Continuous Variables (Chapter 3)

Continuous Variables

We’re looking for features such as:

- Asymmetry
- Outliers
- Multimodality
- Gaps
- Heaping / Rounding
- Impossibilities / Errors

Histograms

- primary tool for continuous data
- count / relative frequency / cumulative frequency / density
- boundaries
- binwidth

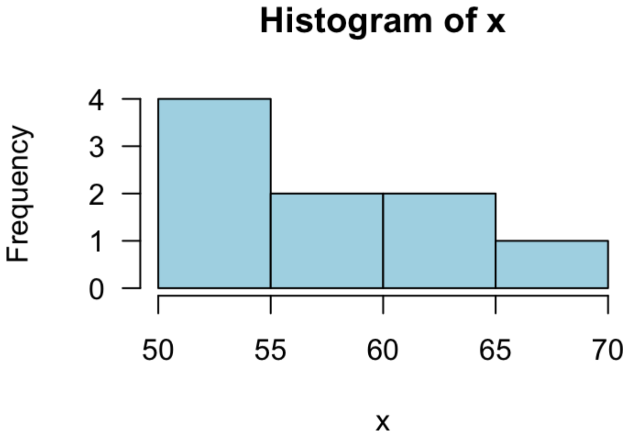
How are histograms created?

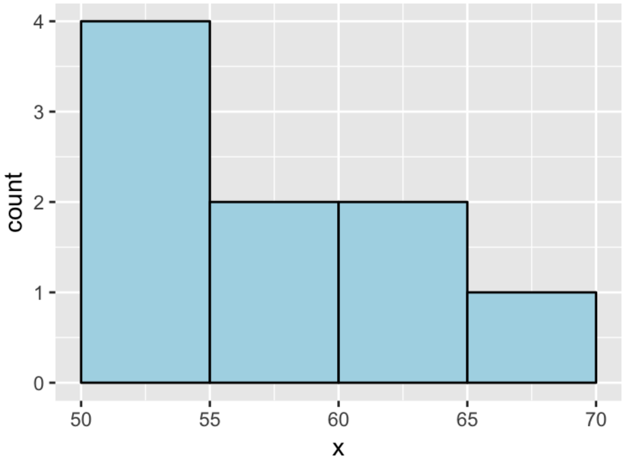
Draw a histogram on paper of the following data.

(use binwidth = 5)

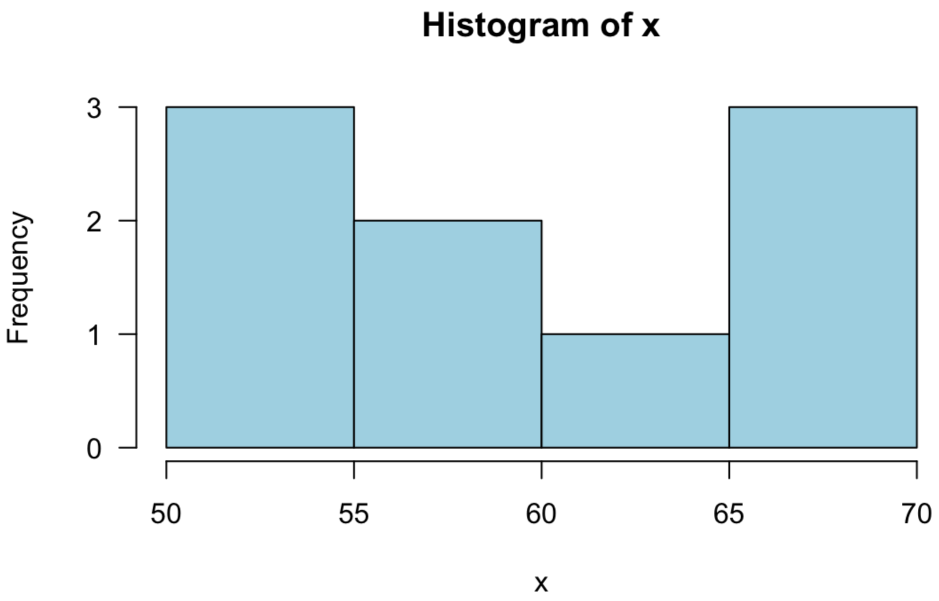
50, 51, 53, 55, 56, 60, 65, 65, 68

How are histograms created?

