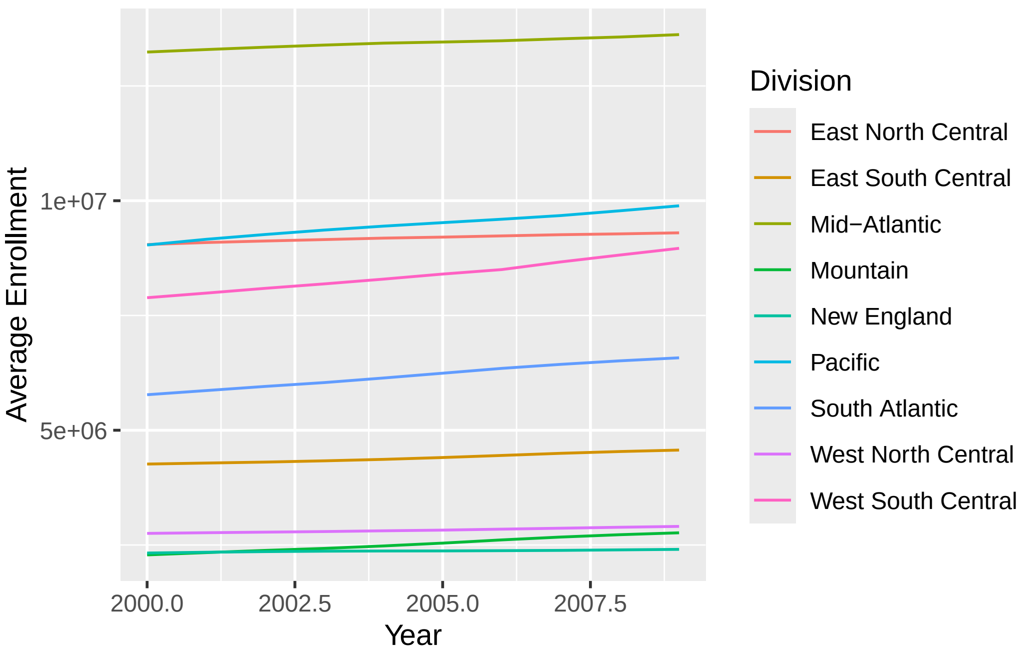
```
PST01ab <- CombiningFunction(PST01a, PST01b)
PST01abc <- CombiningFunction(PST01ab, PST01c)
PST01abcd <- CombiningFunction(PST01abc, PST01d)
```

Plot Other Data Sets with Plot Function

```
plot.state(PST01abcd[[2]])
```

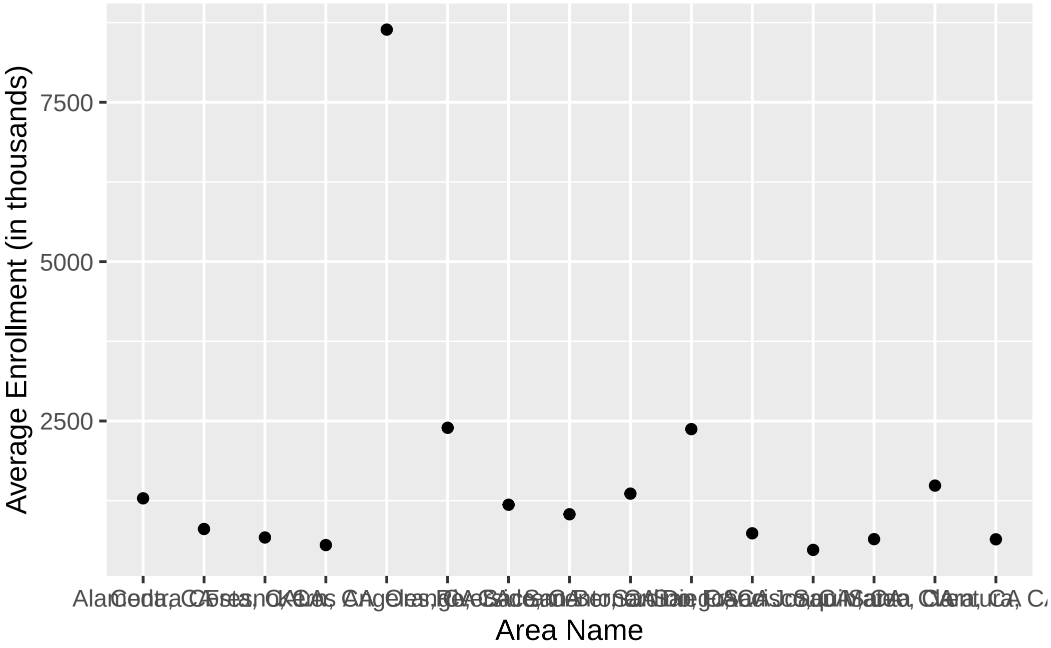
```
`summarise()` has grouped output by 'state_data.division'. You can override
using the `.groups` argument.
```

```
# A tibble: 90 x 3
# Groups:   state_data.division [9]
   state_data.division state_data.Year   y_axis
   <chr>                         <dbl>    <dbl>
 1 East North Central             2000 9044540
 2 East North Central             2001 9088907.
 3 East North Central             2002 9122750
 4 East North Central             2003 9153619.
 5 East North Central             2004 9185006.
 6 East North Central             2005 9206966.
 7 East North Central             2006 9233265.
 8 East North Central             2007 9259753.
 9 East North Central             2008 9277886.
10 East North Central             2009 9300134.
# i 80 more rows
```



