

# STAT UN1201 – Chapter 1

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# Waitlist

1. The waitlist moves in order as places open up.
2. Course materials are available here during change of program period: <http://github.com/jtr13/1201>
3. It is strongly advised to keep up with the material if you are trying to get in the class.

EVERYONE: Once you've made a decision not to take the class, please be considerate and drop it from your schedule.

# Very brief course outline

- Descriptive statistics (Chapter 1)
- Probability (Chapters 2 - 5)
- Inferential statistics (Chapters 6 - 9, 12 - 13)

# Descriptive statistics

- numerical summaries: mean, median, etc.
- graphical summaries

# Anscombe's Quartet

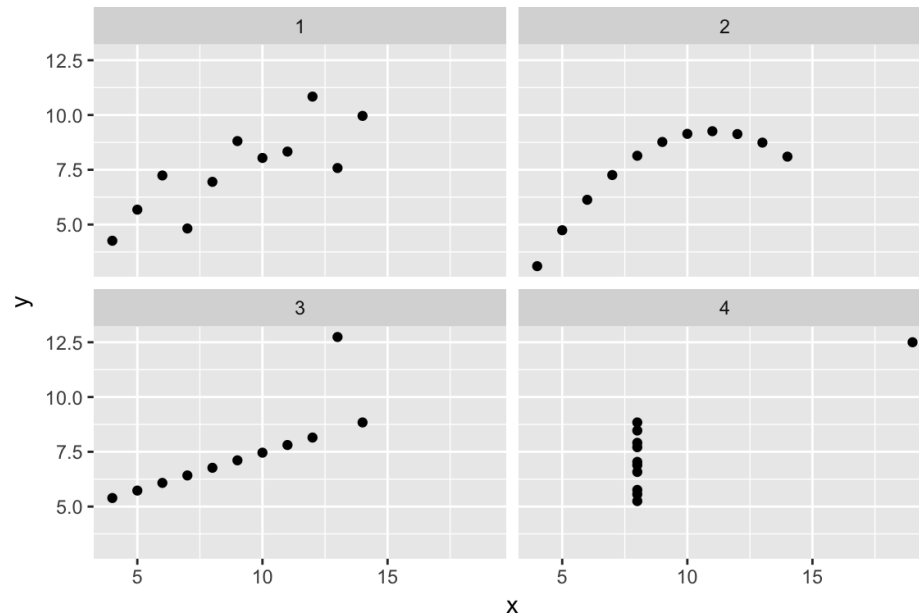
<b>x1</b>	<b>x2</b>	<b>x3</b>	<b>x4</b>	<b>y1</b>	<b>y2</b>	<b>y3</b>	<b>y4</b>
10	10	10	8	8.04	9.14	7.46	6.58
8	8	8	8	6.95	8.14	6.77	5.76
13	13	13	8	7.58	8.74	12.74	7.71
9	9	9	8	8.81	8.77	7.11	8.84
11	11	11	8	8.33	9.26	7.81	8.47
14	14	14	8	9.96	8.10	8.84	7.04
6	6	6	8	7.24	6.13	6.08	5.25
4	4	4	19	4.26	3.10	5.39	12.50
12	12	12	8	10.84	9.13	8.15	5.56
7	7	7	8	4.82	7.26	6.42	7.91
5	5	5	8	5.68	4.74	5.73	6.89

# Anscombe's Quartet, numerical summaries

For each of the four data sets:

- Number of observations  $(n) = 11$
- Mean of the  $x$ 's  $(\bar{x}) = 9.0$
- Mean of the  $y$ 's  $(\bar{y}) = 7.6$
- Equation of the regression line:  $y = 3 + 0.5x$

# Anscombe's Quartet, graphical analysis



# Collecting data

**CITYREALTY**  
NEW YORK CITY REAL ESTATE

SEARCH NYC APARTMENTS MARKET REPORTS

MANHATTAN BROOKLYN QUEENS & BRONX

SEARCH BY MAP ADVANCED SEARCH

**UPPER EAST SIDE**

- ☐ Park/Fifth Ave. to 79th St.
- ☐ Lenox Hill
- ☐ Carnegie Hill
- ☐ Yorkville
- ☐ Roosevelt Island

**UPPER WEST SIDE**

- ☐ Broadway Corridor
- ☐ Central Park West
- ☐ Lincoln Center
- ☒ Morningside Heights
- ☐ Riverside Dr./West End Ave.

