Analysis on World_Bank_Pop

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```
options(repos = c(CRAN = "https://cran.rstudio.com/"))
install.packages("tidyverse")
```

```
## Installing package into 'C:/Users/lenovo/AppData/Local/R/win-library/4.4'
## (as 'lib' is unspecified)

## package 'tidyverse' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
##  C:\Users\lenovo\AppData\Local\Temp\RtmpGSSrVc\downloaded_packages
```

```
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   3.5.1     v tibble    3.2.1
## v lubridate 1.9.3     v tidyr     1.3.1
## v purrr     1.0.2

## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

options(repos = c(CRAN = "https://cran.rstudio.com/")) is a useful command when you prefer to use a specific CRAN mirror in RStudio CRAN mirror in package installions. This can be handy in knitting R Markdown to HTML.

Installing tidyverse can give me access to many datasets including world_bank_pop.

```
(.packages())
```

```
##  [1] "lubridate" "forcats"   "stringr"   "dplyr"     "purrr"     "readr"
##  [7] "tidyr"     "tibble"    "ggplot2"   "tidyverse" "stats"     "graphics"
## [13] "grDevices" "utils"     "datasets"  "methods"   "base"
```

This command (.packages()) is a base function in R that lists the names of the attached packages in your current R session. When you load a package in R using library() or require(), it becomes attached and ready to use.

```r
my_data<- world_bank_pop
head(my_data,6)
```

```
## # A tibble: 6 x 20
##   country indicator       `2000`  `2001`  `2002`  `2003`  `2004`  `2005`  `2006`
##   <chr>   <chr>            <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>   <dbl>
## 1 ABW     SP.URB.TOTL     4.16e4 4.20e+4 4.22e+4 4.23e+4 4.23e+4 4.24e+4 4.26e+4
## 2 ABW     SP.URB.GROW     1.66e0 9.56e-1 4.01e-1 1.97e-1 9.46e-2 1.94e-1 3.67e-1
## 3 ABW     SP.POP.TOTL     8.91e4 9.07e+4 9.18e+4 9.27e+4 9.35e+4 9.45e+4 9.56e+4
## 4 ABW     SP.POP.GROW     2.54e0 1.77e+0 1.19e+0 9.97e-1 9.01e-1 1.00e+0 1.18e+0
## 5 AFE     SP.URB.TOTL     1.16e8 1.20e+8 1.24e+8 1.29e+8 1.34e+8 1.39e+8 1.44e+8
## 6 AFE     SP.URB.GROW     3.60e0 3.66e+0 3.72e+0 3.71e+0 3.74e+0 3.81e+0 3.81e+0
## # i 11 more variables: `2007` <dbl>, `2008` <dbl>, `2009` <dbl>, `2010` <dbl>,
## #   `2011` <dbl>, `2012` <dbl>, `2013` <dbl>, `2014` <dbl>, `2015` <dbl>,
## #   `2016` <dbl>, `2017` <dbl>
```

```r
str(my_data)
```

```
## tibble [1,064 x 20] (S3: tbl_df/tbl/data.frame)
##  $ country  : chr [1:1064] "ABW" "ABW" "ABW" "ABW" ...
##  $ indicator: chr [1:1064] "SP.URB.TOTL" "SP.URB.GROW" "SP.POP.TOTL" "SP.POP.GROW" ...
##  $ 2000     : num [1:1064] 4.16e+04 1.66 8.91e+04 2.54 1.16e+08 ...
##  $ 2001     : num [1:1064] 4.20e+04 9.56e-01 9.07e+04 1.77 1.20e+08 ...
##  $ 2002     : num [1:1064] 4.22e+04 4.01e-01 9.18e+04 1.19 1.24e+08 ...
##  $ 2003     : num [1:1064] 4.23e+04 1.97e-01 9.27e+04 9.97e-01 1.29e+08 ...
##  $ 2004     : num [1:1064] 4.23e+04 9.46e-02 9.35e+04 9.01e-01 1.34e+08 ...
##  $ 2005     : num [1:1064] 4.24e+04 1.94e-01 9.45e+04 1.00 1.39e+08 ...
##  $ 2006     : num [1:1064] 4.26e+04 3.67e-01 9.56e+04 1.18 1.44e+08 ...
##  $ 2007     : num [1:1064] 4.27e+04 4.08e-01 9.68e+04 1.23 1.49e+08 ...
##  $ 2008     : num [1:1064] 4.29e+04 4.13e-01 9.80e+04 1.24 1.55e+08 ...
##  $ 2009     : num [1:1064] 4.31e+04 4.02e-01 9.92e+04 1.23 1.62e+08 ...
##  $ 2010     : num [1:1064] 4.32e+04 2.94e-01 1.00e+05 1.13 1.68e+08 ...
##  $ 2011     : num [1:1064] 4.35e+04 6.62e-01 1.01e+05 9.39e-01 1.75e+08 ...
##  $ 2012     : num [1:1064] 4.39e+04 8.49e-01 1.02e+05 8.10e-01 1.83e+08 ...
##  $ 2013     : num [1:1064] 4.42e+04 8.26e-01 1.03e+05 7.49e-01 1.90e+08 ...
##  $ 2014     : num [1:1064] 4.46e+04 8.11e-01 1.04e+05 6.92e-01 1.98e+08 ...
##  $ 2015     : num [1:1064] 4.49e+04 7.93e-01 1.04e+05 6.38e-01 2.07e+08 ...
##  $ 2016     : num [1:1064] 4.53e+04 7.85e-01 1.05e+05 5.90e-01 2.15e+08 ...
##  $ 2017     : num [1:1064] 4.56e+04 7.72e-01 1.05e+05 5.37e-01 2.24e+08 ...
```

