

Introduction to R Workshop

Session 1
Sean Nguyen



MSU > **BEST**

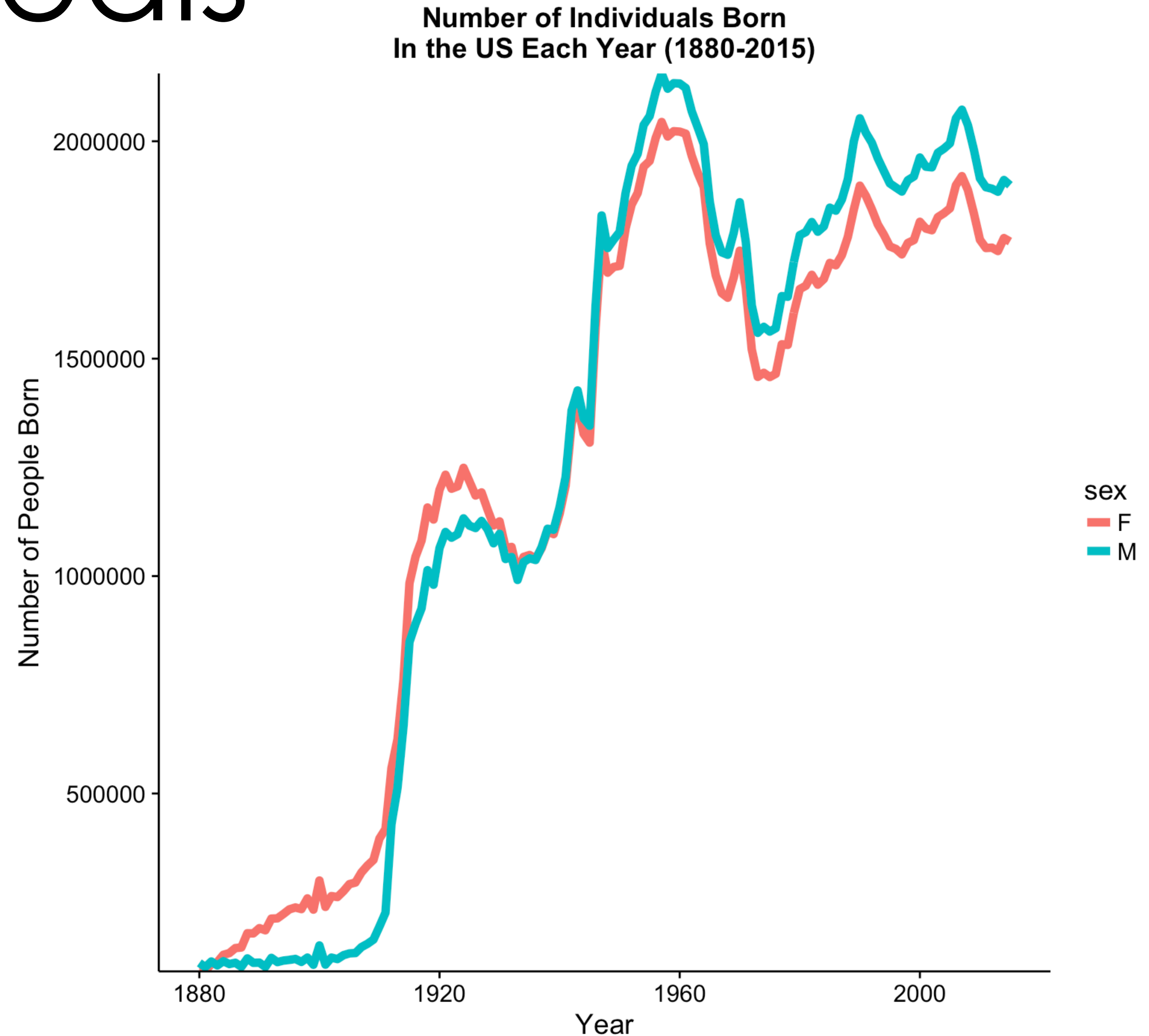
Broadening Experiences in Scientific Training



MICHIGAN STATE
DATA SCIENCE

Session 1: Goals

- **Install** R and Rstudio
- **Import** packages
- **Explore** a dataset
- **Visualize** data



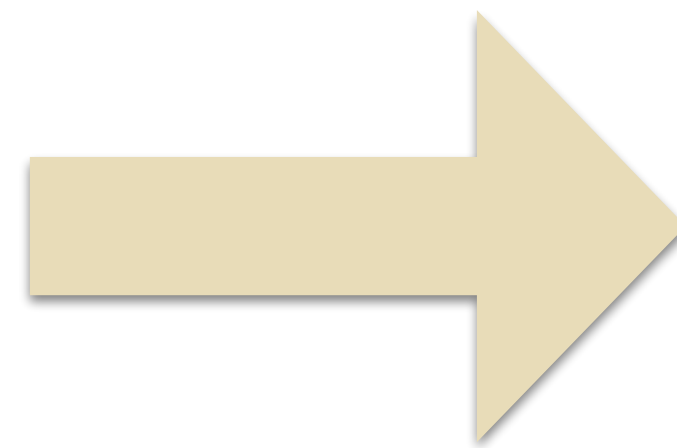
Programming language for statistical computing