**MIDTOWN**

- ☐ Beekman/Sutton Place
- ☐ Midtown East
- ☐ Murray Hill
- ☐ Turtle Bay/United Nations
- ☐ Midtown West

**FINANCIAL DISTRICT/BPC**

- ☐ Battery Park City
- ☐ Financial District

**DOWNTOWN**

- ☐ Chelsea
- ☐ Gramercy Park
- ☐ Greenwich Village
- ☐ East Village
- ☐ West Village
- ☐ Lower East Side
- ☐ NoLiTa/Little Italy
- ☐ NoHo
- ☐ SoHo
- ☐ Tribeca
- ☐ Flatiron/Union Square
- ☐ Stuyvesant Town / PCV

**UPPER MANHATTAN**

- ☐ Harlem
- ☐ East Harlem
- ☐ Washington Heights
- ☐ Inwood
- ☐ Hamilton Heights

**ALL MANHATTAN**

SALES RENTALS

PRICE RANGE: \$100K - \$50M+

BEDROOMS Select (1)




TYPE Select

VIEW LISTINGS →



# Collecting data

HIDE ALL PHOTOS SHOW ALL PHOTOS

ADDRESS	TYPE	NEIGHBORHOOD	BEDS / BATH / SIZE	PRICE	PRICE/FT <sup>2</sup>	LISTED
395 Riverside Drive, #4E 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$799K	-	Feb 22, 2016
390 Riverside Drive, #4G 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 800 ft <sup>2</sup>	\$745K	\$931	Jul 19, 2016
380 Riverside Drive, #8L 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 700 ft <sup>2</sup>	\$725K	\$1,036	Sep 06, 2016
535 West 110th Street, #6B 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 750 ft <sup>2</sup>	\$725K	\$967	Sep 07, 2016
535 West 110th Street, #6A 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 750 ft <sup>2</sup>	\$699K (-4%  )	\$933	Apr 26, 2016
395 Riverside Drive, #2D 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 900 ft <sup>2</sup>	\$699K	\$777	Mar 03, 2016
528 West 111th Street, #24 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$675K (-6.9%  )	-	Apr 15, 2015
545 West 111th Street, #9N 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 650 ft <sup>2</sup>	\$665K (-9.5%  )	\$1,023	Mar 30, 2016
380 Riverside Drive, #6B 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$599K	-	Oct 07, 2015
80 La Salle Street, #20C 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$545K	-	May 19, 2016
609 West 114th Street, #36 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 600 ft <sup>2</sup>	\$535K	\$892	Jun 22, 2016
80 La Salle Street, #21B 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 725 ft <sup>2</sup>	\$535K	\$738	May 04, 2016
80 La Salle Street, #14D 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$529K	-	Apr 14, 2016
175 Claremont Avenue, #3 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba	\$499K (-9.3%  )	-	Mar 30, 2016
3117 Broadway, #56 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 500 ft <sup>2</sup>	\$450K	\$900	Jun 28, 2016

FEATURED NEW DEVELOPMENTS



510 West 123rd Street, #36 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 700 ft <sup>2</sup>	\$450K	\$643	Jul 02, 2016
3115 Broadway, #43 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 650 ft <sup>2</sup>	\$425K	\$654	Apr 18, 2016
3115 Broadway, #42 	<a href="#">CO-OP</a>	Morningside Heights	1 bd / 1 ba / 650 ft <sup>2</sup>	\$379K (-5%  )	\$583	Mar 28, 2016