head() and str() are useful commands in R to have a better understanding on your dataset. head() shows the first few rows of your dataframe while str() displays the structure of your dataframe or R object.

The data in world_bank_pop will be easier to analyze if we convert the columns from 2000 to 2017 to rows.

```r
my_data2 <- my_data %>% pivot_longer(cols = -c(country, indicator), names_to = "Year", values_to = "Valu
head(my_data2)
```

```
## # A tibble: 6 x 4
##   country indicator   Year  Value
##   <chr>   <chr>       <chr> <dbl>
## 1 ABW     SP.URB.TOTL 2000  41625
```

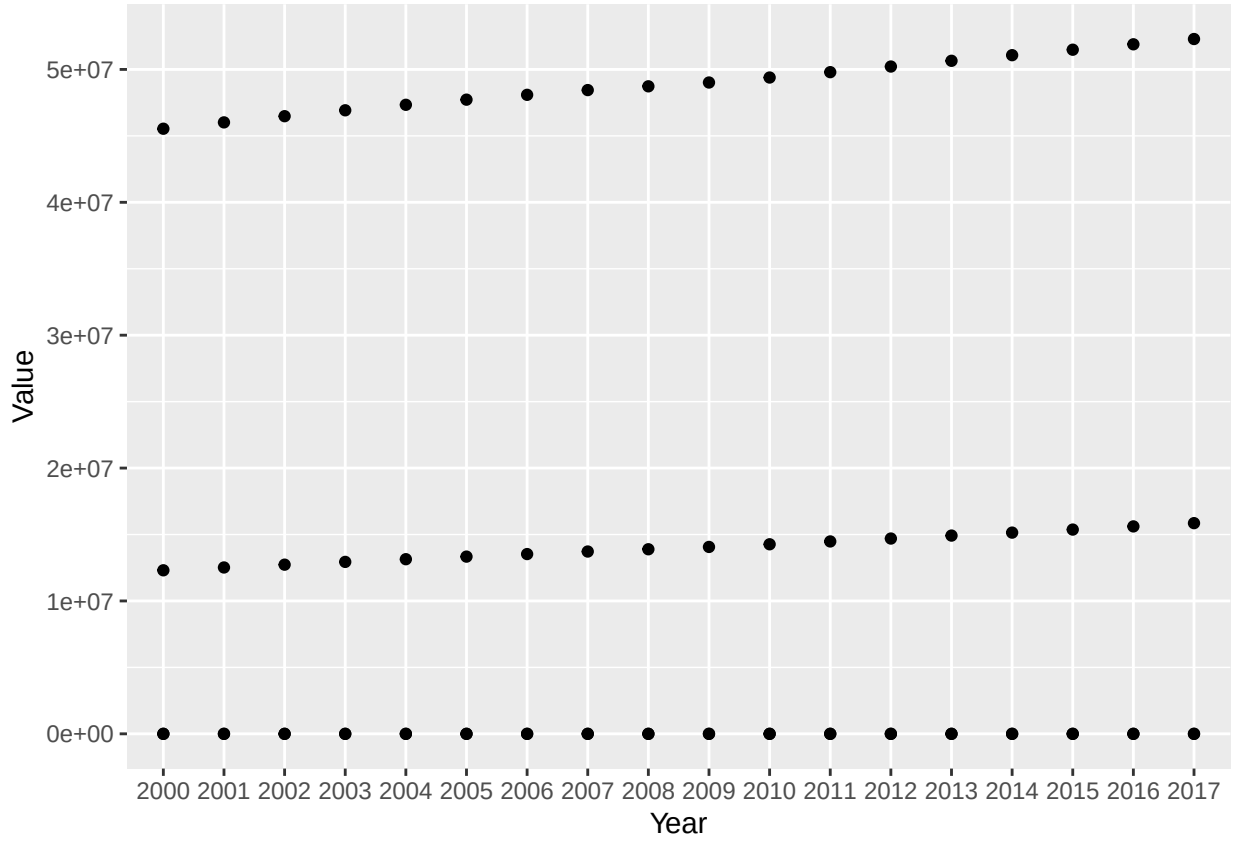
```
## 2 ABW     SP.URB.TOTL 2001  42025
## 3 ABW     SP.URB.TOTL 2002  42194
## 4 ABW     SP.URB.TOTL 2003  42277
## 5 ABW     SP.URB.TOTL 2004  42317
## 6 ABW     SP.URB.TOTL 2005  42399
```

```
str(my_data2)
```

```
## tibble [19,152 x 4] (S3: tbl_df/tbl/data.frame)
##  $ country  : chr [1:19152] "ABW" "ABW" "ABW" "ABW" ...
##  $ indicator: chr [1:19152] "SP.URB.TOTL" "SP.URB.TOTL" "SP.URB.TOTL" "SP.URB.TOTL" ...
##  $ Year     : chr [1:19152] "2000" "2001" "2002" "2003" ...
##  $ Value    : num [1:19152] 41625 42025 42194 42277 42317 ...
```

