

The summarize verb

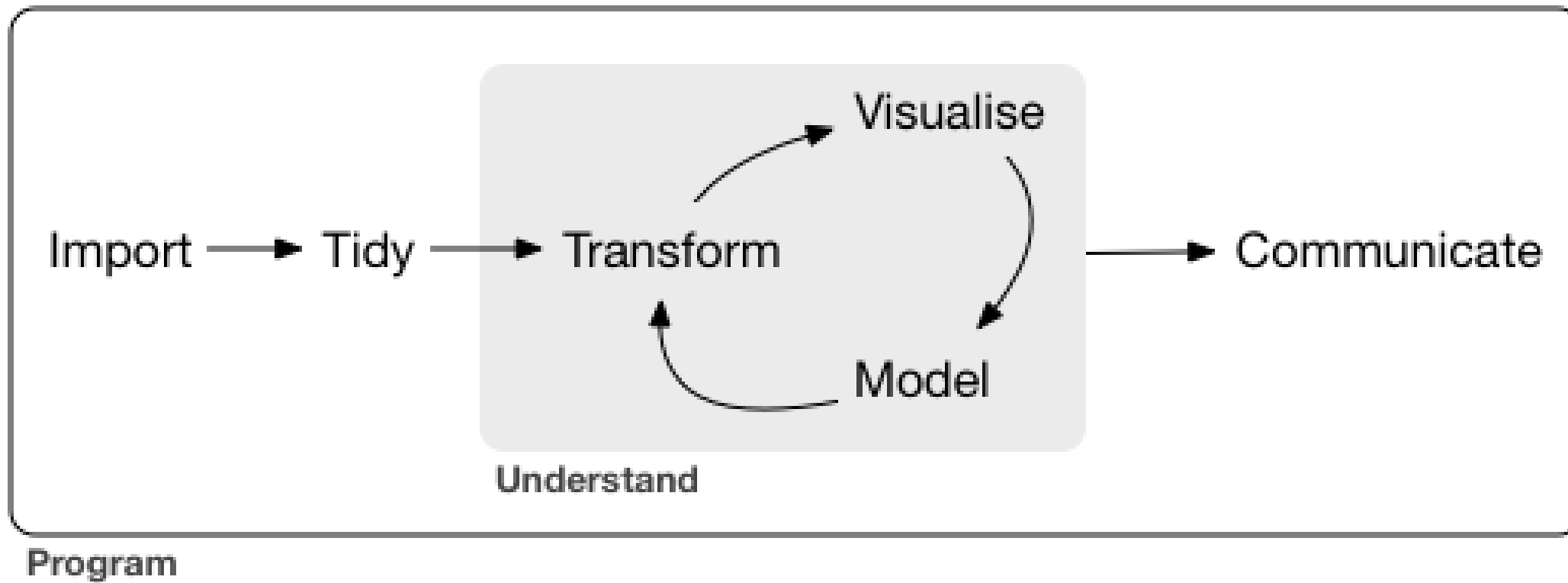
INTRODUCTION TO THE TIDYVERSE



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Data transformation and visualization



Extracting data

```
gapminder %>%  
  filter(country == "United States", year == 2007)
```

```
# A tibble: 1 x 6  
  country continent  year lifeExp      pop gdpPercap  
  <fctr>    <fctr> <int>   <dbl>    <dbl>    <dbl>  
1 United States Americas  2007  78.242 301139947 42951.65
```

The summarize verb

`summarize()` turns
many rows into one



```
gapminder %>%  
  summarize(meanLifeExp = mean(lifeExp))
```

```
# A tibble: 1 x 1  
  meanLifeExp  
    <dbl>  
1    59.47444
```

Summarizing one year

```
gapminder %>%  
  filter(year == 2007) %>%  
  summarize(meanLifeExp = mean(lifeExp))
```

```
# A tibble: 1 x 1  
  meanLifeExp  
      <dbl>  
1    67.00742
```

Summarizing into multiple columns

```
gapminder %>%  
  filter(year == 2007) %>%  
  summarize(meanLifeExp = mean(lifeExp),  
            totalPop = sum(pop))
```

```
# A tibble: 1 x 2  
  meanLifeExp totalPop  
      <dbl>      <dbl>  
1    67.00742 6251013179
```

Functions you can use for summarizing

- `mean`
- `sum`
- `median`
- `min`
- `max`

Let's practice!

