# Project 1

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### Data Processing

```
library(tidyverse)
```

```
-- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.2     v tibble    3.2.1
v lubridate 1.9.4     v tidyr     1.3.1
v purrr     1.0.4
-- Conflicts ------------------------------------------ tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to becor
```

```
library(readr)
EDU01A <-read_csv("data/EDU01a.csv")
```

```
Rows: 3198 Columns: 42
-- Column specification --------------------------------------------------------
Delimiter: ","
chr (22): Area_name, STCOU, EDU010187N1, EDU010187N2, EDU010188N1, EDU010188...
dbl (20): EDU010187F, EDU010187D, EDU010188F, EDU010188D, EDU010189F, EDU010...

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```r
EDU01A |>
  select(Area_name, STCOU, ends_with("D")) |>
  rename(area_name = Area_name) |>
  head(EDU01A, n=5)
```

```
# A tibble: 5 x 12
  area_name     STCOU EDU010187D EDU010188D EDU010189D EDU010190D EDU010191D
  <chr>         <chr>      <dbl>      <dbl>      <dbl>      <dbl>      <dbl>
1 UNITED STATES 00000   40024299   39967624   40317775   40737600   41385442
2 ALABAMA       01000     733735     728234     730048     728252     725541
3 Autauga, AL   01001       6829       6900       6920       6847       7008
4 Baldwin, AL   01003      16417      16465      16799      17054      17479
5 Barbour, AL   01005       5071       5098       5068       5156       5173
# i 5 more variables: EDU010192D <dbl>, EDU010193D <dbl>, EDU010194D <dbl>,
#   EDU010195D <dbl>, EDU010196D <dbl>
```

**Question 2 Convert to long format**

```r
EDU01A_long<-
  EDU01A |>
  select(Area_name, STCOU, ends_with("D")) |>
  rename(area_name = Area_name) |>
  pivot_longer(cols= ends_with("D"),
               names_to = "EDU_combined",
               values_to = "enrollment_value"
               )
  head(EDU01A_long, n=5)
```

```
# A tibble: 5 x 4
  area_name     STCOU EDU_combined enrollment_value
  <chr>         <chr> <chr>                   <dbl>
1 UNITED STATES 00000 EDU010187D           40024299
2 UNITED STATES 00000 EDU010188D           39967624
3 UNITED STATES 00000 EDU010189D           40317775
4 UNITED STATES 00000 EDU010190D           40737600
5 UNITED STATES 00000 EDU010191D           41385442
```

**Question 3 Parsing**

```
EDU01A_longer <-
  EDU01A_long |>
  mutate(two_digit_year= (substr(EDU_combined, start=8, stop = 9)) ,
  year_dbl = as.double(two_digit_year),
  year= if_else(year_dbl >25, 1900 + year_dbl, year_dbl <=25 + 2000),
  survey_value = substr(EDU_combined, start=1, stop = 7)
         )
EDU01A_longer
```

```
# A tibble: 31,980 x 8
   area_name   STCOU EDU_combined enrollment_value two_digit_year year_dbl  year
   <chr>       <chr> <chr>                   <dbl> <chr>              <dbl> <dbl>
 1 UNITED STA~ 00000 EDU010187D           40024299 87                    87  1987
 2 UNITED STA~ 00000 EDU010188D           39967624 88                    88  1988
 3 UNITED STA~ 00000 EDU010189D           40317775 89                    89  1989
 4 UNITED STA~ 00000 EDU010190D           40737600 90                    90  1990
 5 UNITED STA~ 00000 EDU010191D           41385442 91                    91  1991
 6 UNITED STA~ 00000 EDU010192D           42088151 92                    92  1992
 7 UNITED STA~ 00000 EDU010193D           42724710 93                    93  1993
 8 UNITED STA~ 00000 EDU010194D           43369917 94                    94  1994
 9 UNITED STA~ 00000 EDU010195D           43993459 95                    95  1995
10 UNITED STA~ 00000 EDU010196D           44715737 96                    96  1996
# i 31,970 more rows
# i 1 more variable: survey_value <chr>
```

```
long_updated <- select(EDU01A_longer, area_name,STCOU, enrollment_value,year, survey_value)

head(long_updated, n=5)
```

```
# A tibble: 5 x 5
  area_name     STCOU enrollment_value  year survey_value
  <chr>         <chr>            <dbl> <dbl> <chr>
1 UNITED STATES 00000         40024299  1987 EDU0101
2 UNITED STATES 00000         39967624  1988 EDU0101
3 UNITED STATES 00000         40317775  1989 EDU0101
4 UNITED STATES 00000         40737600  1990 EDU0101
5 UNITED STATES 00000         41385442  1991 EDU0101
```