pivot_longer() is a command in tidyr, which reshapes the data from wide to long format. cols= -c(country,indicator) excludes the the two specific columns and all other columns are reshaped. names_to = "Year" specifies the name of the column that has the variable names, while values_to="Value" specifies the name of the column that has the values after pivoting.

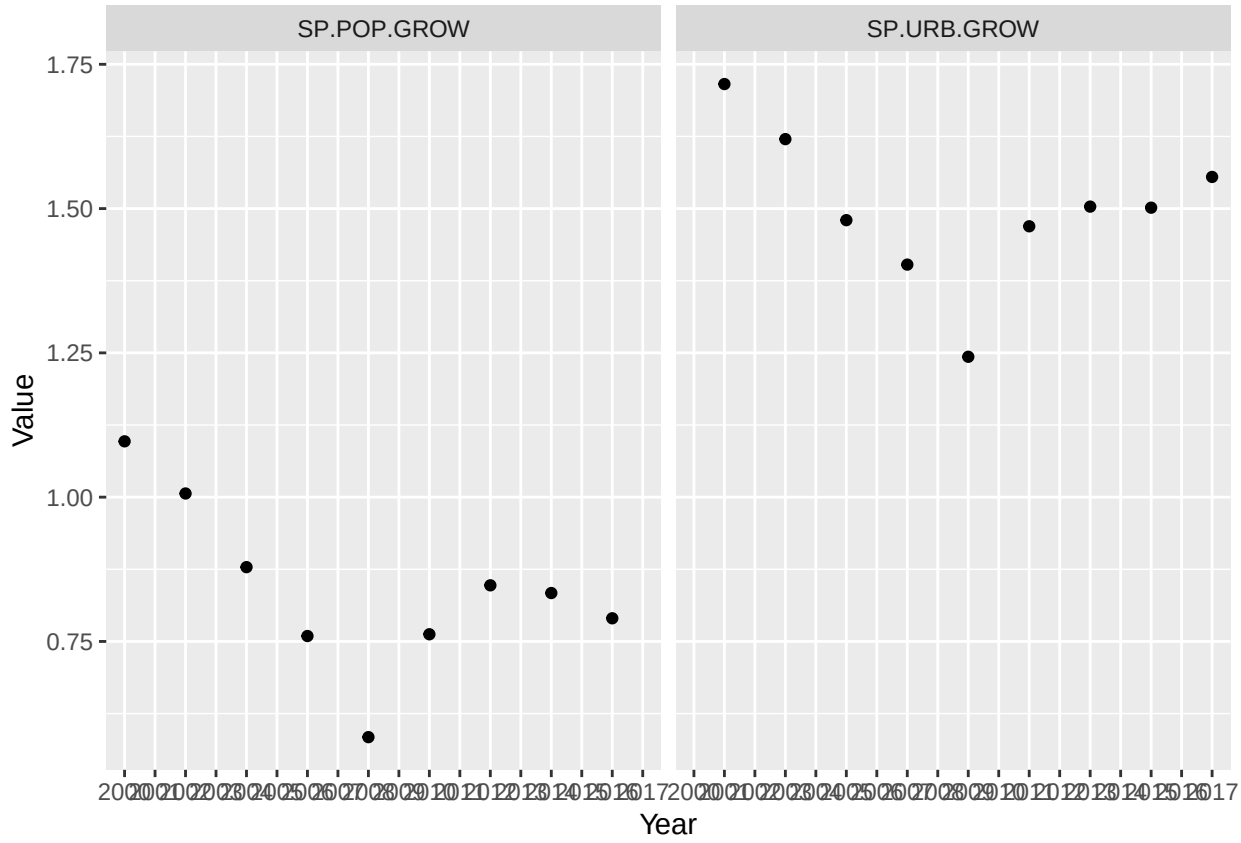
```
my_data2 %>%
  filter(country == "MMR") %>%
  ggplot(aes(Year, Value))+
  geom_point()
```



I have filtered the country "Myanmar" - code name "MMR", and plotted the year on the x-axis and values of population on y-axis. You can see three different dotted lines that represent different values by indicator.