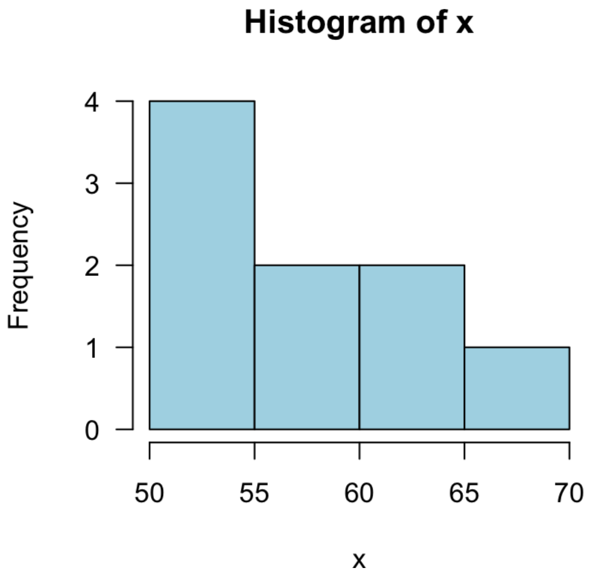


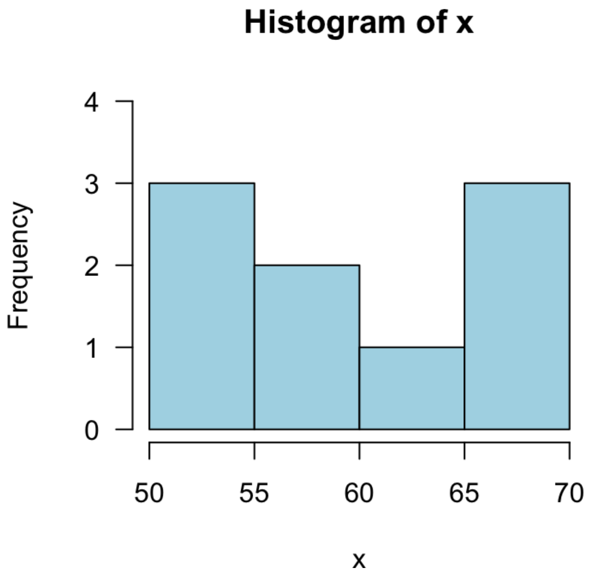


How are histograms created?

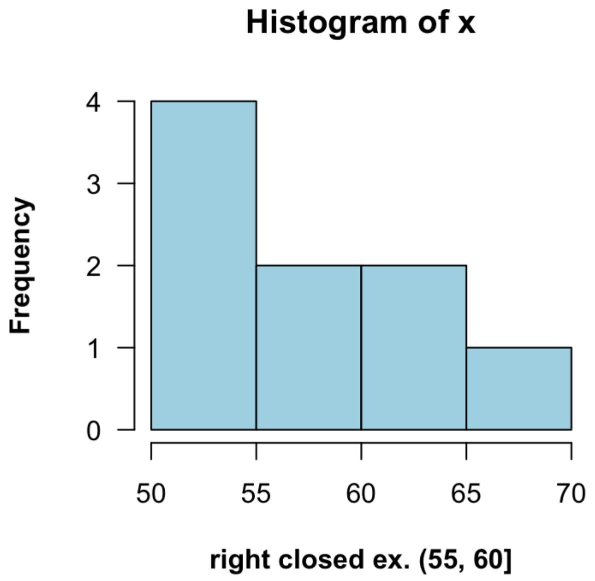


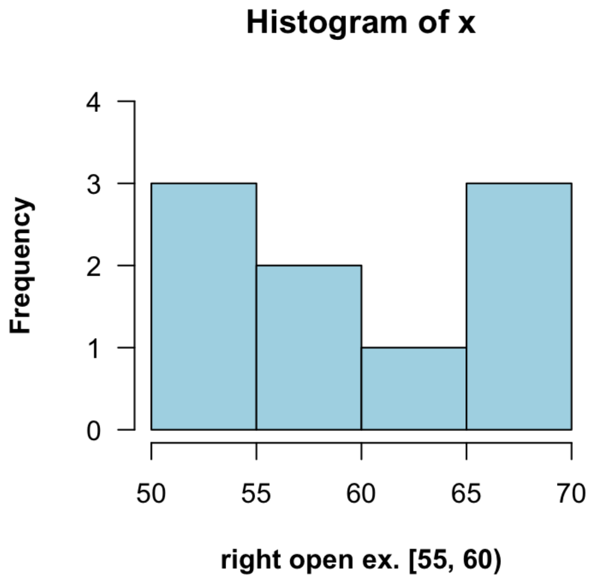
What is causing the difference?