# Cleaning / organizing data

	A	B	C	D	E	F	G	H	
1		ADDRESS	TYPE	NEIGHBORHOOD	BEDS / BATH	PRICE	PRICE/FT2	LISTED	
2	+								
3	3115 Broadw	CO-OP							
4	Morningside	1 bd / 1 ba /	\$379K	\$583	28-Mar-16				
5	+								
6	3115 Broadw	CO-OP							
7	Morningside	1 bd / 1 ba /	\$425K	\$654	18-Apr-16				
8	+								
9	510 West 12	CO-OP							
10	Morningside	1 bd / 1 ba /	\$450K	\$643	2-Jul-16				
11	+								
12	3117 Broadw	CO-OP							
13	Morningside	1 bd / 1 ba /	\$450K	\$900	28-Jun-16				
14	+								
15	175 Claremo	CO-OP							
16	Morningside	1 bd / 1 ba	\$499K	-	30-Mar-16				
17	+								
18	80 La Salle St	CO-OP							
19	Morningside	1 bd / 1 ba	\$529K	-	14-Apr-16				

# Cleaning / organizing data

	A	B	C	D
1	Address		Price	IntPrice
2	3115 Broadway, #42	1 bd / 1 ba / 650 ft2	\$379K	379
3	3115 Broadway, #43	1 bd / 1 ba / 650 ft2	\$425K	425
4	3117 Broadway, #56	1 bd / 1 ba / 500 ft2	\$450K	450
5	510 West 123rd Street, #38	1 bd / 1 ba / 700 ft2	\$450K	450
6	175 Claremont Avenue, #3	1 bd / 1 ba	\$499K	499
7	80 La Salle Street, #14D	1 bd / 1 ba	\$529K	529
8	609 West 114th Street, #36	1 bd / 1 ba / 600 ft2	\$535K	535
9	80 La Salle Street, #21B	1 bd / 1 ba / 725 ft2	\$535K	535
10	80 La Salle Street, #20C	1 bd / 1 ba	\$545K	545
11	380 Riverside Drive, #6B	1 bd / 1 ba	\$599K	599
12	545 West 111th Street, #9N	1 bd / 1 ba / 650 ft2	\$665K	665
13	528 West 111th Street, #24	1 bd / 1 ba	\$675K	675
14	535 West 110th Street, #6A	1 bd / 1 ba / 750 ft2	\$699K	699
15	395 Riverside Drive, #2D	1 bd / 1 ba / 900 ft2	\$699K	699
16	380 Riverside Drive, #8L	1 bd / 1 ba / 700 ft2	\$725K	725
17	535 West 110th Street, #6B	1 bd / 1 ba / 750 ft2	\$725K	725
18	390 Riverside Drive, #4G	1 bd / 1 ba / 800 ft2	\$745K	745
19	395 Riverside Drive, #4E	1 bd / 1 ba	\$799K	799
20				
21				

# Visualizing one-dimensional continuous data

- stem-and-leaf plot
- histogram
  - *frequency*
  - *relative frequency*
  - *density*
- boxplot

# Stem-and-leaf plot

Prices:

```
## [1] 379 425 450 450 499 529 535 535 545 599 665  
## [12] 675 699 699 725 725 745 799
```

Prices, rounded to 2 significant digits:

```
## [1] 380 430 450 450 500 530 540 540 550 600 670  
## [12] 680 700 700 730 730 750 800
```

# Stem-and-leaf plot

Prices:

```
## [1] 379 425 450 450 499 529 535 535 545 599 665
## [12] 675 699 699 725 725 745 799
```

Prices, rounded to 2 significant digits:

```
## [1] 380 430 450 450 500 530 540 540 550 600 670
## [12] 680 700 700 730 730 750 800
```

```
##
## The decimal point is 2 digit(s) to the right of the |
##
## 3 | 8
## 4 | 355
## 5 | 03445
## 6 | 078
## 7 | 00335
## 8 | 0
```

# Stem and leaf plot

Total Fertility Rate (average births per woman)

```
##
##   The decimal point is at the |
##
##  1 | 3333333333444444555555555555556666666677777788888888889999999999
##  2 | 0000000011112222233333334444445555555666666679999
##  3 | 01112233333344567889
##  4 | 0011112245555667779999
##  5 | 0001222333355788
##  6 | 012344
##  7 | 6
```