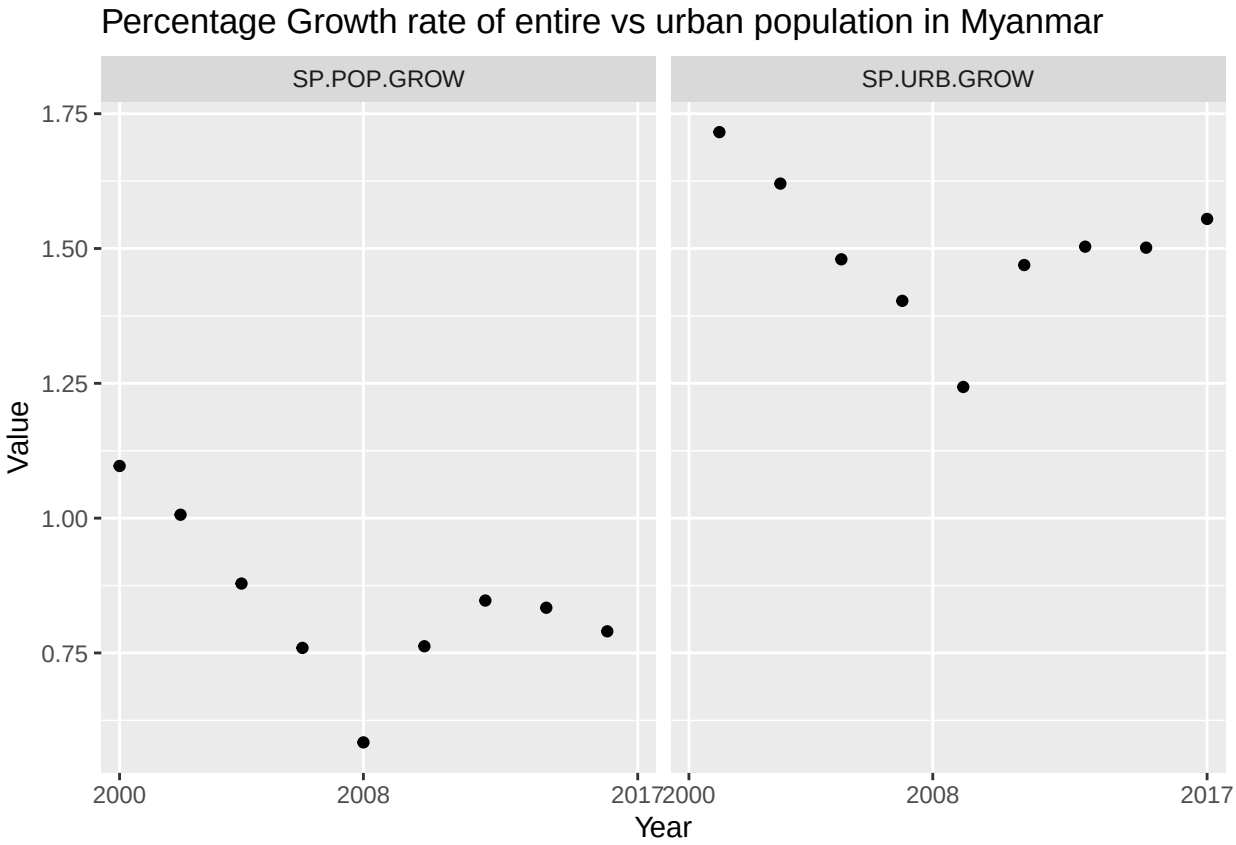
The thing that went wrong for two indicators namely SP.POP.GROW and SP.URB.GROW is that we plotted against very high numbers of SP.POP.TOTL and SP.URB.TOTL.

```
my_data2 %>%
  filter(country == "MMR", indicator == c("SP.POP.GROW", "SP.URB.GROW")) %>%
  ggplot(aes(Year, Value))+
  geom_point()+
  facet_wrap(~indicator)
```



By applying filter on two proportion value and facet_wrap() function, we can clearly see the scatter plot for the population in each year by each indicator type. But the labels on x-axis are overlapped.