**Question 4 Two Tibbles**

```r
County_indices <- grep(pattern = ", [A-Z]{2}", long_updated$area_name)
noncounty_tibble <- long_updated [-County_indices, ]
county_tibble <- long_updated [County_indices, ]

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

head(county_tibble, n=10)
```

```
# A tibble: 10 x 5
   area_name   STCOU enrollment_value  year survey_value
   <chr>       <chr>            <dbl> <dbl> <chr>
 1 Autauga, AL 01001             6829  1987 EDU0101
 2 Autauga, AL 01001             6900  1988 EDU0101
 3 Autauga, AL 01001             6920  1989 EDU0101
 4 Autauga, AL 01001             6847  1990 EDU0101
 5 Autauga, AL 01001             7008  1991 EDU0101
 6 Autauga, AL 01001             7137  1992 EDU0101
 7 Autauga, AL 01001             7152  1993 EDU0101
 8 Autauga, AL 01001             7381  1994 EDU0101
 9 Autauga, AL 01001             7568  1995 EDU0101
10 Autauga, AL 01001             7834  1996 EDU0101
```

```r
head(noncounty_tibble, n=10)
```

```
# A tibble: 10 x 5
   area_name     STCOU enrollment_value  year survey_value
   <chr>         <chr>            <dbl> <dbl> <chr>
 1 UNITED STATES 00000         40024299  1987 EDU0101
 2 UNITED STATES 00000         39967624  1988 EDU0101
 3 UNITED STATES 00000         40317775  1989 EDU0101
 4 UNITED STATES 00000         40737600  1990 EDU0101
 5 UNITED STATES 00000         41385442  1991 EDU0101
 6 UNITED STATES 00000         42088151  1992 EDU0101
 7 UNITED STATES 00000         42724710  1993 EDU0101
 8 UNITED STATES 00000         43369917  1994 EDU0101
 9 UNITED STATES 00000         43993459  1995 EDU0101
10 UNITED STATES 00000         44715737  1996 EDU0101
```

**Question 5 County level new variable**

```
county_tibble |>
mutate(state = substr(area_name, nchar(area_name) - 1, nchar(area_name))
)
```

```
# A tibble: 31,450 x 6
   area_name   STCOU enrollment_value  year survey_value state
   <chr>       <chr>            <dbl> <dbl> <chr>        <chr>
 1 Autauga, AL 01001             6829  1987 EDU0101      AL
 2 Autauga, AL 01001             6900  1988 EDU0101      AL
 3 Autauga, AL 01001             6920  1989 EDU0101      AL
 4 Autauga, AL 01001             6847  1990 EDU0101      AL
 5 Autauga, AL 01001             7008  1991 EDU0101      AL
 6 Autauga, AL 01001             7137  1992 EDU0101      AL
 7 Autauga, AL 01001             7152  1993 EDU0101      AL
 8 Autauga, AL 01001             7381  1994 EDU0101      AL
 9 Autauga, AL 01001             7568  1995 EDU0101      AL
10 Autauga, AL 01001             7834  1996 EDU0101      AL
# i 31,440 more rows
```

**Question 6 Non-county "division"**

```
noncounty_tibble <- noncounty_tibble |>
  mutate(
    state = sub(".*,\\s*", "", area_name),
division = case_when(
  state %in% c("CONNECTICUT", "MAINE", "MASSACHUSETTS", "NEW HAMPSHIRE", "RHODE ISLAND", "VE
      state %in% c("NEW JERSEY", "NEW YORK", "PENNSYLVANIA") ~ "Mid-Atlantic",
      state %in% c("ILLINOIS", "INDIANA", "MICHIGAN", "OHIO", "WISCONSIN") ~ "East North Cen
      state %in% c("IOWA", "KANSAS", "MINNESOTA", "NEBRASKA", "NORTH DAKOTA", "SOUTH DAKOTA"
      state %in% c("DELAWARE", "DISTRICT OF COLUMBIA","District of Columbia", "FLORIDA", "GE
      state %in% c("ALABAMA", "KENTUCKY", "MISSISSIPPI", "TENNESSEE") ~ "East South Central"
      state %in% c("ARKANSAS", "LOUISIANA", "OKLAHOMA", "TEXAS") ~ "West South Central",
      state %in% c("ARIZONA", "COLORADO", "IDAHO", "MONTANA", "NEVADA", "NEW MEXICO", "UTAH"
      state %in% c("ALASKA", "CALIFORNIA", "HAWAII", "OREGON", "WASHINGTON") ~ "Pacific",
  TRUE ~ "ERROR" )
)
```

### Function for Steps 1 and 2

```
library(tidyverse)
```

```
readData <- function(filepath, columns= "!area_name & !STCOU") {
  data2 <- read.csv(filepath)
  filterdata <- select(data2, c(area_name = "Area_name", "STCOU"), ends_with("D"))
  long_data <- pivot_longer(filterdata, cols = (!area_name & !STCOU), names_to = "EDU_combine
}
```

```
result2 <- readData("./data/EDU01b.csv")
head(result2, 5)
```

```
# A tibble: 5 x 4
  area_name     STCOU EDU_combined enrollment_value
  <chr>         <int> <chr>                   <int>
1 UNITED STATES     0 EDU010197D           44534459
2 UNITED STATES     0 EDU010198D           46245814
3 UNITED STATES     0 EDU010199D           46368903
4 UNITED STATES     0 EDU010200D           46818690
5 UNITED STATES     0 EDU010201D           47127066
```

### Function for Step 3

```
dataYear <- function(step2) {
  long_updated = mutate(step2, year_dbl= as.double(substr(EDU_combined, start=8, stop = 9)),
  year = if_else(year_dbl > 25, 1900 + year_dbl, 2000 + year_dbl),
  survey_value = substr(EDU_combined, start=1, stop = 7)
         )
  long_updated <- subset(long_updated, select = -year_dbl)
}
```

```
result3 <- dataYear(result2)
head(result3, 5)
```

```
# A tibble: 5 x 6
  area_name     STCOU EDU_combined enrollment_value  year survey_value
  <chr>         <int> <chr>                   <int> <dbl> <chr>
```

```
1 UNITED STATES     0 EDU010197D           44534459  1997 EDU0101
2 UNITED STATES     0 EDU010198D           46245814  1998 EDU0101
3 UNITED STATES     0 EDU010199D           46368903  1999 EDU0101
4 UNITED STATES     0 EDU010200D           46818690  2000 EDU0102
5 UNITED STATES     0 EDU010201D           47127066  2001 EDU0102
```