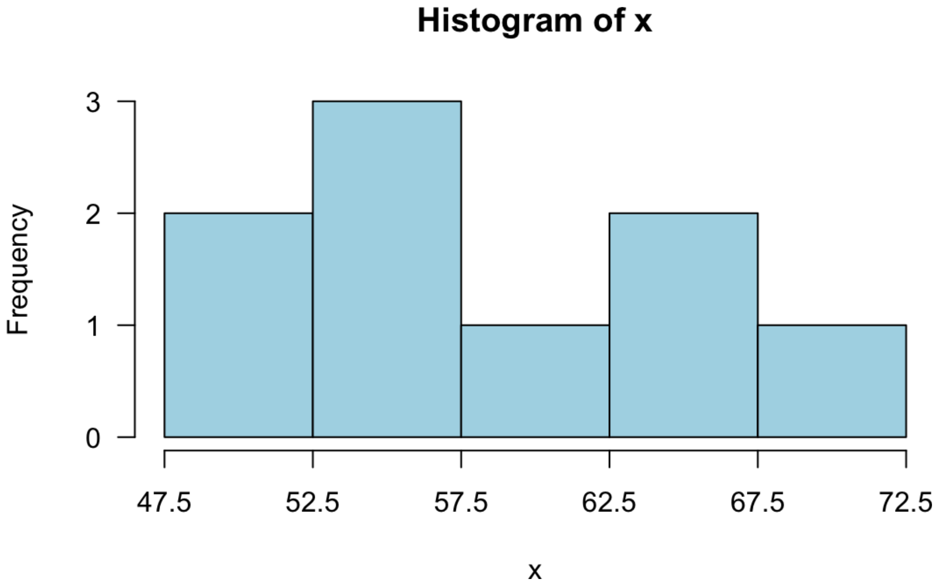


Bin boundaries

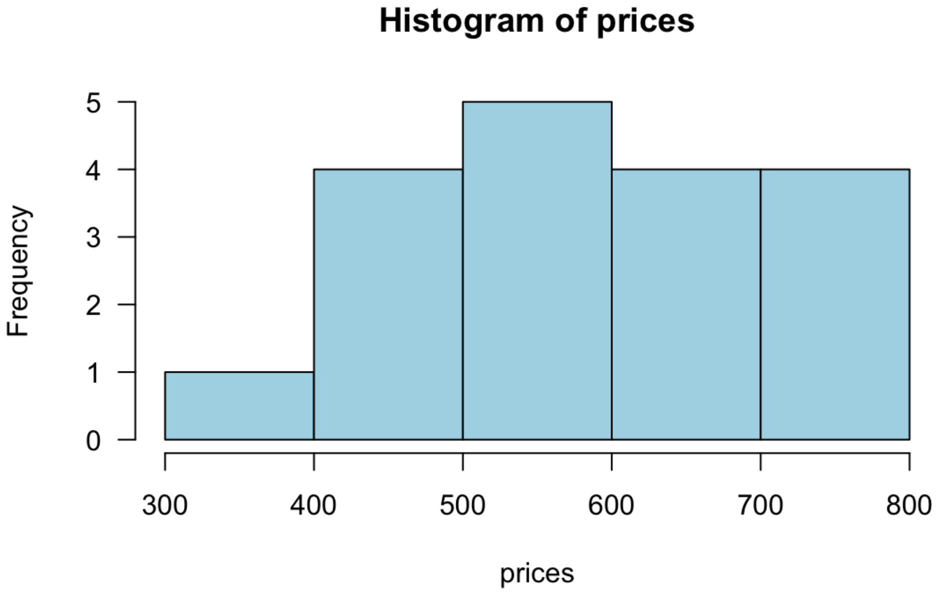




Bin boundaries

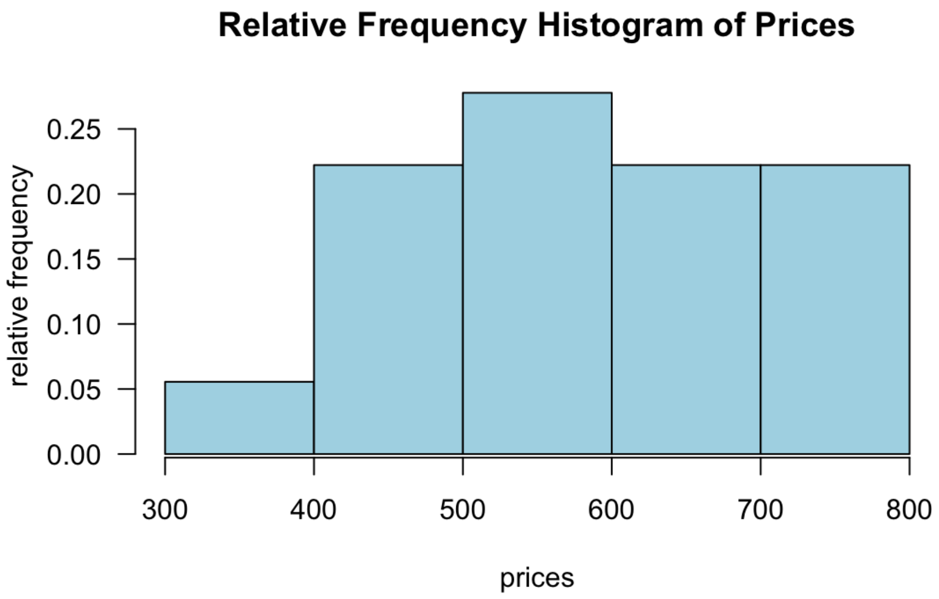


Frequency (count) histogram

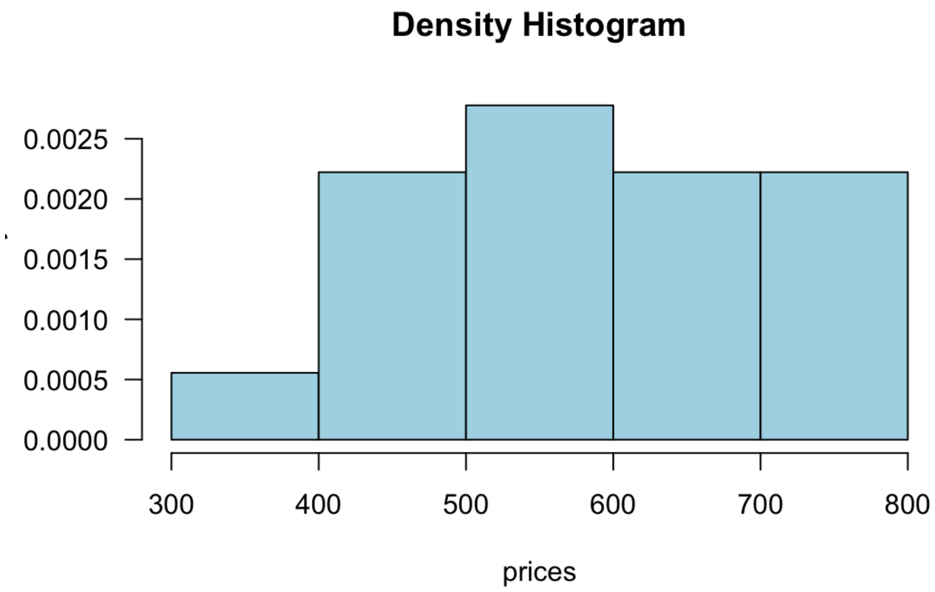


Prices of one-bedroom apartments in Morningside Heights (zip 10027) in $1000k