R is good for:
reproducible
analysis



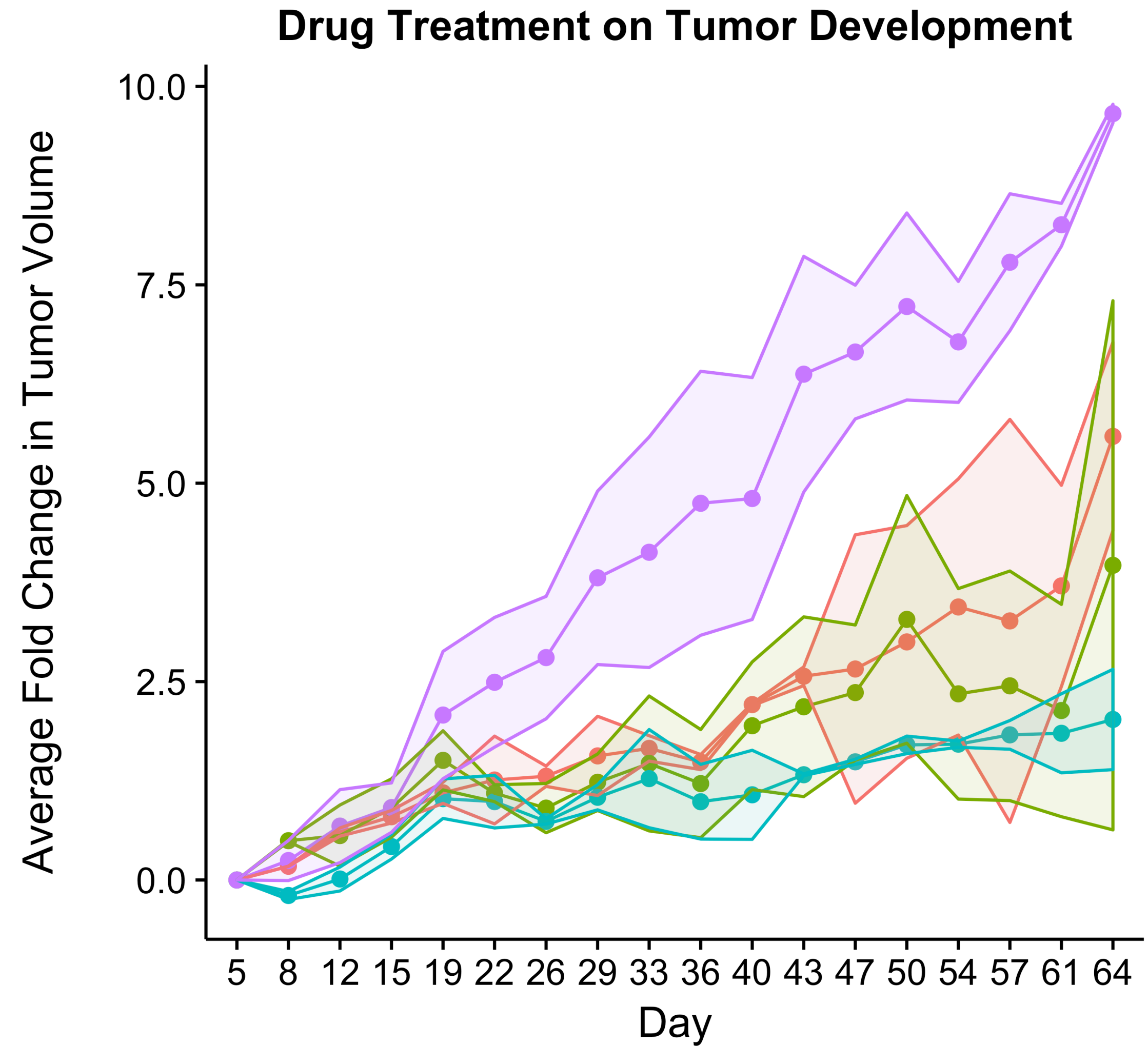
Raw data



Analyzed data

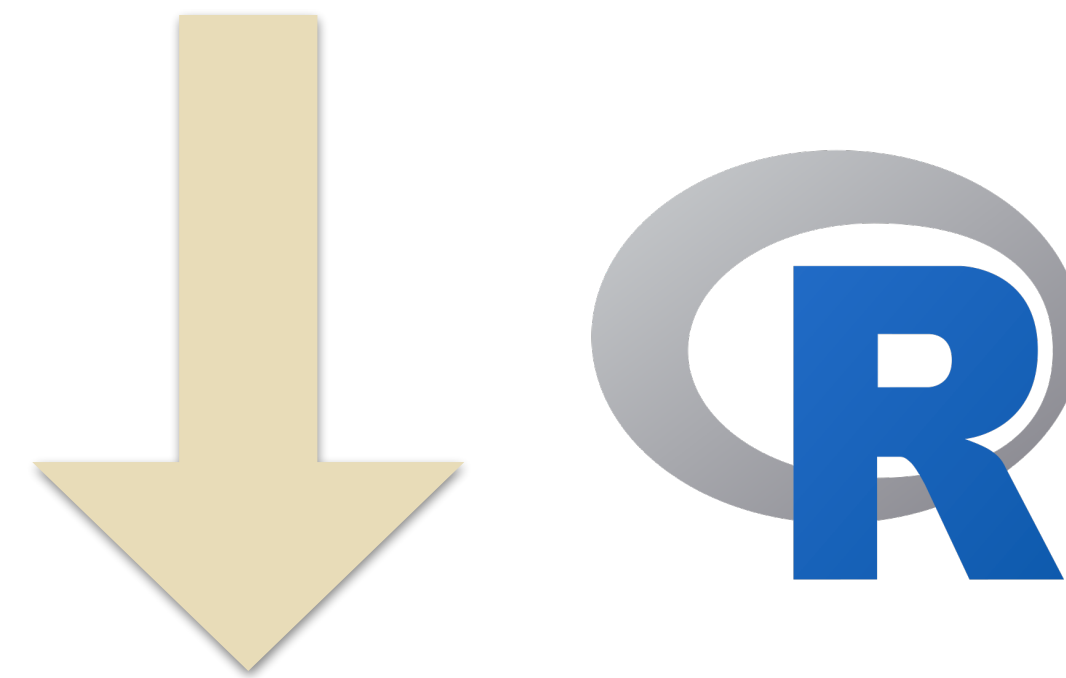
R is good for:
generating
beautiful figures