**Function for Step 5**

```
state_function <- function(county_tibble){
  new_county_tibble <- mutate(county_tibble, state = substr(area_name, nchar(area_name) - 1,
         )
  return(new_county_tibble)
}
```

**Function for Step 6**

```
division_function <- function(noncounty_tibble) {
  new_noncounty_tibble <- mutate(noncounty_tibble,
    state = sub(".*,\\s*", "", area_name),
    division = case_when(state %in% c("CONNECTICUT", "MAINE", "MASSACHUSETTS", "NEW HAMPSHIR
                         state %in% c("NEW JERSEY", "NEW YORK", "PENNSYLVANIA") ~ "Mid-Atlan
                         state %in% c("ILLINOIS", "INDIANA", "MICHIGAN", "OHIO", "WISCONSIN"
                         state %in% c("IOWA", "KANSAS", "MINNESOTA", "NEBRASKA", "NORTH DAKO
                         state %in% c("DELAWARE", "DISTRICT OF COLUMBIA","District of Columb
                         state %in% c("ALABAMA", "KENTUCKY", "MISSISSIPPI", "TENNESSEE") ~ "
                         state %in% c("ARKANSAS", "LOUISIANA", "OKLAHOMA", "TEXAS") ~ "West S
                         state %in% c("ARIZONA", "COLORADO", "IDAHO", "MONTANA", "NEVADA", "
                         state %in% c("ALASKA", "CALIFORNIA", "HAWAII", "OREGON", "WASHINGTO
                         TRUE ~ "ERROR" )
    )
  return(new_noncounty_tibble)
}
```

**Function for Step 4**

```
create_datasets <- function(long_data) {
  County_indices <- grep(pattern = ", [A-Z]{2}", long_updated$area_name)
```

```
  noncounty_tibble <- long_updated[-County_indices, ]
  county_tibble <- long_updated[County_indices, ]
  class(county_tibble) <- c("county", class(county_tibble))
  class(noncounty_tibble) <- c("state", class(noncounty_tibble))
  final_county_tibble <- state_function(county_tibble)
  final_noncounty_tibble <- division_function(noncounty_tibble)
  return(list(final_county_tibble, final_noncounty_tibble))
}
```

```
result4 <- create_datasets(result3)
result4
```

```
[[1]]
# A tibble: 31,450 x 6
   area_name   STCOU enrollment_value  year survey_value state
   <chr>       <chr>            <dbl> <dbl> <chr>        <chr>
 1 Autauga, AL 01001             6829  1987 EDU0101      AL
 2 Autauga, AL 01001             6900  1988 EDU0101      AL
 3 Autauga, AL 01001             6920  1989 EDU0101      AL
 4 Autauga, AL 01001             6847  1990 EDU0101      AL
 5 Autauga, AL 01001             7008  1991 EDU0101      AL
 6 Autauga, AL 01001             7137  1992 EDU0101      AL
 7 Autauga, AL 01001             7152  1993 EDU0101      AL
 8 Autauga, AL 01001             7381  1994 EDU0101      AL
 9 Autauga, AL 01001             7568  1995 EDU0101      AL
10 Autauga, AL 01001             7834  1996 EDU0101      AL
# i 31,440 more rows

[[2]]
# A tibble: 530 x 7
   area_name     STCOU enrollment_value  year survey_value state        division
   <chr>         <chr>            <dbl> <dbl> <chr>        <chr>        <chr>
 1 UNITED STATES 00000         40024299  1987 EDU0101      UNITED STAT~ ERROR
 2 UNITED STATES 00000         39967624  1988 EDU0101      UNITED STAT~ ERROR
 3 UNITED STATES 00000         40317775  1989 EDU0101      UNITED STAT~ ERROR
 4 UNITED STATES 00000         40737600  1990 EDU0101      UNITED STAT~ ERROR
 5 UNITED STATES 00000         41385442  1991 EDU0101      UNITED STAT~ ERROR
 6 UNITED STATES 00000         42088151  1992 EDU0101      UNITED STAT~ ERROR
 7 UNITED STATES 00000         42724710  1993 EDU0101      UNITED STAT~ ERROR
 8 UNITED STATES 00000         43369917  1994 EDU0101      UNITED STAT~ ERROR
 9 UNITED STATES 00000         43993459  1995 EDU0101      UNITED STAT~ ERROR
10 UNITED STATES 00000         44715737  1996 EDU0101      UNITED STAT~ ERROR
```

```
# i 520 more rows
```

### Wrapper Function

```
my_wrapper <- function(url, value = "Enrollment Value"){
  result <- read_csv(url) |>
  readData(value = value) |>
  dataYear() |>
  create_datasets()
  return(result)
}
```