Relative frequency histogram



Density Histogram

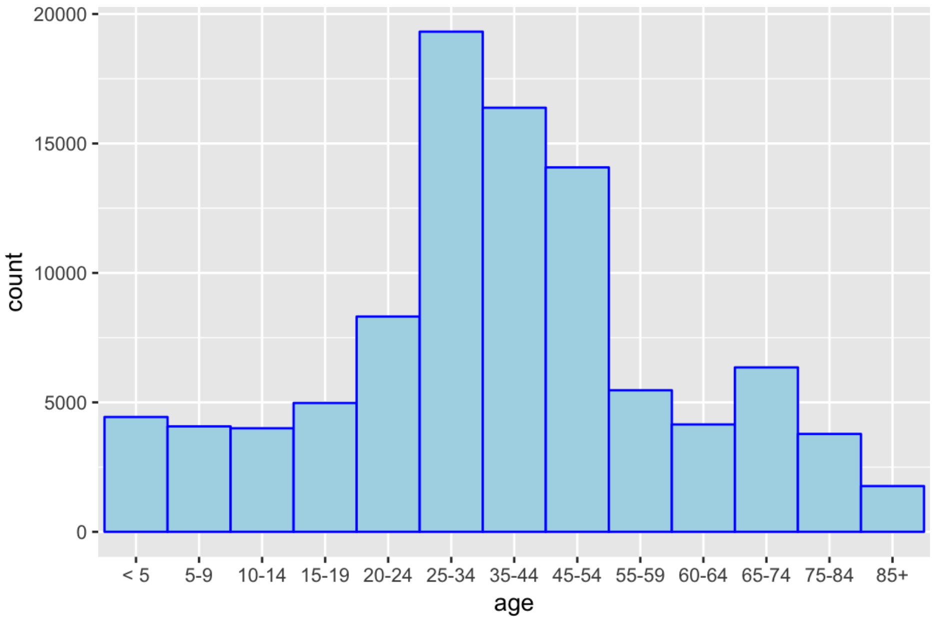


Count, Relative Frequency, Density

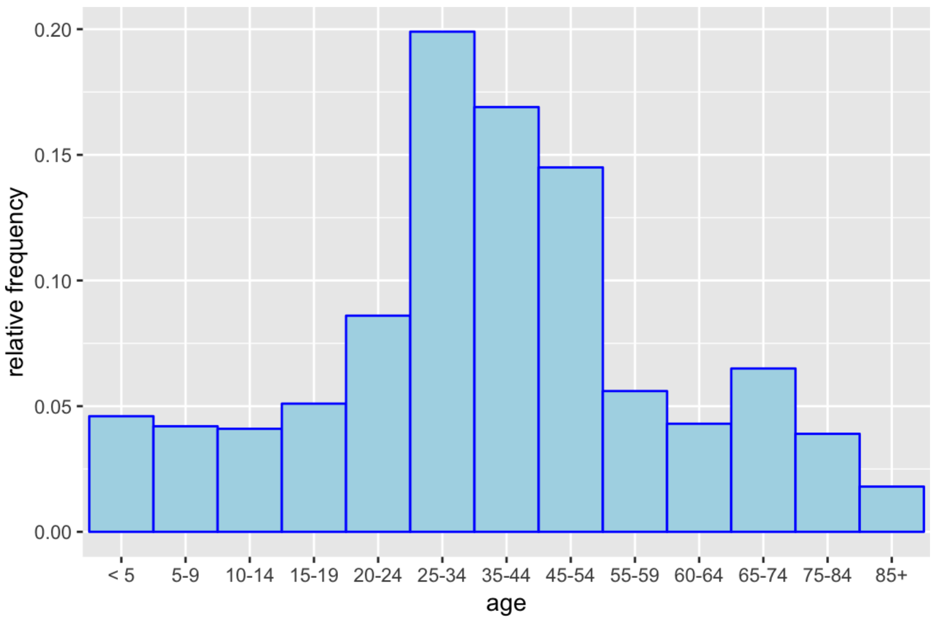
Bin	Count	Relative Frequency	Density
300-400	1	.056	.00056
400-500	4	.22	.0022
500-600	5	.28	.0028
600-700	4	.22	.0022
700-800	4	.22	.0022