Raw data



R is good for:
calculating
statistics

Raw data



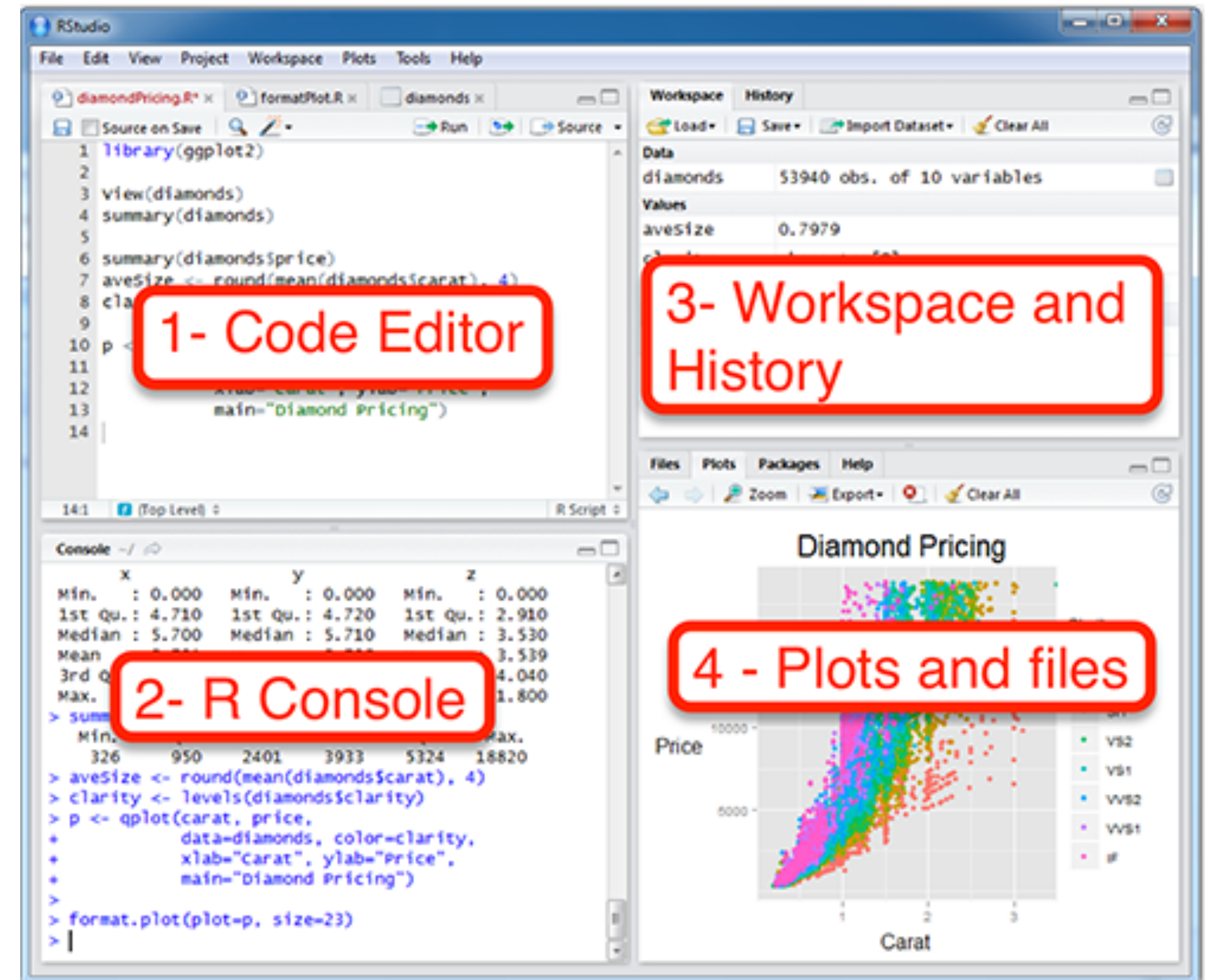
```
ANOVA <- aov(mean~(Organism*Treatment),data=data4)
tidy(ANOVA)
```