## Call It and Combine Your Data

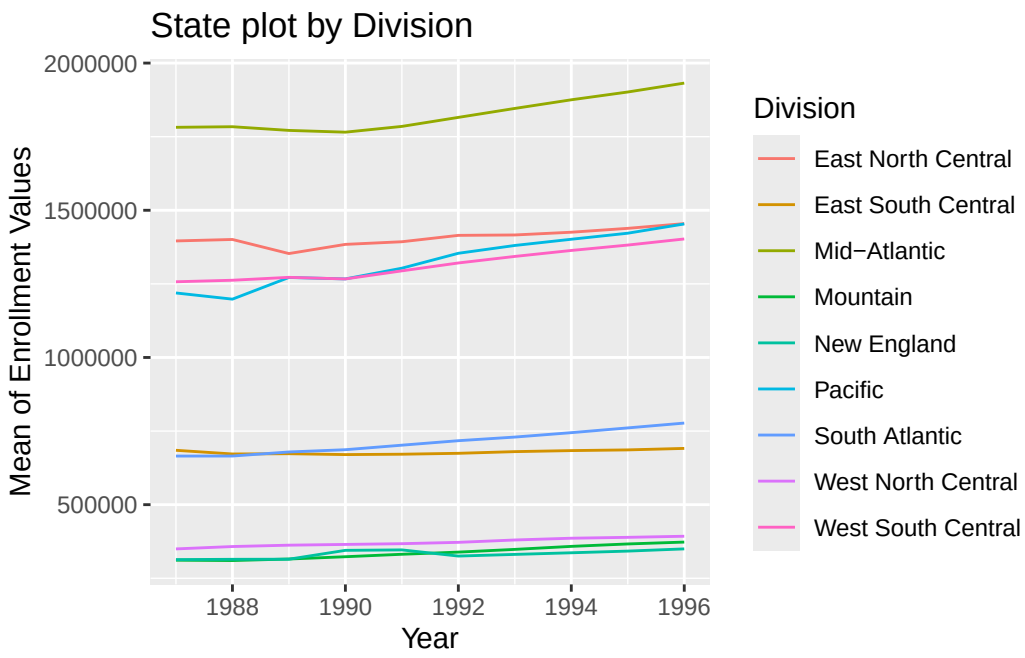
```
Data_1A <-my_wrapper("data/EDU01a.csv")
Data_1B <-my_wrapper("data/EDU01b.csv")

combine <-function (input1,input2) {
all_county <-bind_rows(input1[[1]], input2[[1]])
all_noncounty<-bind_rows(input1[[2]], input2[[2]])
return(list(all_county, all_noncounty))
}
combined_data <-combine (Data_1A,Data_1B)
```

## Writing a Generic Function for Summarizing

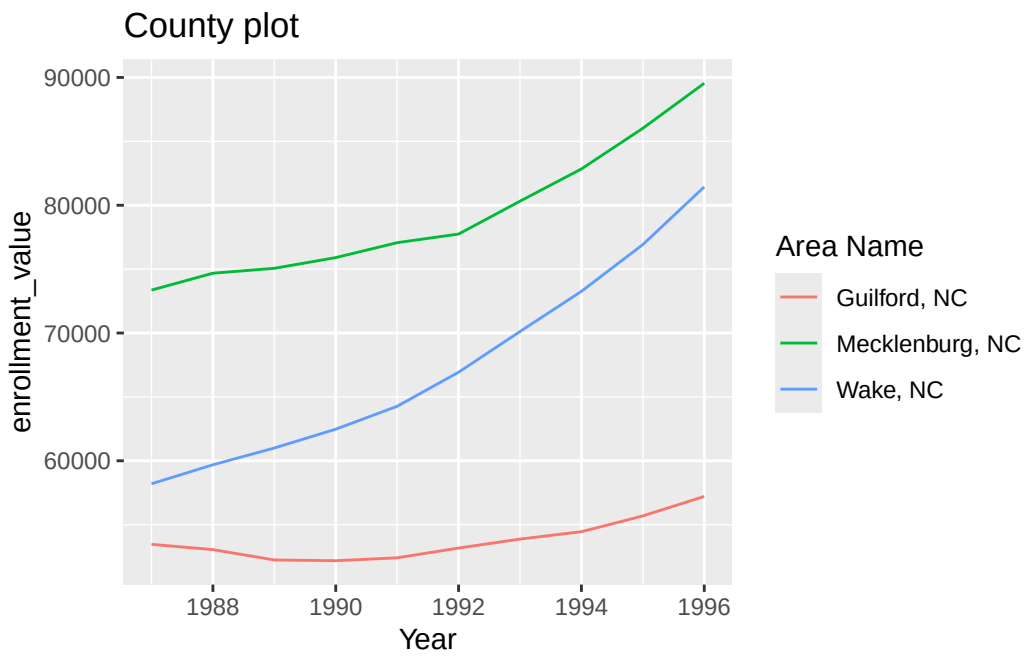
```
plot.state <- function(df, var_name = "enrollment_value") {
  ggplot(df[[2]] |>
    filter(division != "ERROR") |>
    group_by(division, year) |>
    mutate(mean = mean(get(var_name))),
    aes(x = year, y = mean, color = division)) +
    geom_line(aes(color = division)) +
    labs(x = "Year", y = "Mean of Enrollment Values", title = "State plot by Division") +
    scale_color_discrete(name = "Division")
}
```

```
plot.state(combined_data)
```




```
plot.county <- function(df, state_name = "NC", var_name = "enrollment_value", sortby = "top"
  newdf <- df[[1]] |>
    filter(state == state_name) |>
    group_by(area_name) |>
    mutate(mean = mean(get(var_name)))
  sortdf <- if (sortby == "top") {
    head(arrange(newdf, desc(mean)), n = sortvalue)
  } else if (sortby == "bottom") {
    head(arrange(newdf, mean), n = sortvalue)
  }
  ggplot(sortdf,
    aes(x = year, y = get(var_name), color = area_name)
  ) +
    geom_line(aes(color = area_name)) +
    labs(x = "Year", y = var_name, title = "County plot") +
    scale_color_discrete(name = "Area Name")
}
```

```
plot.county(combined_data, state_name = "NC", sortby = "top", sortvalue = 50)
```