- How is relative frequency calculated?
- How is density calculated?

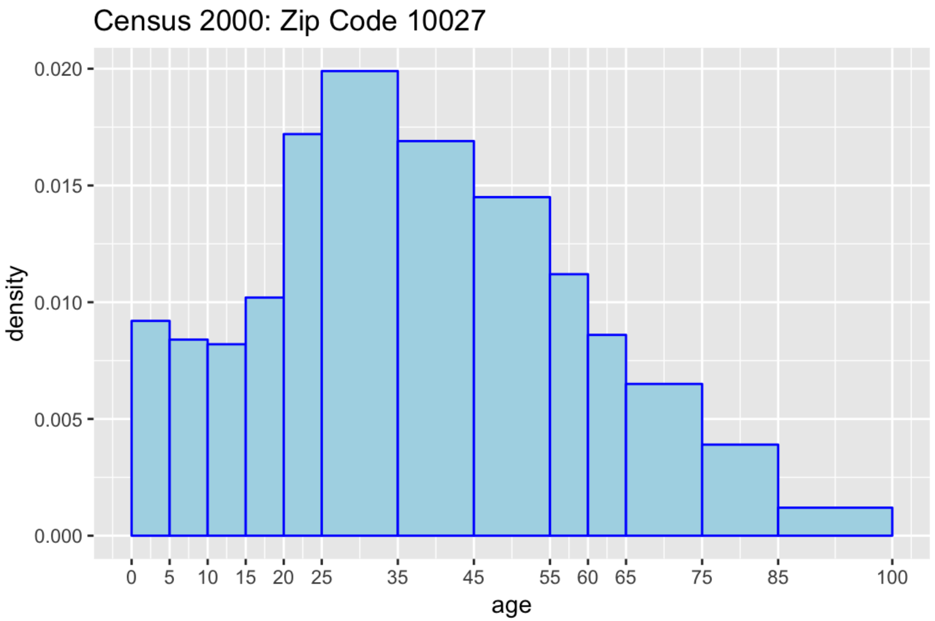
What’s wrong with this histogram?



Relative frequency histogram



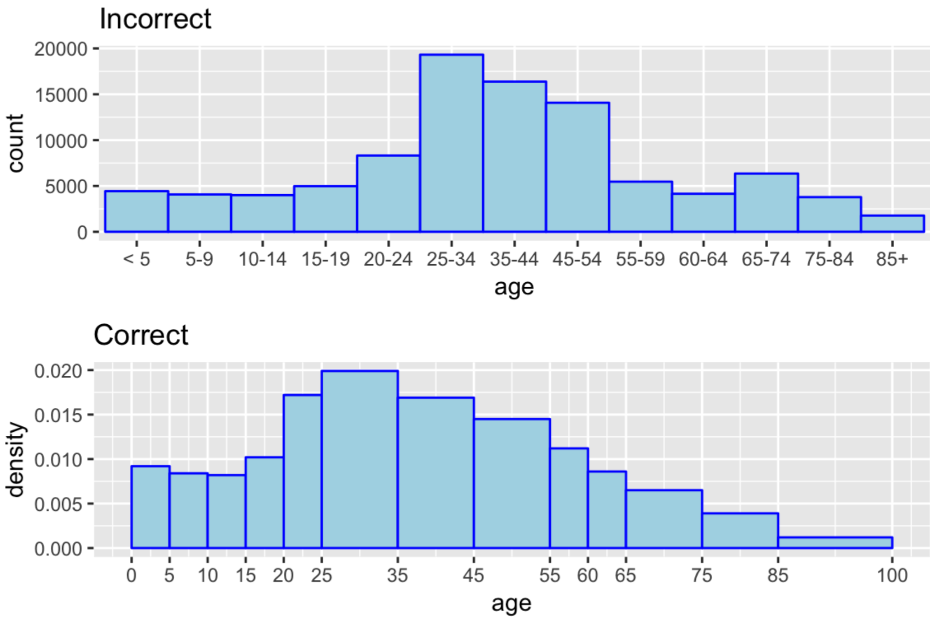
Density histogram with unequal bin (or class) widths