term <chr>	df <dbl>	sumsq <dbl>	meansq <dbl>	statistic <dbl>	p.value <dbl>
Organism	2	26807.853	13403.9267	43.48849	3.176012e-06
Treatment	1	21687.502	21687.5022	70.36422	2.306759e-06
Organism:Treatment	2	16466.031	8233.0156	26.71168	3.807941e-05
Residuals	12	3698.613	308.2178	NA	NA

4 rows



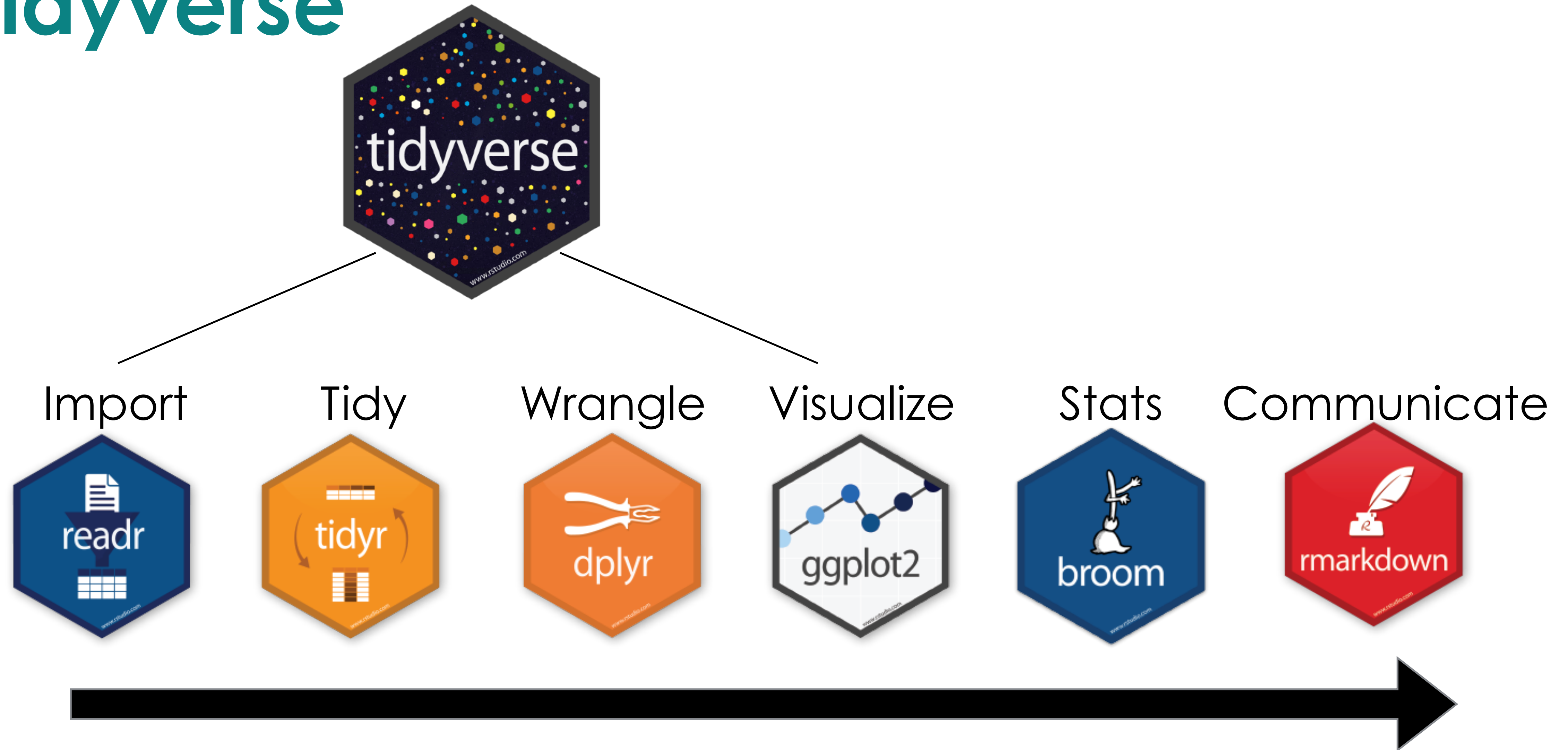
Integrated development
environment (IDE) for easy
creation and organization
of R scripts