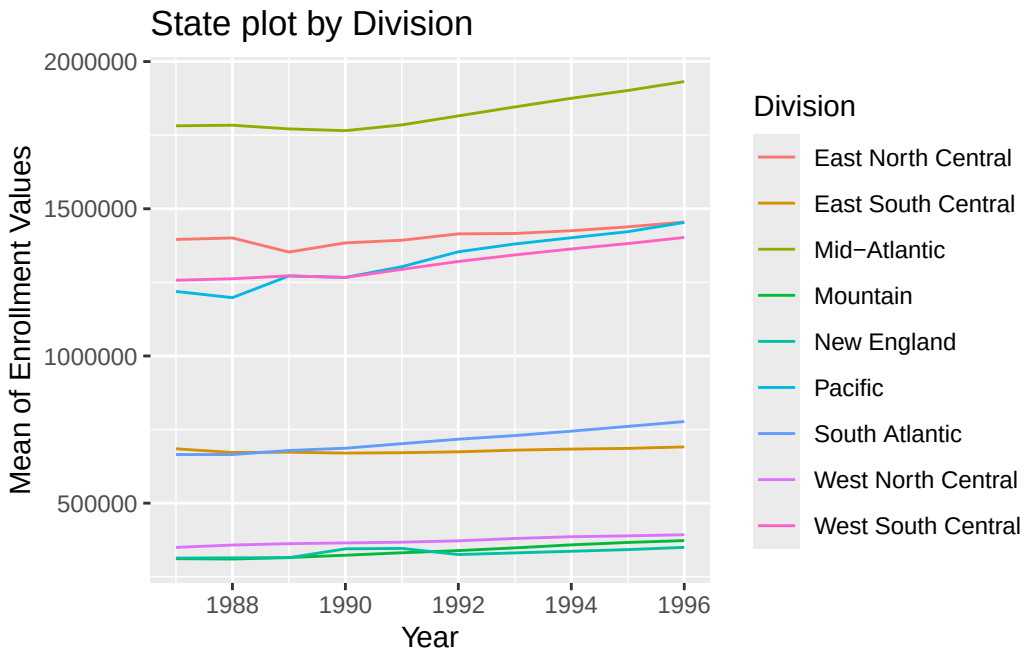



### Put It Together

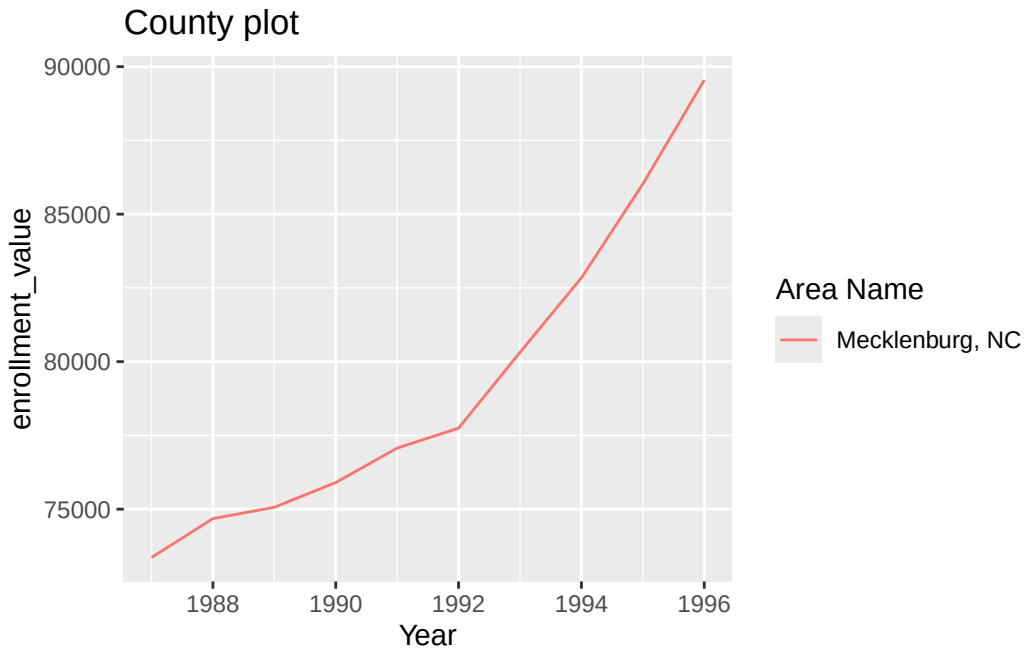
```
EDU01AWrapped <-my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01a.csv")
EDU01BWrapped <-my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/EDU01b.csv")
```

```
combined_enrolled <- combine (EDU01AWrapped,EDU01BWrapped)
```