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The group_by verb

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The summarize verb

```
gapminder %>%  
  filter(year == 2007) %>%  
  summarize(meanLifeExp = mean(lifeExp),  
            totalPop = sum(pop))
```

```
# A tibble: 1 x 2  
  meanLifeExp totalPop  
    <dbl>      <dbl>  
1   67.00742 6251013179
```

group_by() before
summarize() turns groups
into one row each



Summarizing by year

```
gapminder %>%  
  group_by(year) %>%  
  summarize(meanLifeExp = mean(lifeExp),  
            totalPop = sum(pop))
```

```
# A tibble: 12 x 3  
  year meanLifeExp totalPop  
  <int>      <dbl>    <dbl>  
1  1952    49.05762 2406957150  
2  1957    51.50740 2664404580  
3  1962    53.60925 2899782974  
4  1967    55.67829 3217478384  
5  1972    57.64739 3576977158  
6  1977    59.57016 3930045807  
7  1982    61.53320 4289436840  
8  1987    63.21261 4691477418  
9  1992    64.16034 5110710260  
10 1997    65.01468 5515204472  
11 2002    65.69492 5886977579  
12 2007    67.00742 6251013179
```

Summarizing by continent

```
gapminder %>%  
  filter(year == 2007) %>%  
  group_by(continent) %>%  
  summarize(meanLifeExp = mean(lifeExp),  
            totalPop = sum(pop))
```

```
# A tibble: 5 x 3  
  continent meanLifeExp totalPop  
  <fctr>      <dbl>      <dbl>  
1 Africa    48.86533 6187585961  
2 Americas  64.65874 7351438499  
3 Asia      60.06490 30507333901  
4 Europe    71.90369 6181115304  
5 Oceania   74.32621 212992136
```

Summarizing by continent and year

```
gapminder %>%  
  group_by(year, continent) %>%  
  summarize(totalPop = sum(pop),  
            meanLifeExp = mean(lifeExp))
```

```
# A tibble: 60 x 4  
# Groups:   year [?]  
   year continent totalPop meanLifeExp  
  <int>   <fctr>    <dbl>    <dbl>  
1  1952   Africa  237640501  39.13550  
2  1952 Americas  345152446  53.27984  
3  1952    Asia  1395357351  46.31439  
4  1952   Europe  418120846  64.40850  
5  1952  Oceania  10686006   69.25500  
6  1957   Africa  264837738  41.26635  
7  1957 Americas  386953916  55.96028  
8  1957    Asia  1562780599  49.31854  
9  1957   Europe  437890351  66.70307  
10 1957  Oceania  11941976   70.29500  
# ... with 50 more rows
```

Let's practice!

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Visualizing summarized data

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Summarizing by year

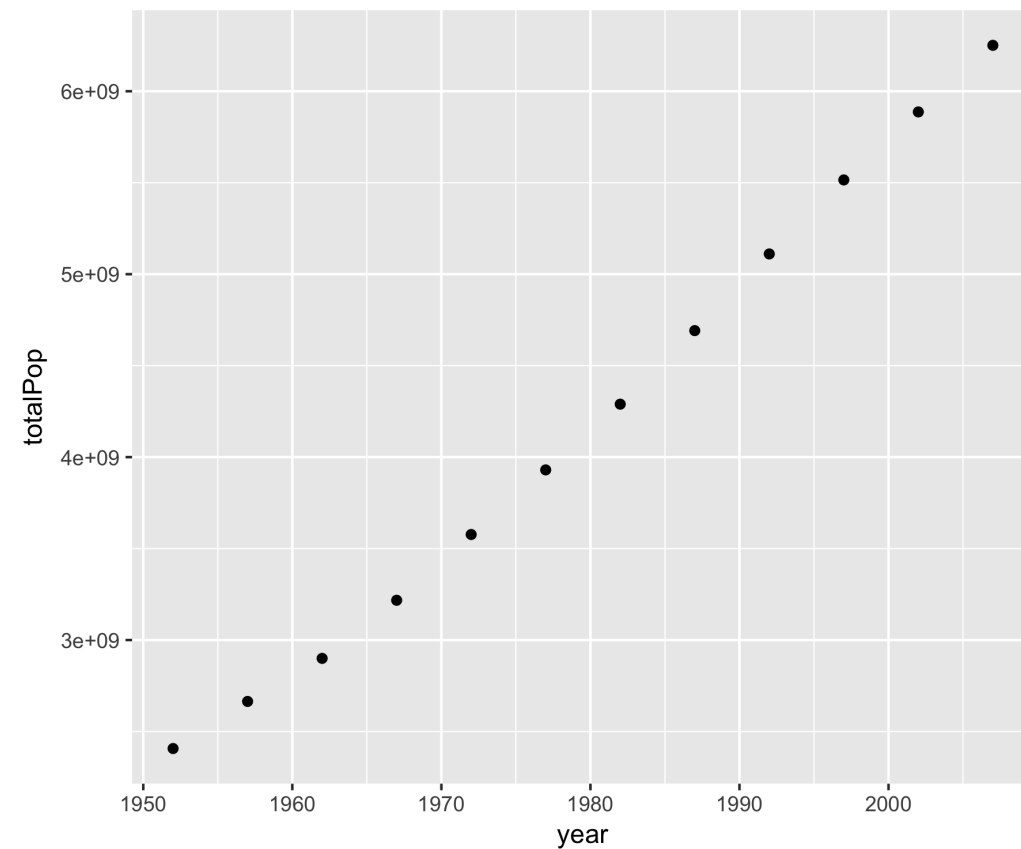
```
by_year <- gapminder %>%  
  group_by(year) %>%  
  summarize(totalPop = sum(pop),  
            meanLifeExp = mean(lifeExp))
```

```
by_year
```

```
# A tibble: 12 x 3  
  year  totalPop meanLifeExp  
  <int>    <dbl>    <dbl>  
1  1952 2406957150    49.05762  
2  1957 2664404580    51.50740  
3  1962 2899782974    53.60925  
4  1967 3217478384    55.67829  
5  1972 3576977158    57.64739  
6  1977 3930045807    59.57016  
7  1982 4289436840    61.53320  
8  1987 4691477418    63.21261  
9  1992 5110710260    64.16034  
10 1997 5515204472    65.01468  
11 2002 5886977579    65.69492  
12 2007 6251013179    67.00742
```