Packages are:
a collection of
useful functions



Data Analysis in the Tidyverse



Data Analysis in the Tidyverse

Import



Tidy



Wrangle



`filter()`
`group_by()`
`arrange()`
`summarise()`

Visualize



`ggplot()`
`geom_line()`
`geom_bar()`
`geom_point()`

Stats



Communicate



Install packages



Package - Collection of R functions

- Only install once
- Load them each time you run a script

tidyverse, babynames, cowplot

	year	sex	name	n	prop
1	1880	F	Mary	7065	0.0723843285
2	1880	F	Anna	2604	0.0266792345
3	1880	F	Emma	2003	0.0205216999
4	1880	F	Elizabeth	1939	0.0198659891
5	1880	F	Minnie	1746	0.0178886111
6	1880	F	Margaret	1578	0.0161673702
7	1880	F	Ida	1472	0.0150813491
8	1880	F	Alice	1414	0.0144871112
9	1880	F	Bertha	1320	0.0135240359
10	1880	F	Sarah	1288	0.0131961805
11	1880	F	Annie	1258	0.0128888160
12	1880	F	Clara	1226	0.0125609606

The Assignment Operator

- Assigns value to an **object**

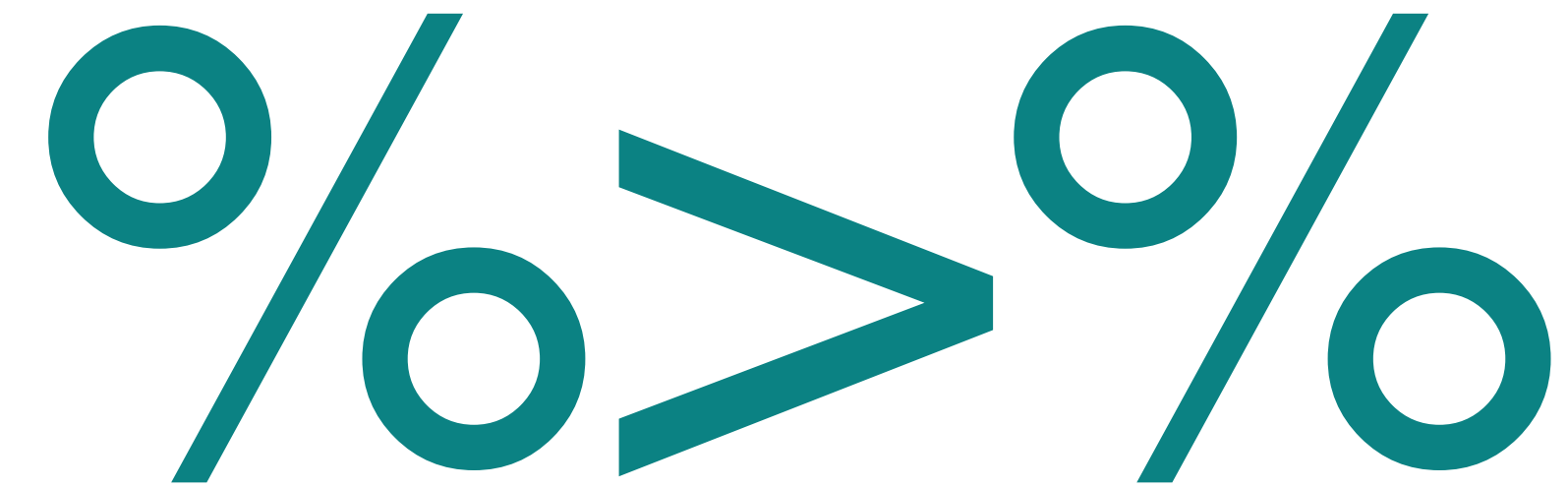


x <- 4

x

> 4

Pipe operator



- Interpreted as “**then**”

Fruit	Count
Apple	34
Raspberry	67
Pear	35
Plum	27
Peach	5
Strawberry	2
Melon	97
Mango	5

data %>%

filter(Fruit == “Raspberry”)

Fruit	Count
Raspberry	67

dplyr - clean up/aggregate data

- **filter()**
- **arrange()**
- **group_by()**
- **summarize()**



`filter()`- picks rows based on values



`filter(Fruit == "Raspberry")`

Fruit	Count
Apple	34
Raspberry	67
Pear	35
Plum	27
Peach	5
Strawberry	2
Melon	97
Mango	5