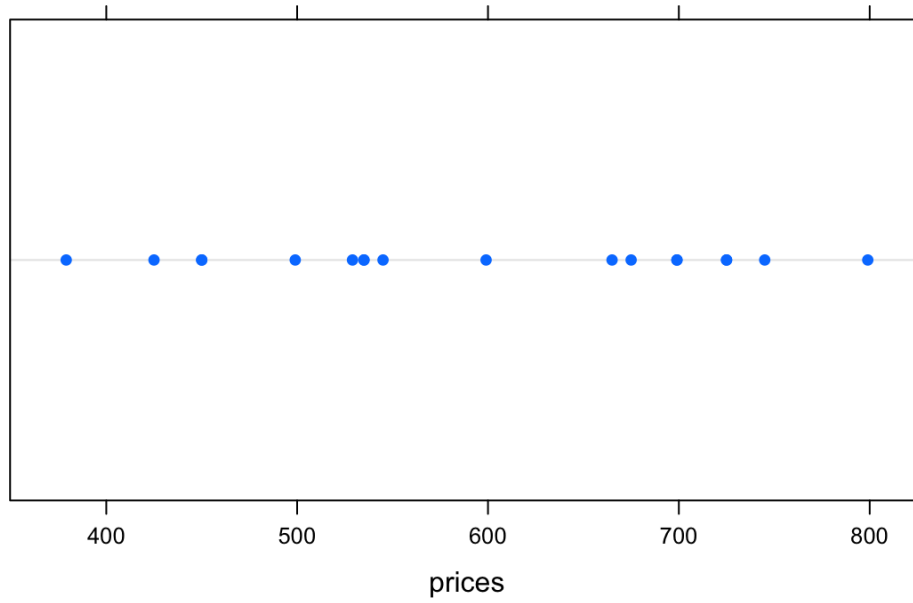
# Stem and leaf plot, change the length (scale)

Total Fertility Rate

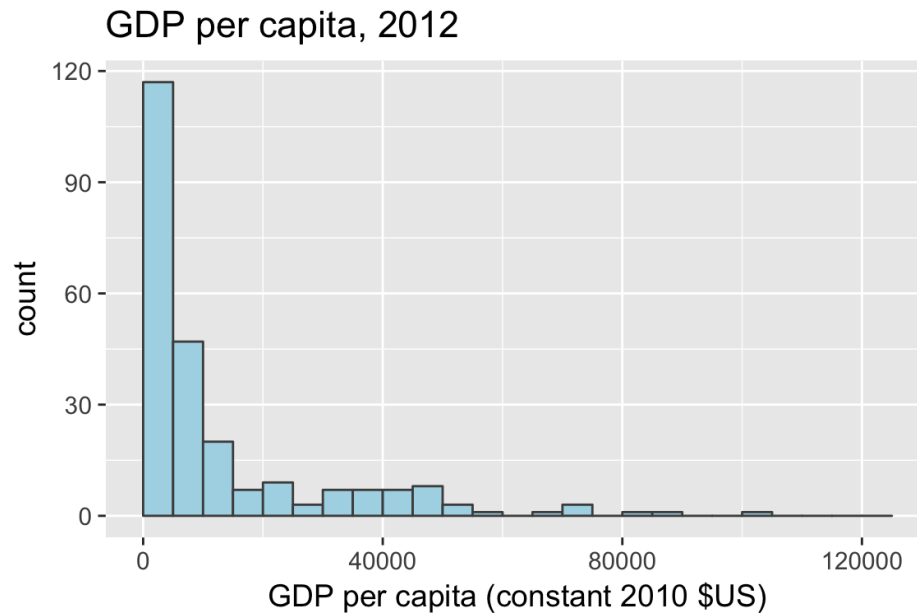
```
##
## The decimal point is at the |
##
## 1 | 333333333444444
## 1 | 5555555555555666666677777788888888889999999999
## 2 | 0000000011112222233333334444444
## 2 | 555555556666666679999
## 3 | 01112233333344
## 3 | 567889
## 4 | 001111224
## 4 | 5555667779999
## 5 | 00012223333
## 5 | 55788
## 6 | 012344
## 6 |
## 7 |
## 7 | 6
```