Density = RelFreq / Binwidth

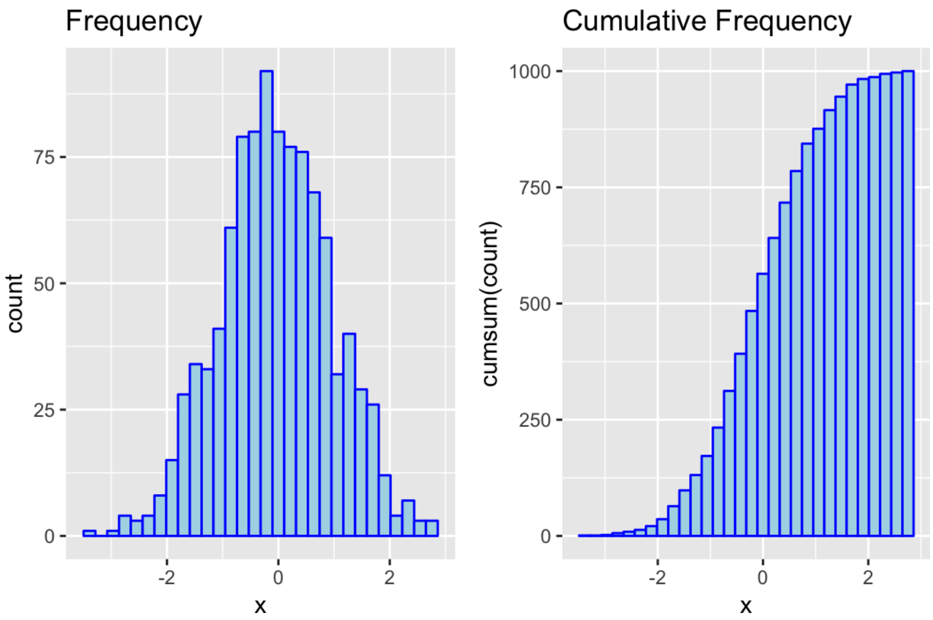
Class	Frequency	RelFreq	ClassWidth	Density
< 5	4435	0.046	5	0.009
5-9	4072	0.042	5	0.008
10-14	3999	0.041	5	0.008
15-19	4977	0.051	5	0.010
20-24	8316	0.086	5	0.017
25-34	19317	0.199	10	0.020
35-44	16380	0.169	10	0.017
45-54	14077	0.145	10	0.014
55-59	5467	0.056	5	0.011
60-64	4148	0.043	5	0.009
65-74	6350	0.065	10	0.007
75-84	3781	0.039	10	0.004
85+	1767	0.018	15	0.001