Fruit	Count
Raspberry	67

`filter(Count < 10)`

Fruit	Count
Peach	5
Strawberry	2
Mango	5



arrange()- changes row order

Fruit	Count
Apple	34
Raspberry	67
Pear	35
Plum	27
Peach	5
Strawberry	2
Melon	97
Mango	5

arrange(desc(Count))

Fruit	Count
Melon	97
Raspberry	67
Pear	35
Apple	34
Mango	5
Peach	5



- **group_by()**- 'lock-in' by certain criteria
- **summarize()** - reduce multiple values to a single value

Cat	Fruit	Count
1	Apple	34
1	Raspberry	67
1	Pear	35
1	Plum	27
2	Peach	5
2	Strawberry	2
2	Melon	97
2	Mango	5

data %>%

group_by(Cat) %>%

summarize(Total = sum(Count))

Cat	Total
1	163
2	109

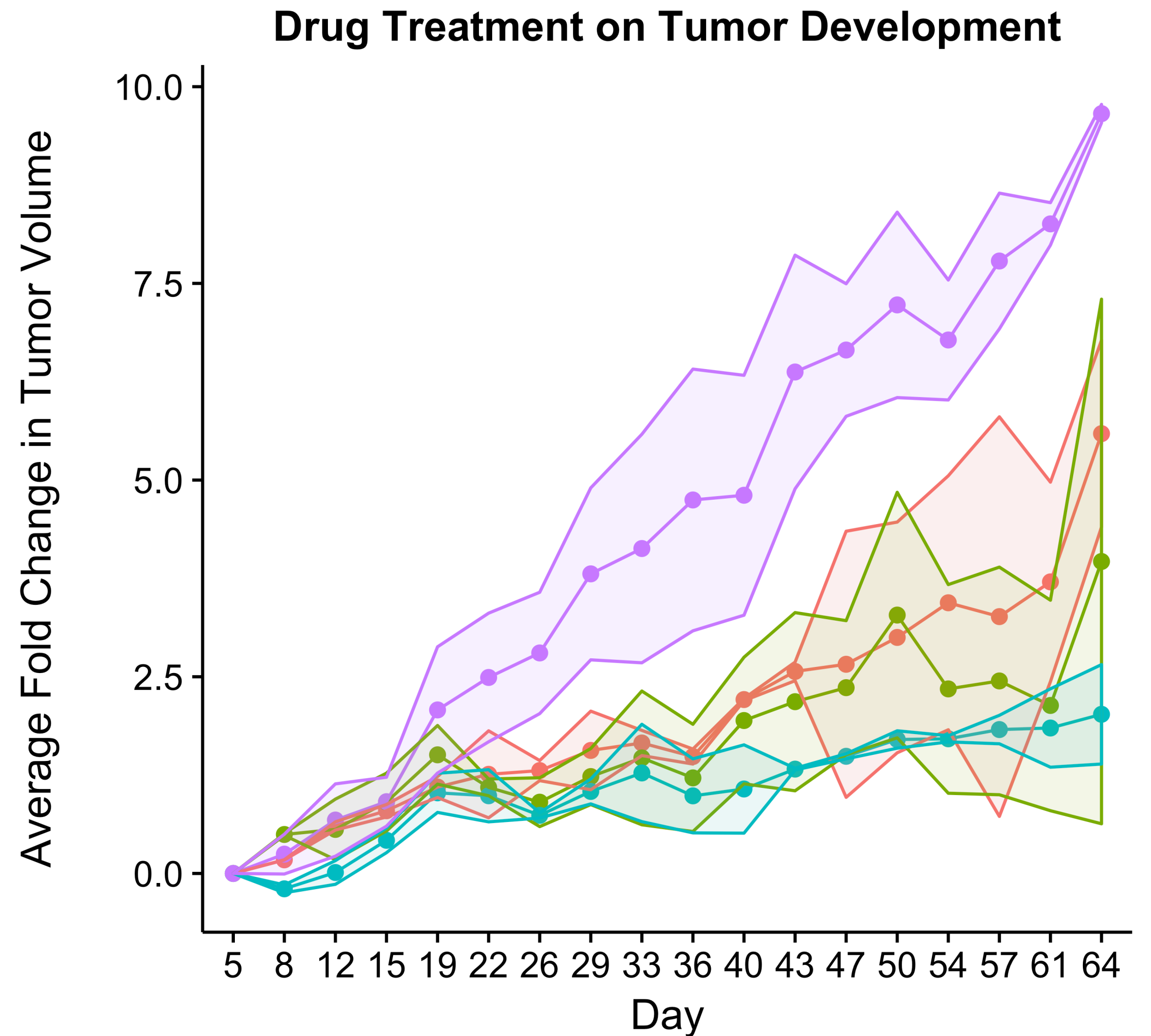
dplyr - clean up/aggregate data

- **filter()**- picks **rows** based on values
- **arrange()**- changes **row order**
- **group_by()**- '**lock-in**' by certain criteria
- **summarize()** - **reduce** multiple values to a **single value**