# Dotplot

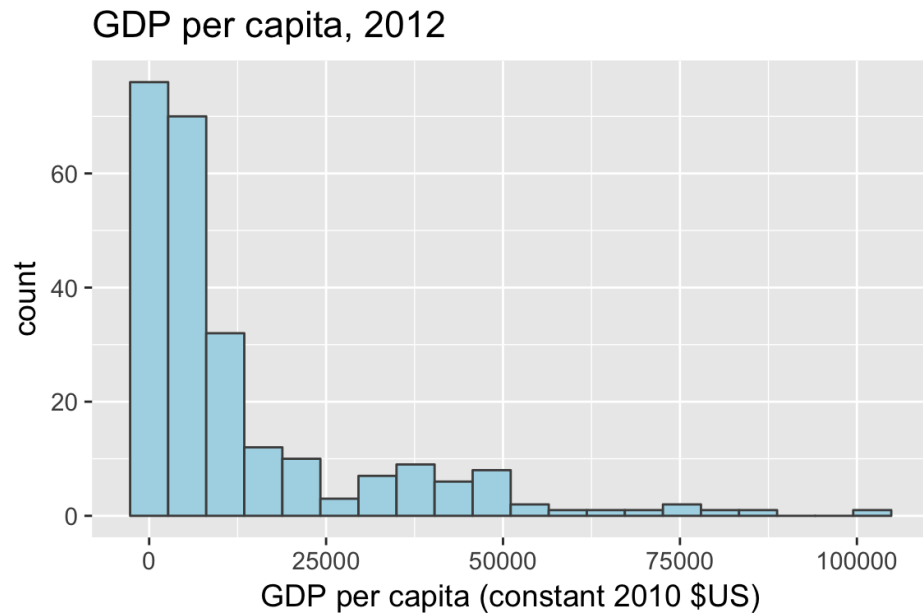


# Frequency histogram

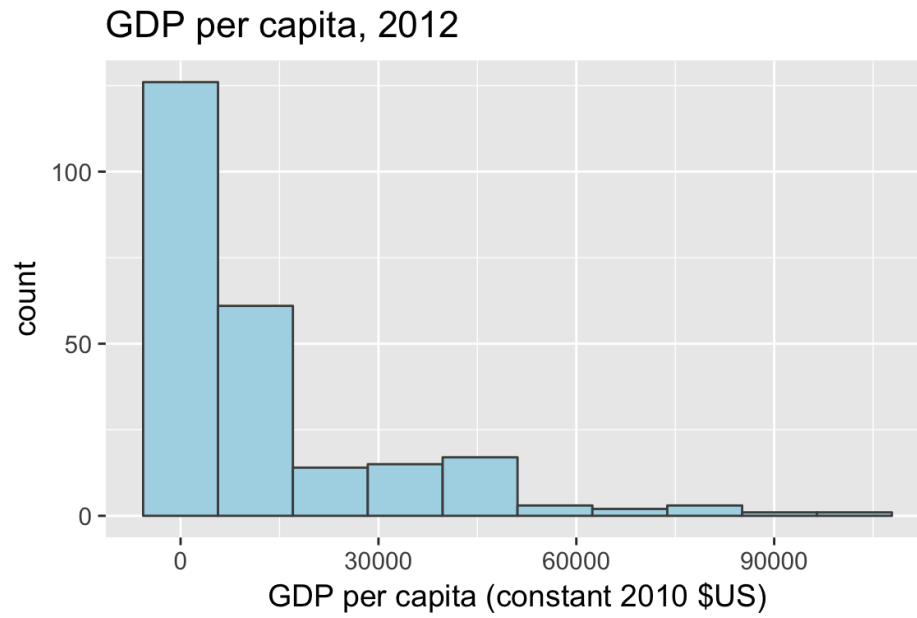


Source: World Bank

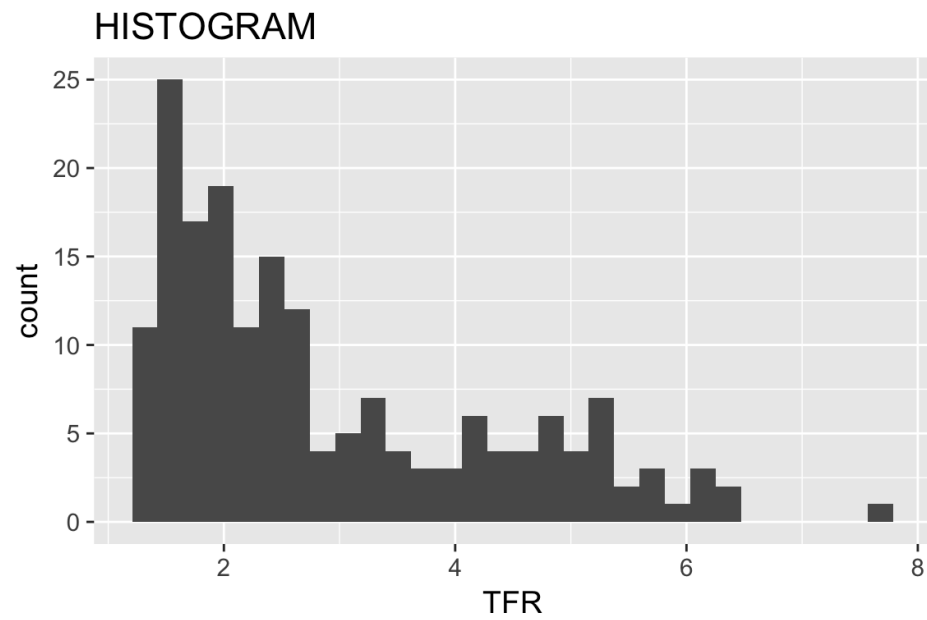