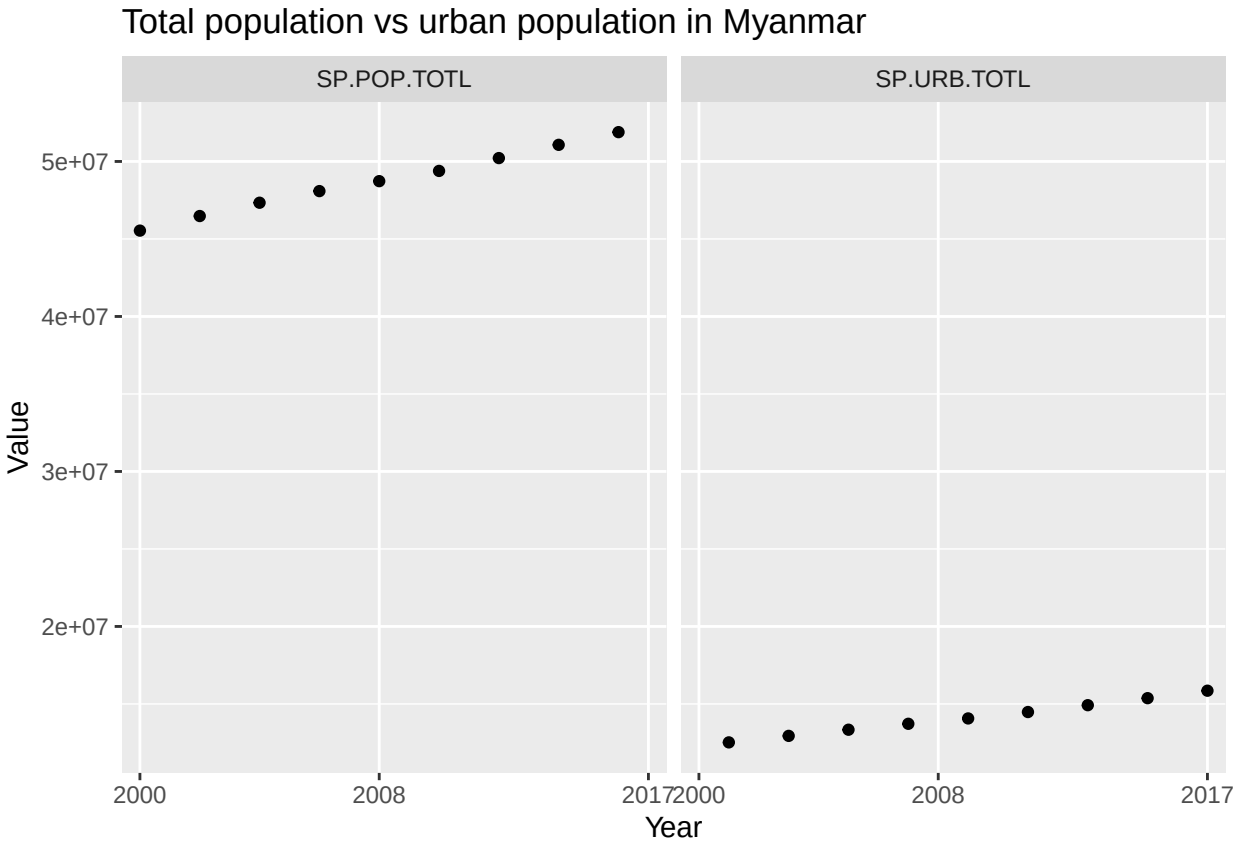
```
my_data2 %>%
  filter(country == "MMR", indicator == c("SP.POP.GROW", "SP.URB.GROW")) %>%
  ggplot(aes(Year, Value))+
  geom_point()+
  facet_wrap(~indicator)+
  scale_x_discrete(breaks = function(x) c(first(x), last(x), x[length(x) %/% 2]))+
  labs(title = "Percentage Growth rate of entire vs urban population in Myanmar")
```



By adding the scale_x_discrete(), we cleaned up the labels on x axis, by showing only the first, middle, and last labels. Note: since the labels are discrete, we use scale_x_discrete() instead of scale_x_continuous().

Let's go back to the population value SP.POP.TOTL and SP.URB.TOTL.