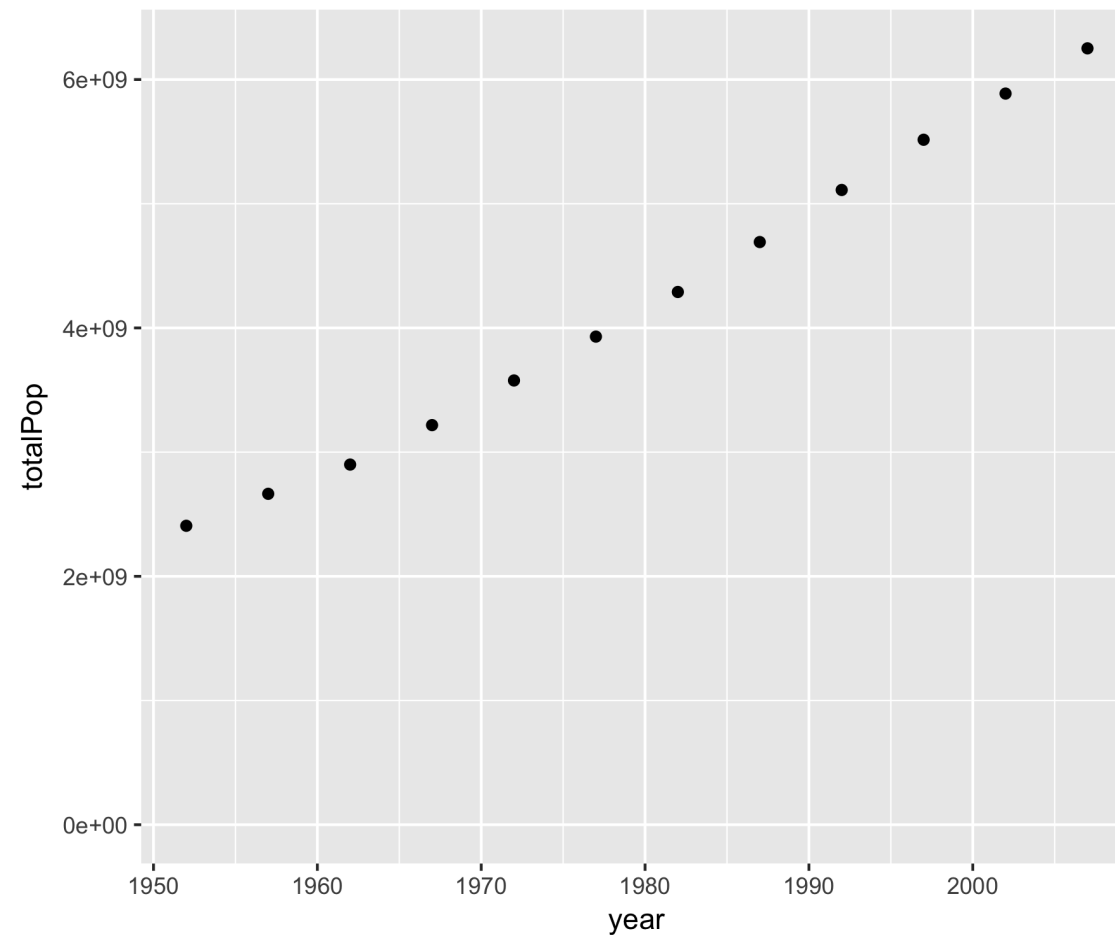

Visualizing population over time

```
ggplot(by_year, aes(x = year, y = totalPop)) +  
  geom_point()
```



Starting y-axis at zero

```
ggplot(by_year, aes(x = year, y = totalPop)) +  
  geom_point() +  
  expand_limits(y = 0)
```