ggplot2

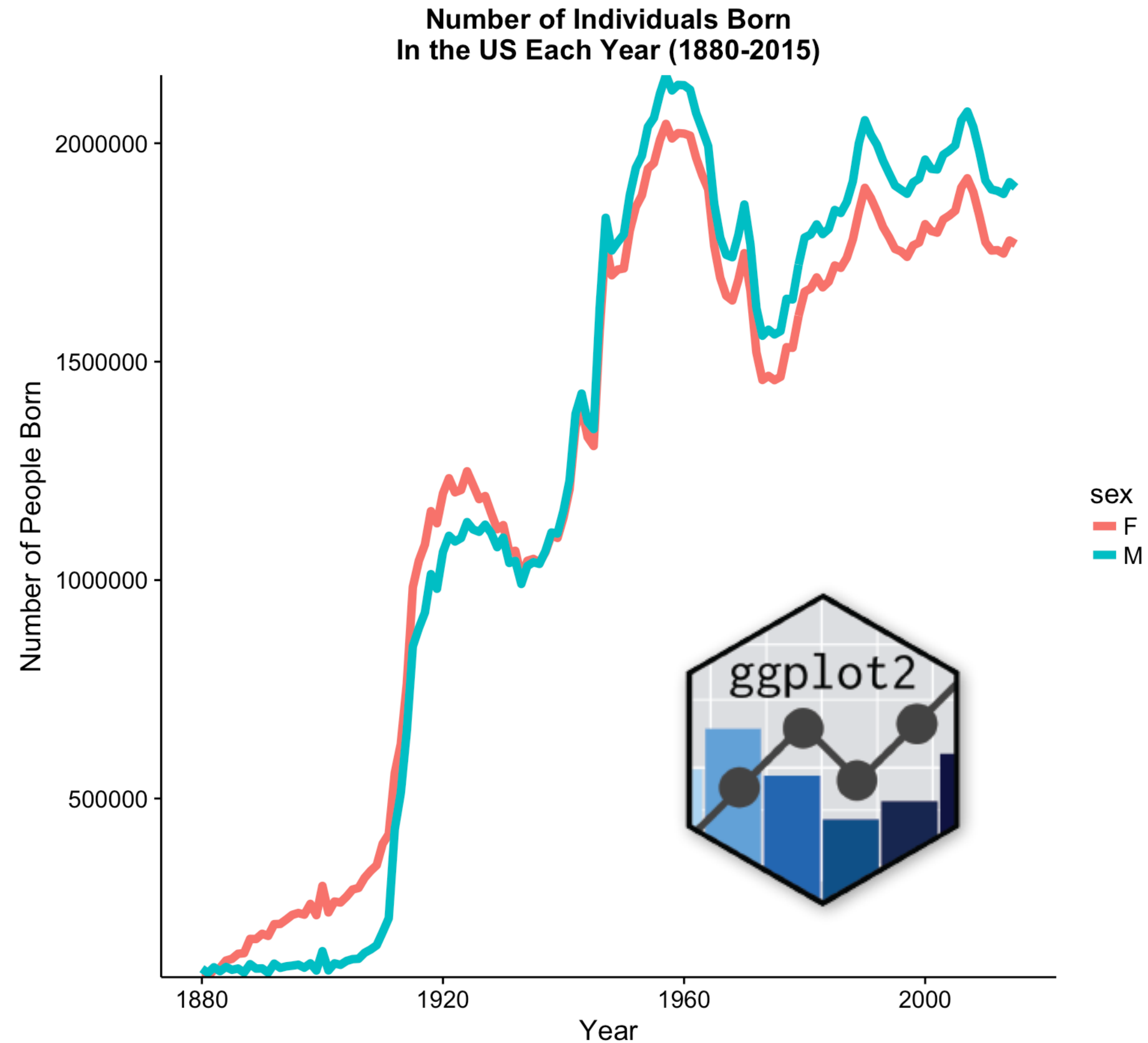
**Powerful graphing package
for generating high quality
figures based on the
grammar of graphics**