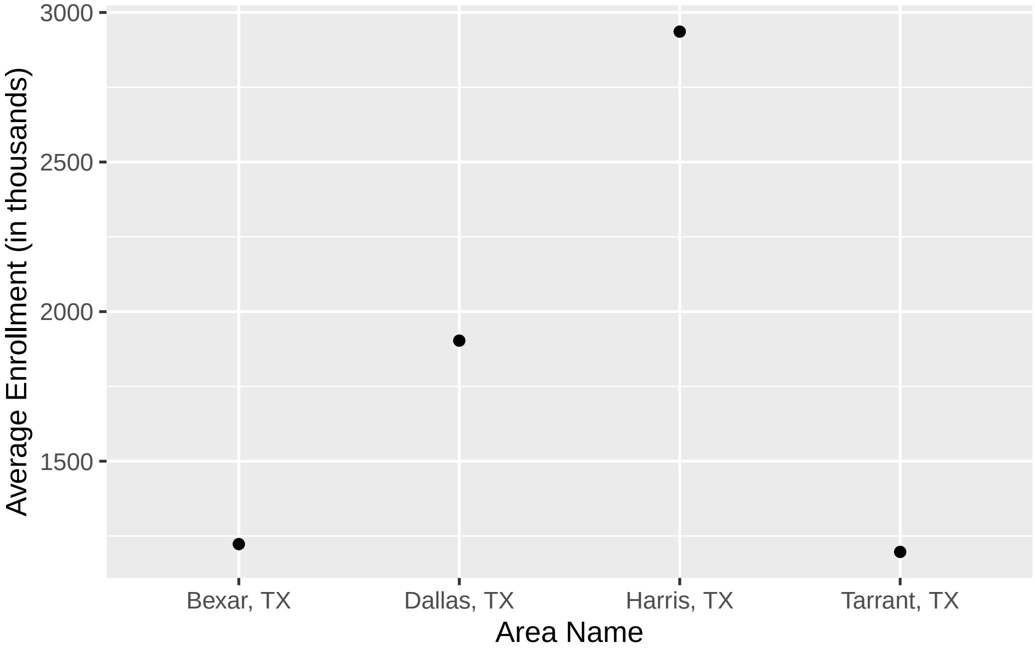
```
plot.county(PST01abcd[[1]], state =' CA', order = 'Top', n = 15)
```

```
# A tibble: 15 x 2
   county_data.area_name   y_axis
   <chr>                    <dbl>
 1 Los Angeles, CA       8639795.
 2 Orange, CA            2393272.
 3 San Diego, CA         2372674.
 4 Santa Clara, CA       1486544.
 5 San Bernardino, CA    1360795.
 6 Alameda, CA           1287280.
 7 Riverside, CA         1186328.
 8 Sacramento, CA        1037222.
 9 Contra Costa, CA       805928.
10 San Francisco, CA      738149.
11 Fresno, CA             672464.
12 San Mateo, CA          646729.
13 Ventura, CA            644290.
14 Kern, CA               553970.
15 San Joaquin, CA        478151.
```