Summarizing by year and continent

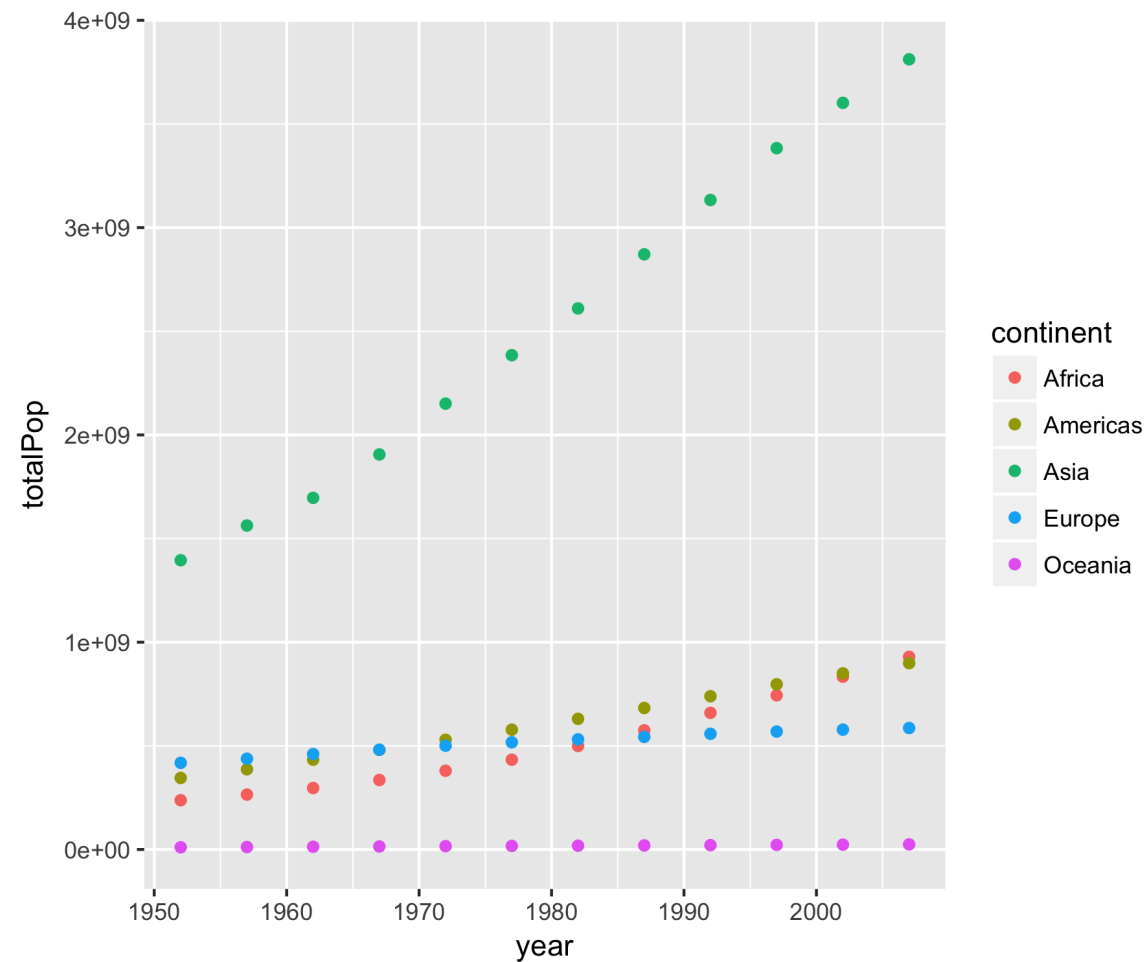
```
by_year_continent <- gapminder %>%  
  group_by(year, continent) %>%  
  summarize(totalPop = sum(pop),  
            meanLifeExp = mean(lifeExp))
```

```
by_year_continent
```

```
# A tibble: 60 x 4  
# Groups:   year [?]  
   year continent  totalPop meanLifeExp  
  <int>   <fctr>      <dbl>      <dbl>  
1  1952   Africa  237640501    39.13550  
2  1952 Americas  345152446    53.27984  
3  1952    Asia  1395357351    46.31439  
4  1952   Europe  418120846    64.40850  
5  1952  Oceania   10686006    69.25500  
6  1957   Africa  264837738    41.26635  
7  1957 Americas  386953916    55.96028  
8  1957    Asia  1562780599    49.31854  
9  1957   Europe  437890351    66.70307  
10 1957  Oceania  11941976    70.29500  
# ... with 50 more rows
```

Visualizing population by year and continent

```
ggplot(by_year_continent, aes(x = year, y = totalPop, color = continent)) +  
  geom_point() +  
  expand_limits(y = 0)
```



Let's practice!

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