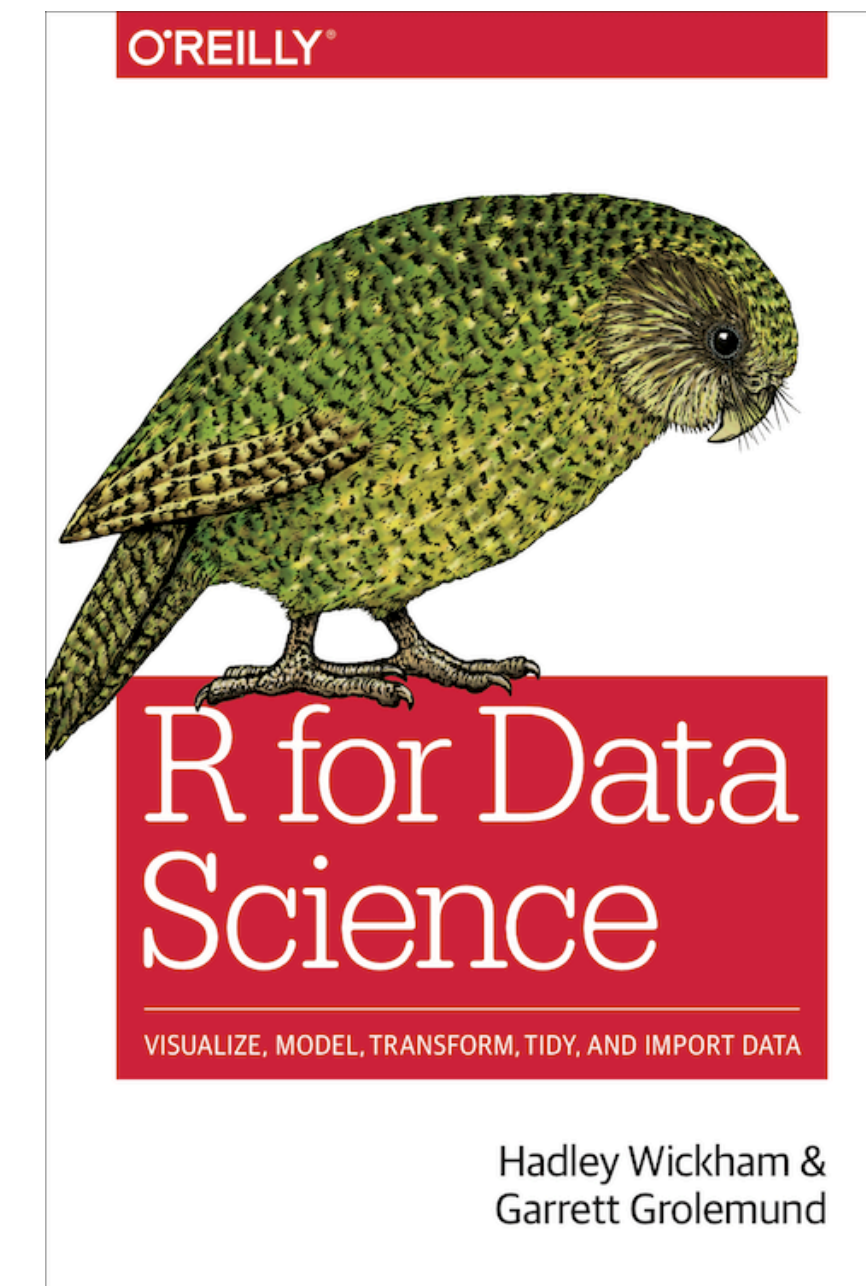
ggplot2

```
data %>%  
  ggplot(aes( x = year,  
              y = n,  
              color = sex)) +  
  geom_line()
```

	year	sex	name	n	prop
1	1880	F	Mary	7065	0.0723843285
2	1880	F	Anna	2604	0.0266792345
3	1880	F	Emma	2003	0.0205216999
4	1880	F	Elizabeth	1939	0.0198659891
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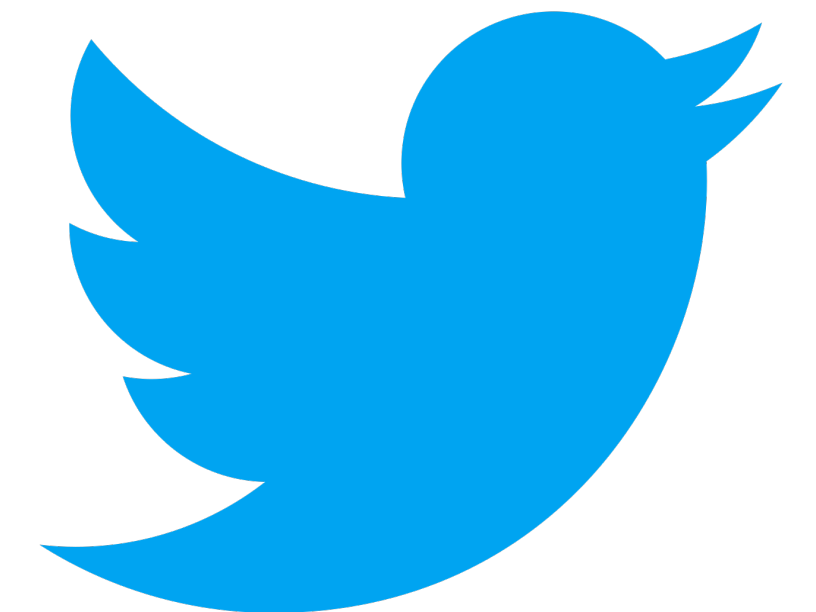
Resources



GitHub



stackoverflow



Demo!

Try to determine:

- Total number of babies born between 1980:1990
- Total number of males and females named “Frankie”
 - Graph it!
- Determine if you or your partners have a more popular name
 - Graph it!