Compare the histograms



Source: https://factfinder.census.gov/

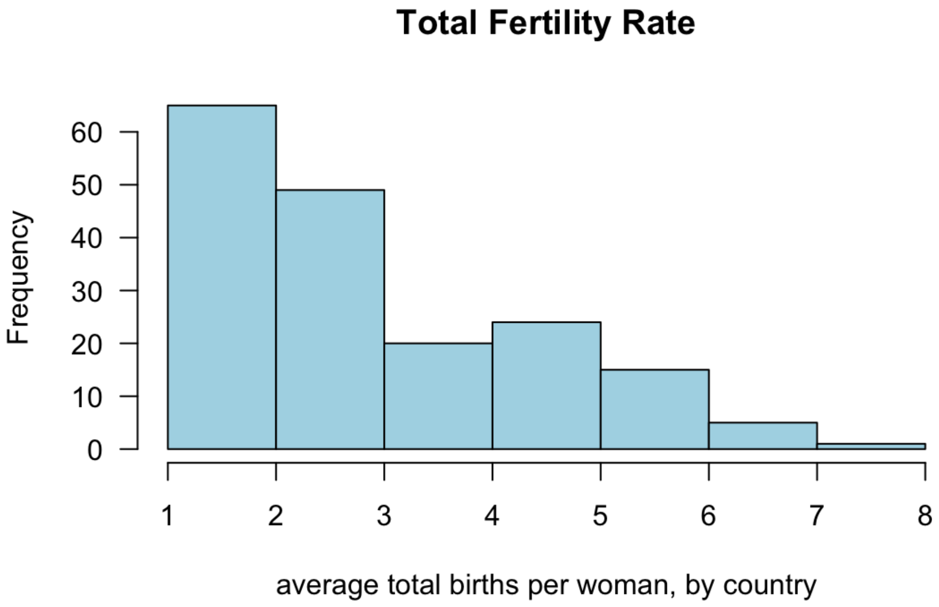
Cumulative frequency histogram



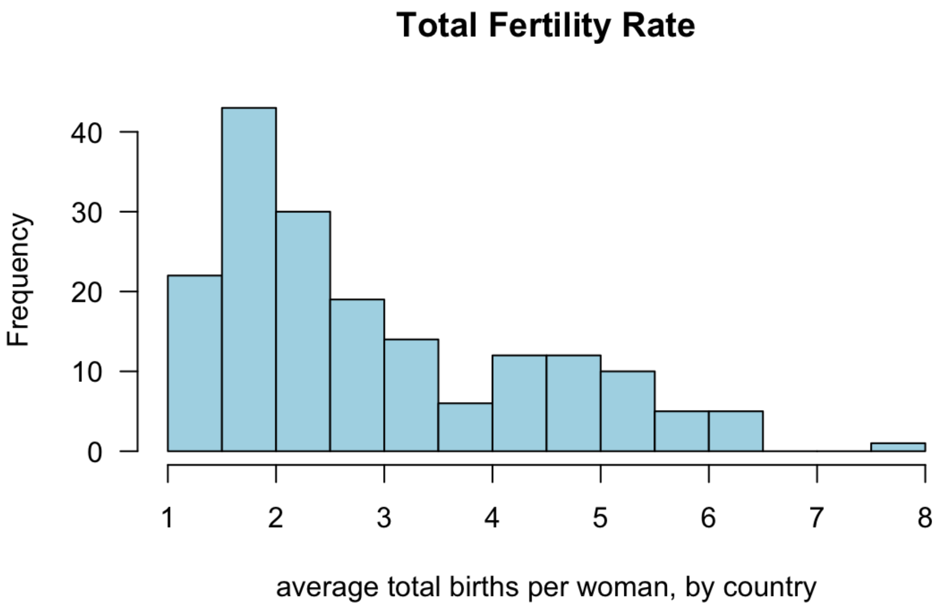
Binwidth

```
 'stat_bin()' using 'bins = 30'. Pick better
value with 'binwidth'.
```

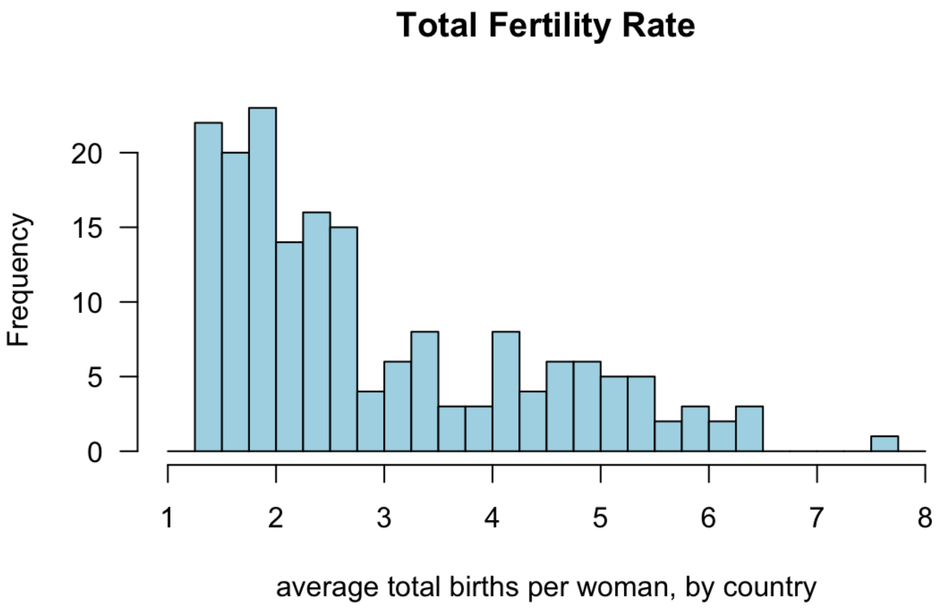
Histograms


Total Fertility Rate
Frequency
0
10
20
30
40
50
60
1
2
3
4
5
6
7
8
average total births per woman, by country

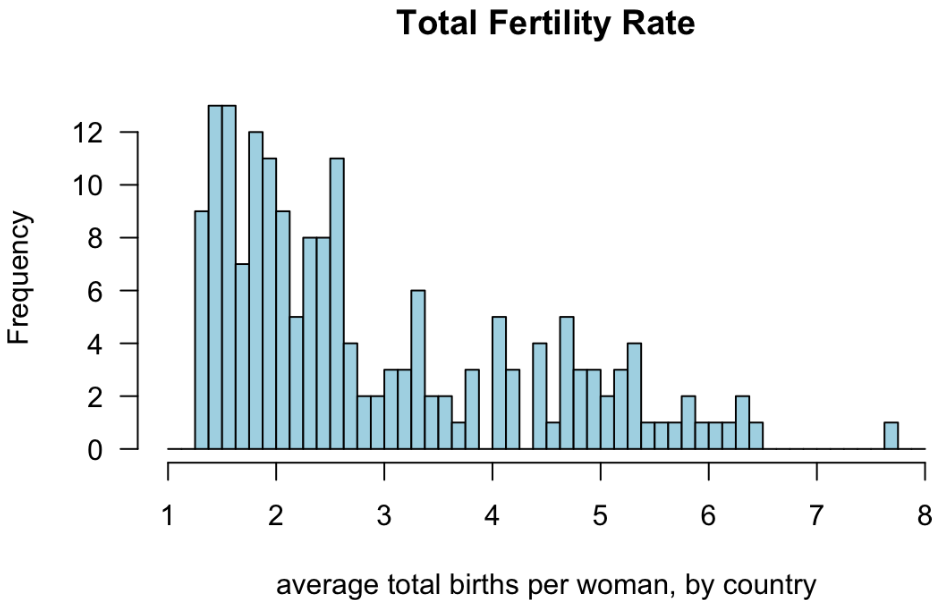
Histograms


Total Fertility Rate
Frequency
0
10
20
30
40
1
2
3
4
5
6
7
8
average total births per woman, by country