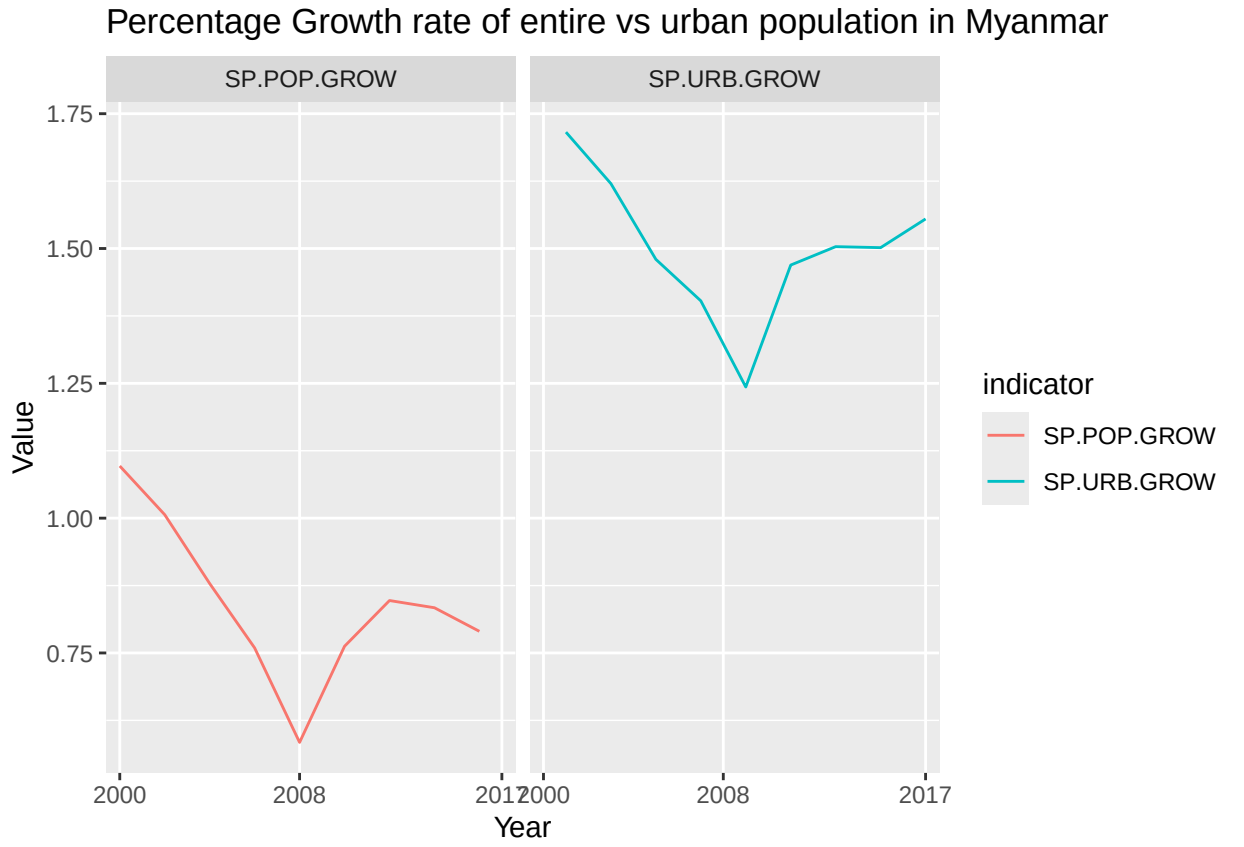
```
my_data2 %>%
  filter(country == "MMR", indicator == c("SP.POP.TOTL", "SP.URB.TOTL")) %>%
  ggplot(aes(Year, Value))+
  geom_point()+
  facet_wrap(~indicator)+
  scale_x_discrete(breaks = function(x) c(first(x), last(x), x[length(x) %/% 2]))+
  labs(title = "Total population vs urban population in Myanmar")
```



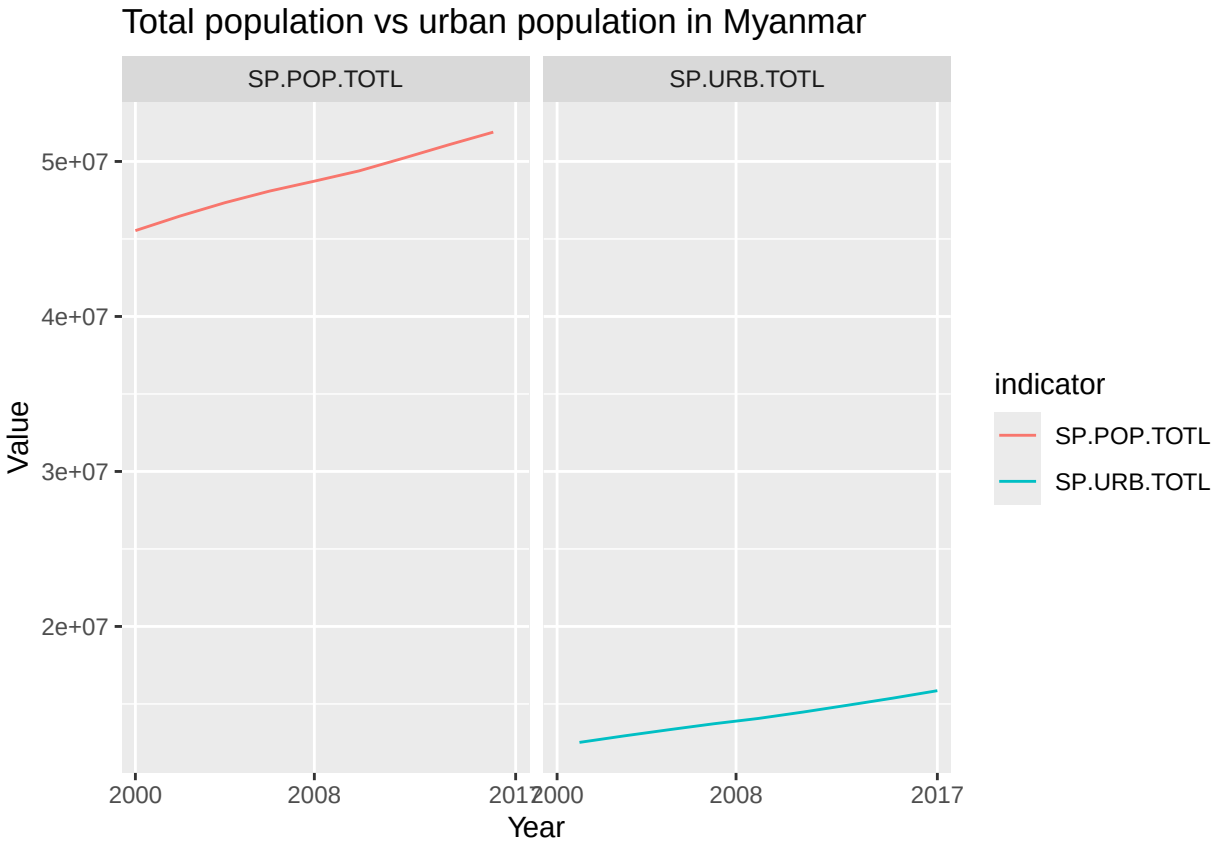
These graphs look great, let's try with line graphs.