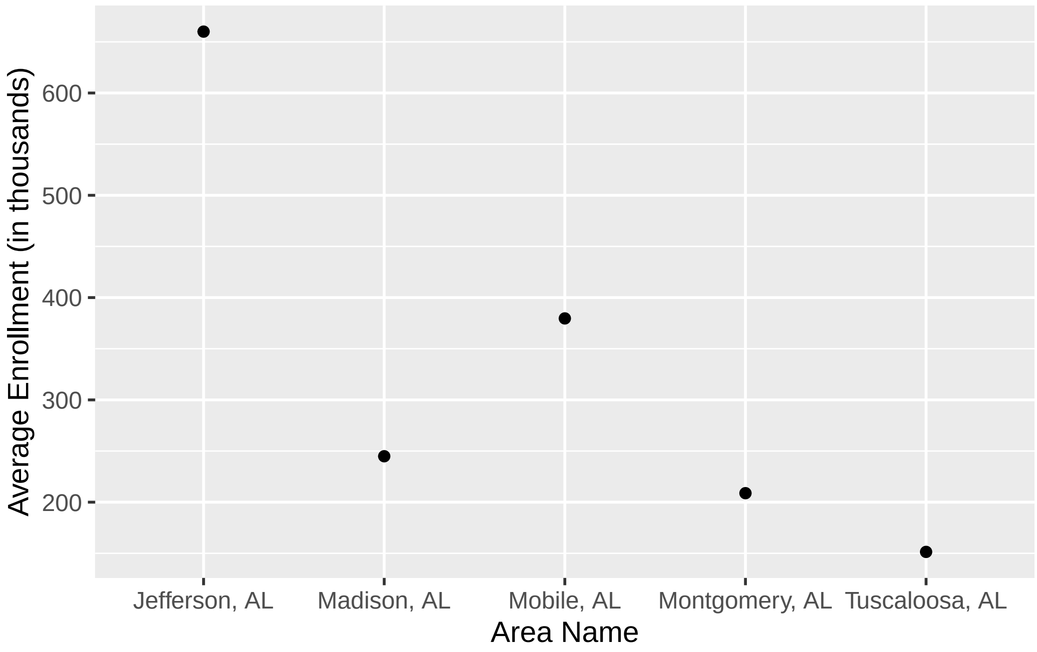
```
plot.county(PST01abcd[[1]], state = ' TX', order = 'Top', n = 4)
```

```
# A tibble: 4 x 2
  county_data.area_name   y_axis
  <chr>                    <dbl>
1 Harris, TX             2935994.
2 Dallas, TX             1903013.
3 Bexar, TX              1222903.
4 Tarrant, TX            1196789.
```



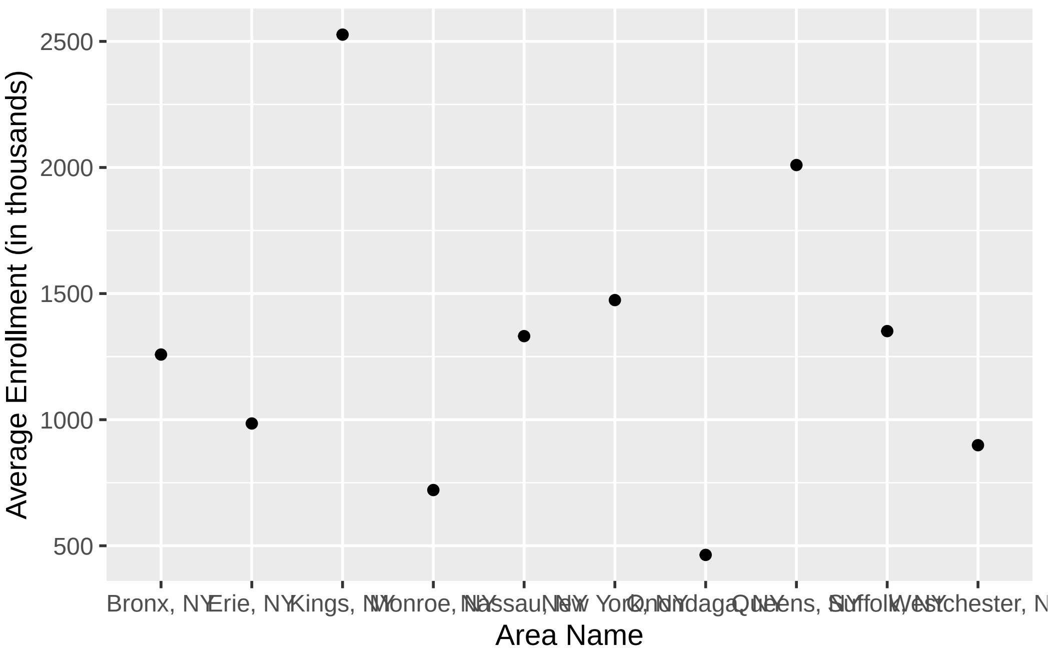
```
plot.county(PST01abcd[[1]])
```

```
# A tibble: 5 x 2
  county_data.area_name  y_axis
  <chr>                   <dbl>
1 Jefferson, AL         660014.
2 Mobile, AL            379642 
3 Madison, AL           244899.
4 Montgomery, AL        208781.
5 Tuscaloosa, AL        151387.
```



```
plot.county(PST01abcd[[1]], state = ' NY', order = 'Top', n = 10)
```

```
# A tibble: 10 x 2
   county_data.area_name   y_axis
   <chr>                    <dbl>
 1 Kings, NY              2526834.
 2 Queens, NY             2009665.
 3 New York, NY           1474154.
 4 Suffolk, NY            1351148.
 5 Nassau, NY             1331286.
 6 Bronx, NY              1258213.
 7 Erie, NY                984911.
 8 Westchester, NY         898835.
 9 Monroe, NY              720902.
10 Onondaga, NY            463793.
```


Average Enrollment (in thousands)
2500
2000
1500
1000
500
Bronx, NY
Erie, NY
Kings, NY
Monroe, NY
Nassau, NY
New York, NY
Onondaga, NY
Queens, NY
Suffolk, NY
Westchester, N
Area Name