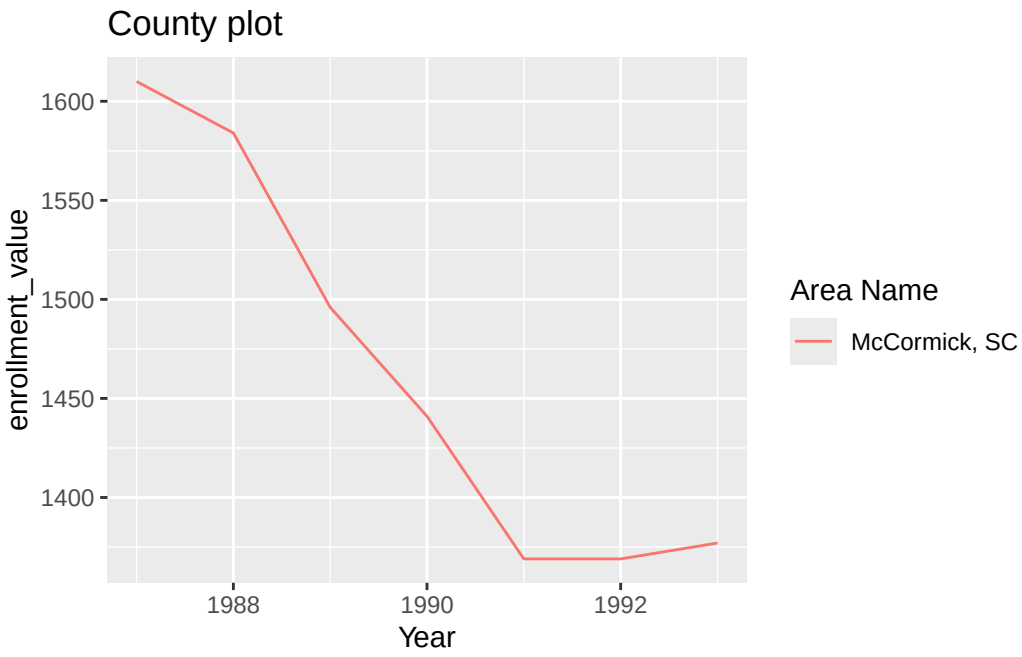
```
plot.state(combined_enrolled)
```



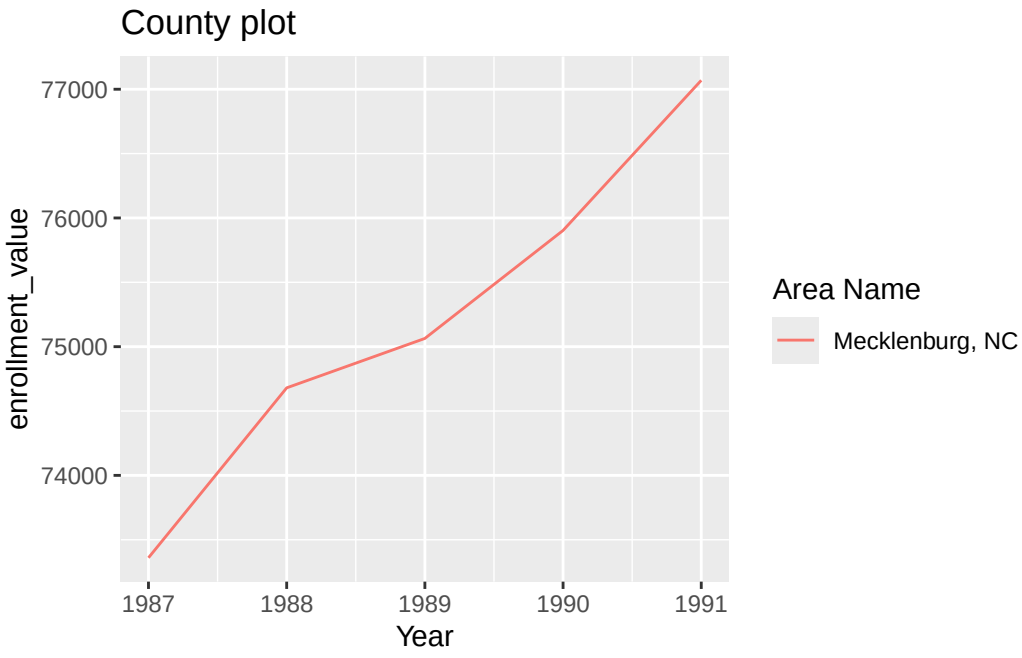

```
plot.county(combined_enrolled, sortvalue = 20)
```



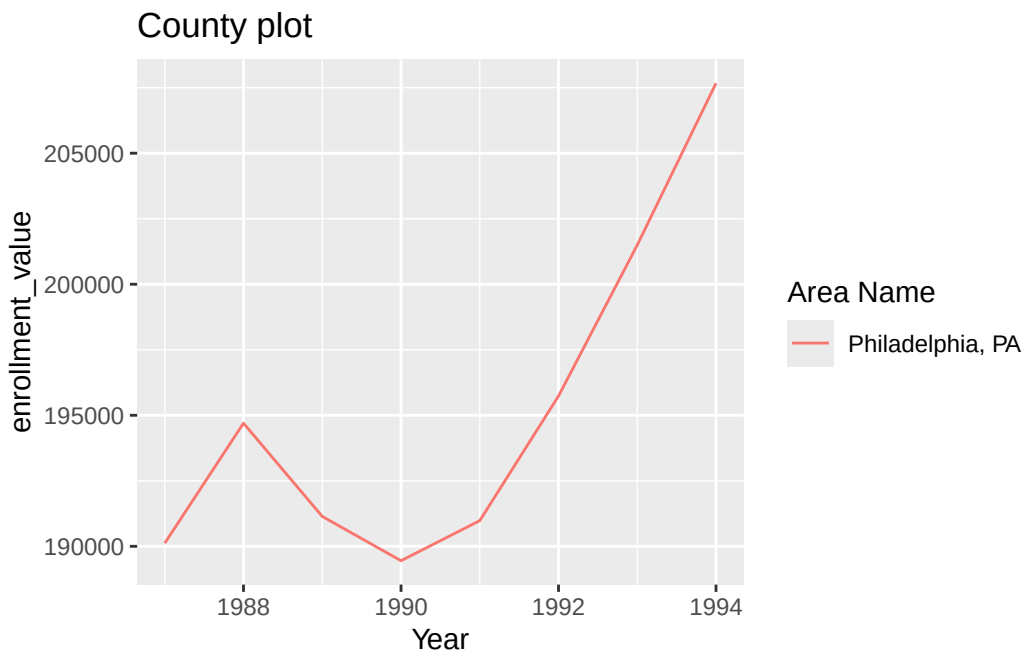
```
plot.county(combined_enrolled, state_name = "SC", var_name = "enrollment_value", sortby = "bo
```




```
plot.county(combined_enrolled)
```