By adding the group and color aesthetic in ggplot()function, different colors are denoted to values in each indicator graph.

```
my_data2 %>%
  filter(country == "MMR", indicator == c("SP.POP.GROW", "SP.URB.GROW")) %>%
  ggplot(aes(Year, Value, group = indicator, color = indicator)) +
  geom_line() +
  facet_wrap(~indicator) +
  scale_x_discrete(breaks = function(x) c(first(x), last(x), x[length(x) %/% 2]))+
  labs(title = "Percentage Growth rate of entire vs urban population in Myanmar")
```




```
my_data2 %>%
  filter(country == "MMR", indicator == c("SP.POP.TOTL", "SP.URB.TOTL")) %>%
  ggplot(aes(Year, Value, group = indicator, color = indicator)) +
  geom_line() +
  facet_wrap(~indicator) +
  scale_x_discrete(breaks = function(x) c(first(x), last(x), x[length(x) %/% 2]))+
  labs(title = "Total population vs urban population in Myanmar")
```



ASEAN Countries - SP.POP.TOTL

```
my_data_ASEAN <- my_data2 %>%
  filter(country %in% c("MMR", "BRN","KHM", "IDN", "LAO", "MYS",  "PHL", "SGP", "THA", "VNM"), indicato

head(my_data_ASEAN)
```

```
## # A tibble: 6 x 5
##   country indicator   Year   Value Population_m
##   <chr>   <chr>       <chr>  <dbl>        <dbl>
## 1 BRN     SP.POP.TOTL 2000  333926         0.33
## 2 BRN     SP.POP.TOTL 2001  340748         0.34
## 3 BRN     SP.POP.TOTL 2002  347463         0.35
## 4 BRN     SP.POP.TOTL 2003  354045         0.35
## 5 BRN     SP.POP.TOTL 2004  360461         0.36
## 6 BRN     SP.POP.TOTL 2005  366717         0.37
```

ASEAN Countries - SP.POP.TOTL from 2014 to 2017

```
my_data_ASEAN2014_7 <- my_data_ASEAN %>% filter( Year %in% c("2014", "2015", "2016", "2017"))

head(my_data_ASEAN2014_7)
```

```
## # A tibble: 6 x 5
##   country indicator   Year      Value Population_m
```

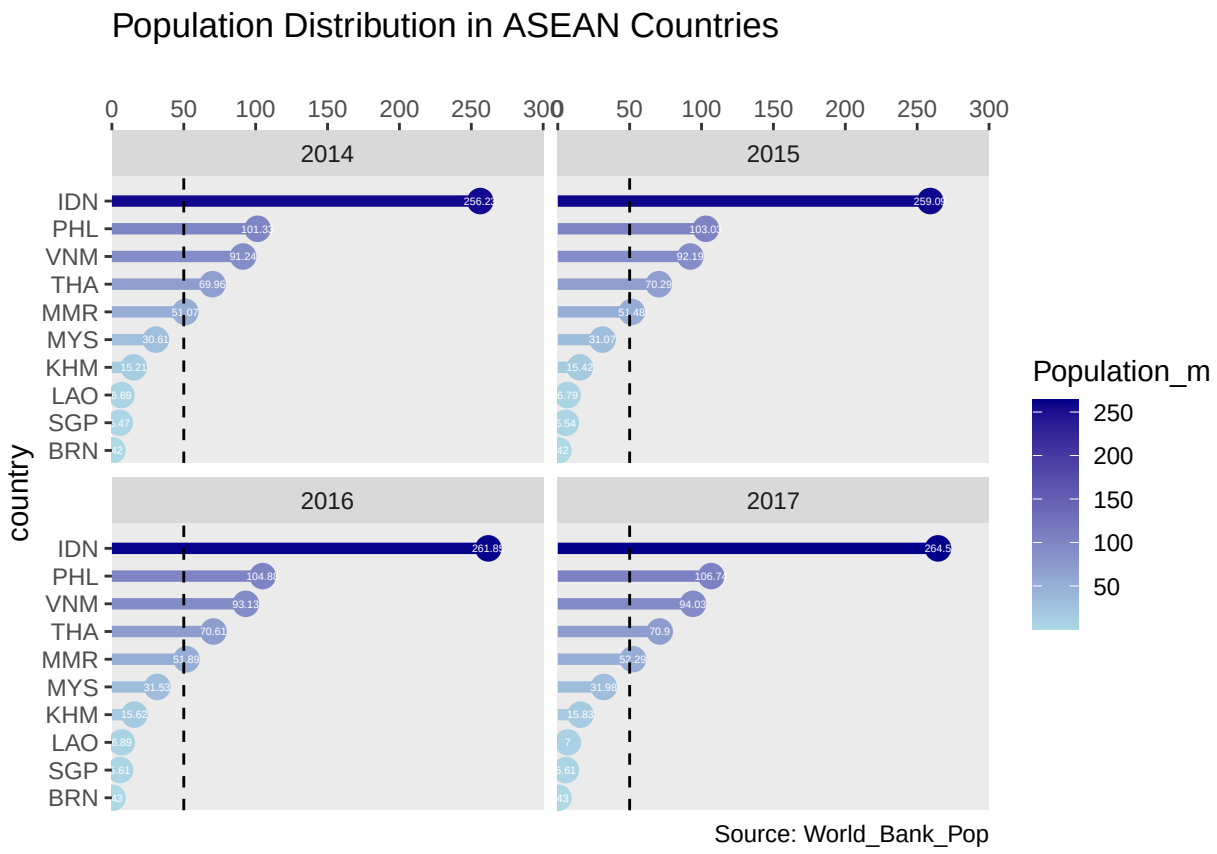
```
##   <chr>   <chr>       <chr>     <dbl>        <dbl>
## 1 BRN     SP.POP.TOTL 2014     416656         0.42
## 2 BRN     SP.POP.TOTL 2015     421437         0.42
## 3 BRN     SP.POP.TOTL 2016     425994         0.43
## 4 BRN     SP.POP.TOTL 2017     430276         0.43
## 5 IDN     SP.POP.TOTL 2014  256229761       256.
## 6 IDN     SP.POP.TOTL 2015  259091970       259.
```