# Change number of bins to 20



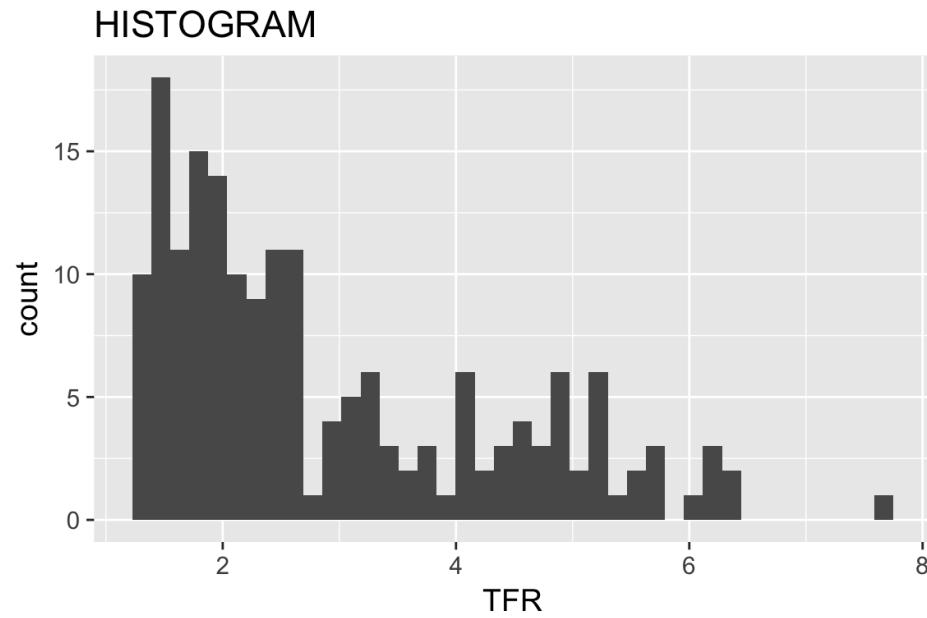
# Change number of bins to 10



# Total fertility rate



# Change the number of bins to 40



# Shapes of histograms

- Unimodal
- Bimodal
- Skewed left
- Skewed right