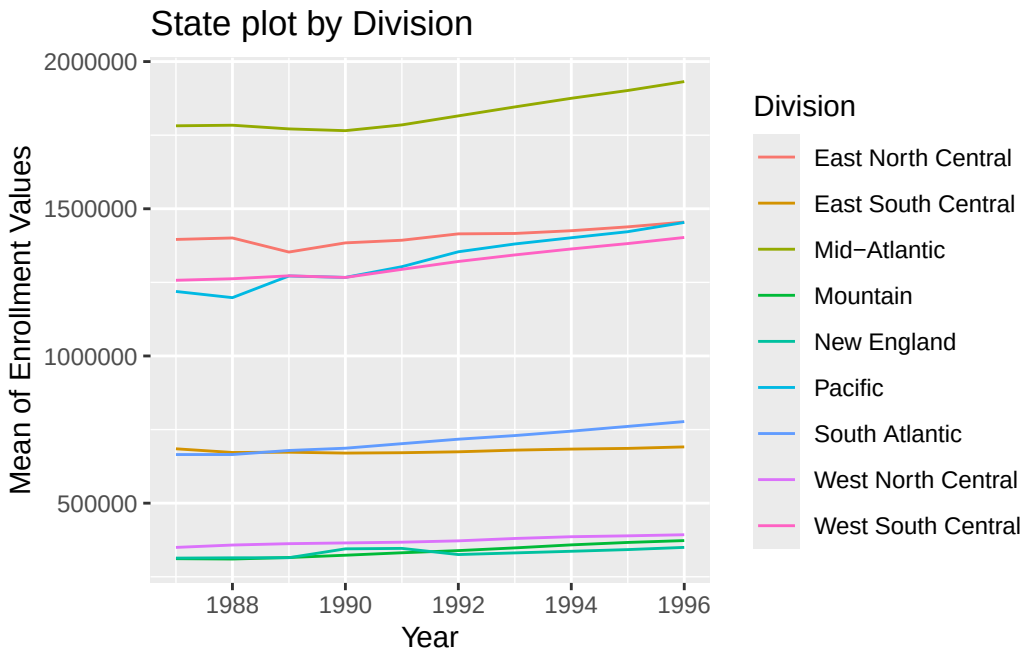
```
plot.county(combined_enrolled, state_name = "PA", sortby = "top", sortvalue = 8 )
```



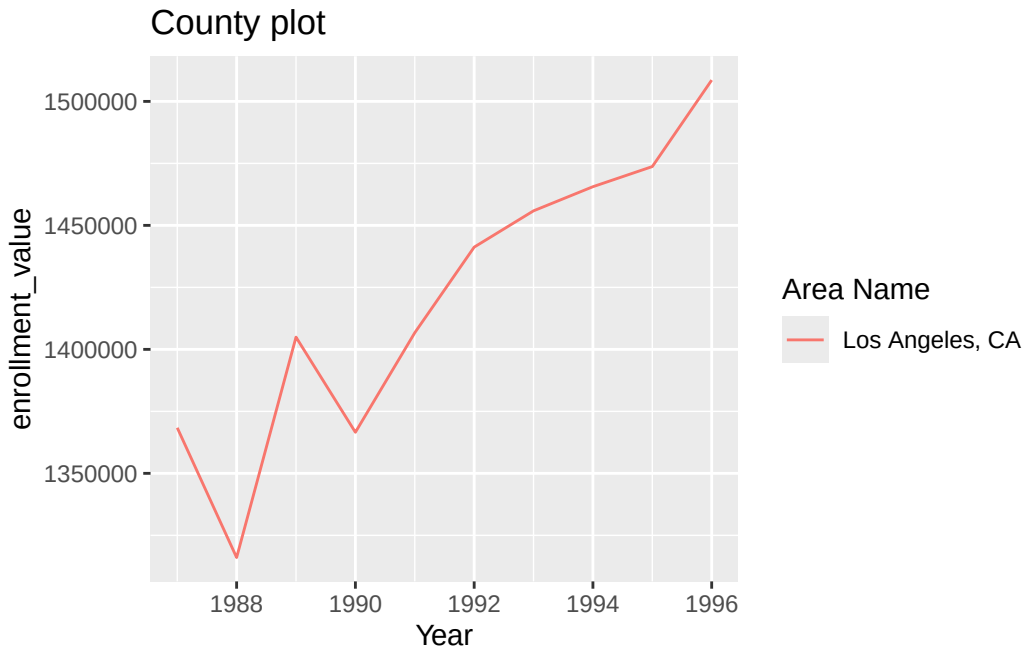

```
PST01a <- my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01a.csv")
PST01b <- my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01b.csv")
PST01c <- my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01c.csv")
PST01d <- my_wrapper("https://www4.stat.ncsu.edu/~online/datasets/PST01d.csv")
```

```
Combined_PST01ab<-combine(PST01a,PST01b)
Combined_PST01cd <-combine(PST01c, PST01d)
Combined_PST01all <- combine(Combined_PST01ab, Combined_PST01cd )
```