Population Distribution in ASEAN Countries

```
# Reorder the country factor based on Population_m in descending order
my_data_ASEAN2014_7$country <- reorder(my_data_ASEAN2014_7$country, my_data_ASEAN2014_7$Population_m, FU

# Plot
my_data_ASEAN2014_7 %>%
  ggplot(aes(x = Population_m, y = country, color = Population_m)) +
  geom_point(size = 4) +
  geom_segment(aes(xend = 0, yend = country), size = 2) +
  geom_text(aes(label = round(Population_m, 2)), color = "white", size = 1.5) +
  geom_vline(xintercept = 50, color = "black", linetype = "dashed") +  # Add vertical line at Populatio
  scale_x_continuous(
    "",
    expand = c(0,0),
    limits = c(0, 300),
    breaks = seq(0, 300, by = 50),  # Set breaks by 50
    position = "top"
  ) +
  scale_y_discrete(expand = expansion(mult = c(0.05, 0.1))) +  # Add space on y-axis
  scale_color_gradientn(colors = c("lightblue", "darkblue")) +
  labs(
    title = "Population Distribution in ASEAN Countries",
    caption = "Source: World_Bank_Pop"
  ) +
  facet_wrap(~Year) +
  theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank()
  )
```

```
## Warning: Using ‘size‘ aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use ‘linewidth‘ instead.
## This warning is displayed once every 8 hours.
## Call ‘lifecycle::last_lifecycle_warnings()‘ to see where this warning was
## generated.
```



ASEAN Countries - SP.URB.TOTL from 2014 to 2017

```
my_data_ASEAN_URB <- my_data2 %>%
  filter(country %in% c("MMR", "BRN","KHM", "IDN", "LAO", "MYS",  "PHL", "SGP", "THA", "VNM"), indicato
```

Urban Population Distribution in ASEAN Countries

```
# Reorder the country factor based on Population_m in descending order
my_data_ASEAN_URB$country <- reorder(my_data_ASEAN_URB$country, my_data_ASEAN_URB$Urban_Pop_m, FUN = ma

# Plot
my_data_ASEAN_URB %>%
  ggplot(aes(x = Urban_Pop_m, y = country, color = Urban_Pop_m)) +
  geom_point(size = 4) +
  geom_segment(aes(xend = 0, yend = country), size = 2) +
  geom_text(aes(label = round(Urban_Pop_m, 2)), color = "white", size = 1.5) +
  geom_vline(xintercept = 25, color = "black", linetype = "dashed") +  # Add vertical line at Urban_Pop
  scale_x_continuous(
    "",
    expand = c(0,0),
    limits = c(0, 150),
    breaks = seq(0, 150, by = 25),  # Set breaks by 25
    position = "top"
  ) +
  scale_y_discrete(expand = expansion(mult = c(0.05, 0.1))) +  # Add space on y-axis
  scale_color_gradientn(colors = c("lightblue", "darkblue")) +
```

```
  labs(
    title = "Urban Population Distribution in ASEAN Countries",
    caption = "Source: World_Bank_Pop"
  ) +
  facet_wrap(~Year) +
  theme(
    panel.grid.major = element_blank(),
    panel.grid.minor = element_blank()
  )
```