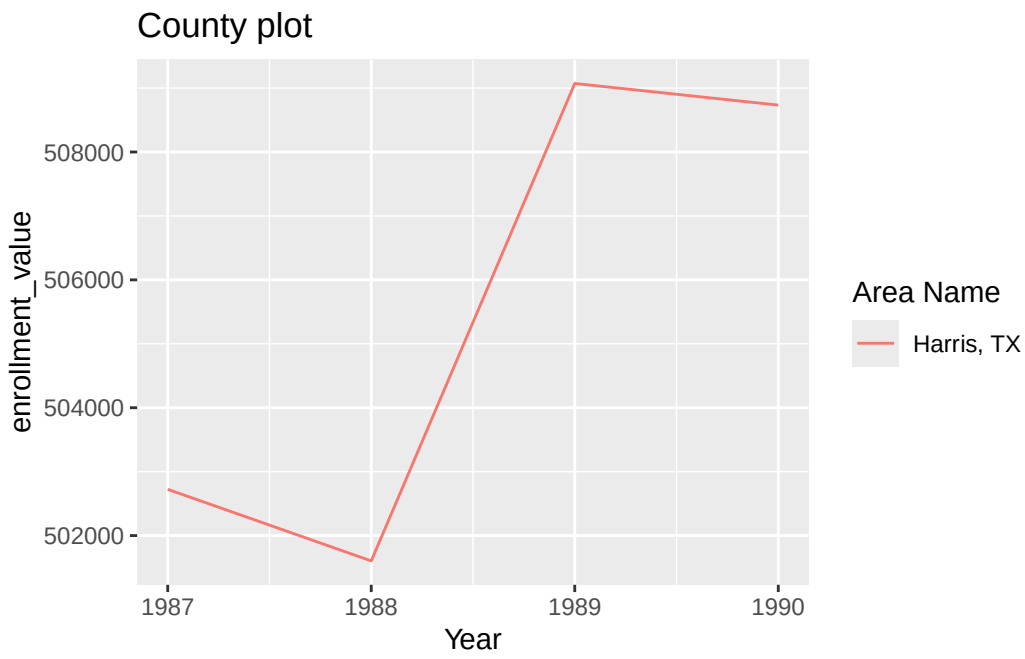
```
plot.state(Combined_PST01all)
```



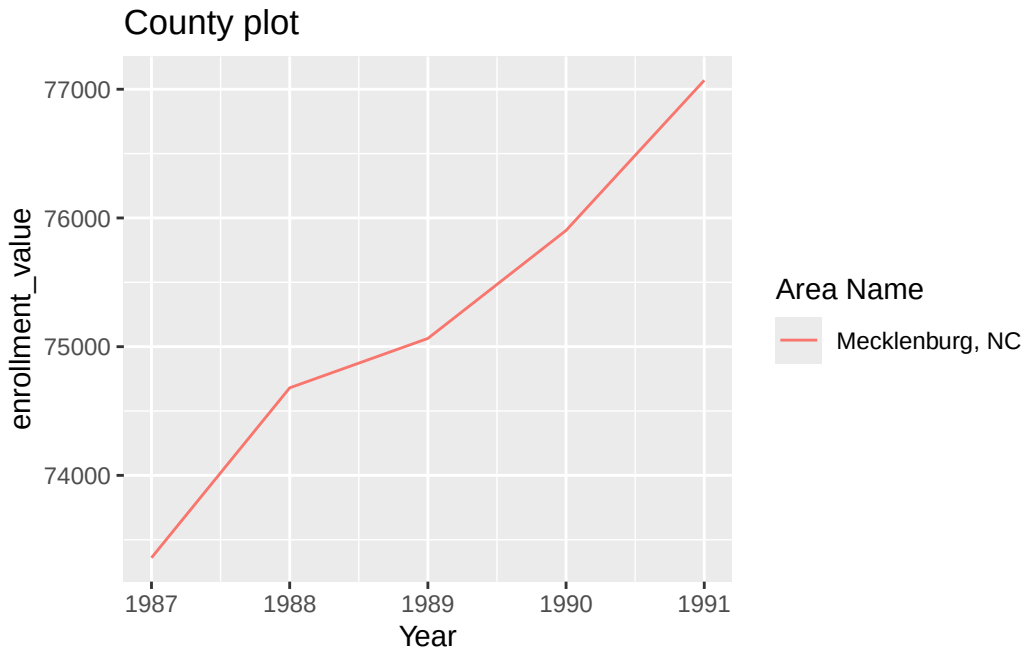

```
plot.county(Combined_PST01all, state_name = "CA", sortby = "top", sortvalue = 15)
```



```
plot.county(Combined_PST01all, state_name = "TX", sortby = "top", sortvalue = 4)
```




```
plot.county(Combined_PST01all)
```



```
plot.county(Combined_PST01all, state_name = "NY", sortby = "top", sortvalue = 10)
```