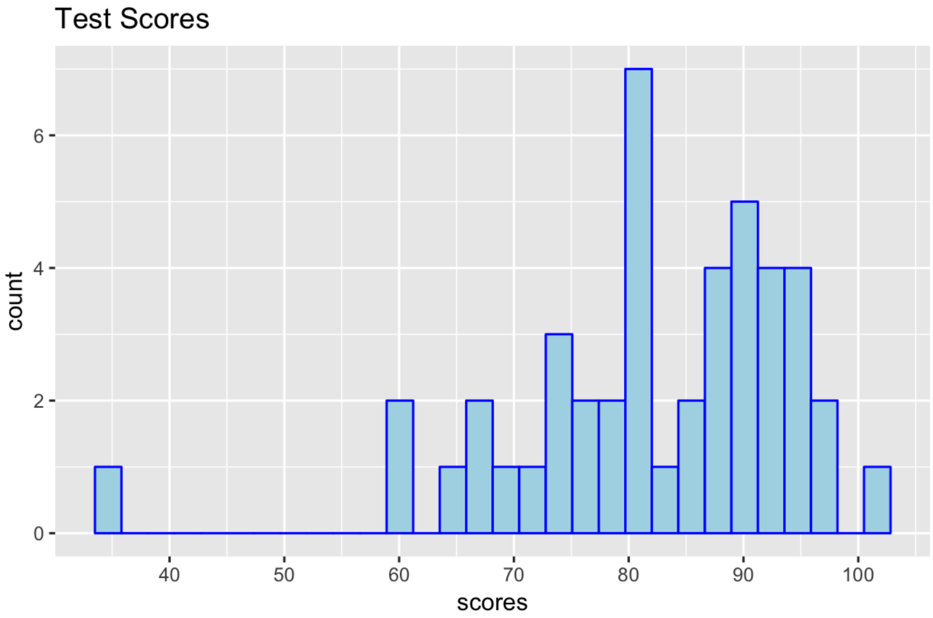
Histograms


Total Fertility Rate
Frequency
0
5
10
15
20
1
2
3
4
5
6
7
8
average total births per woman, by country

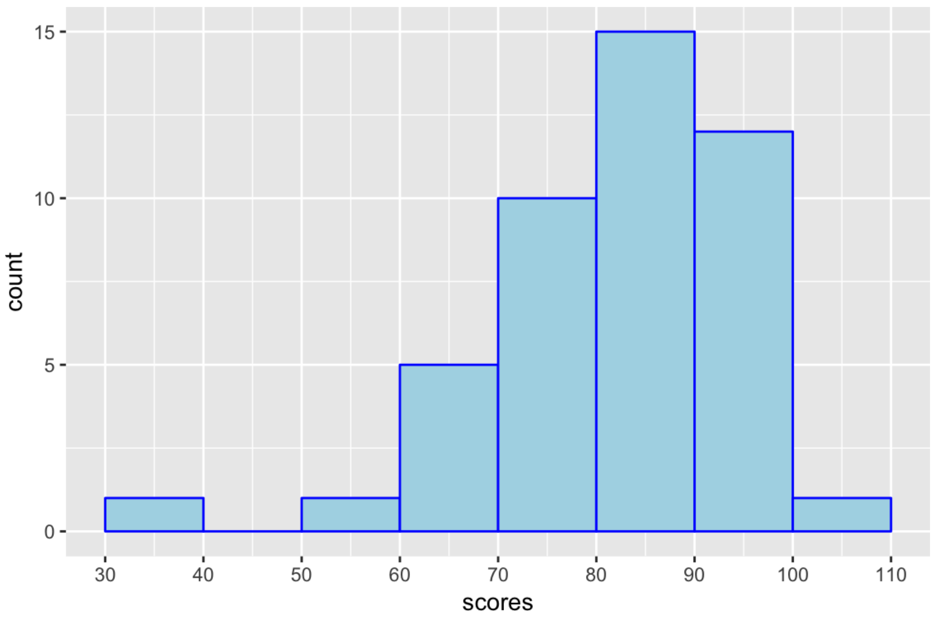
Histograms


Total Fertility Rate
Frequency
0
2
4
6
8
10
12
1
2
3
4
5
6
7
8
average total births per woman, by country

Histograms

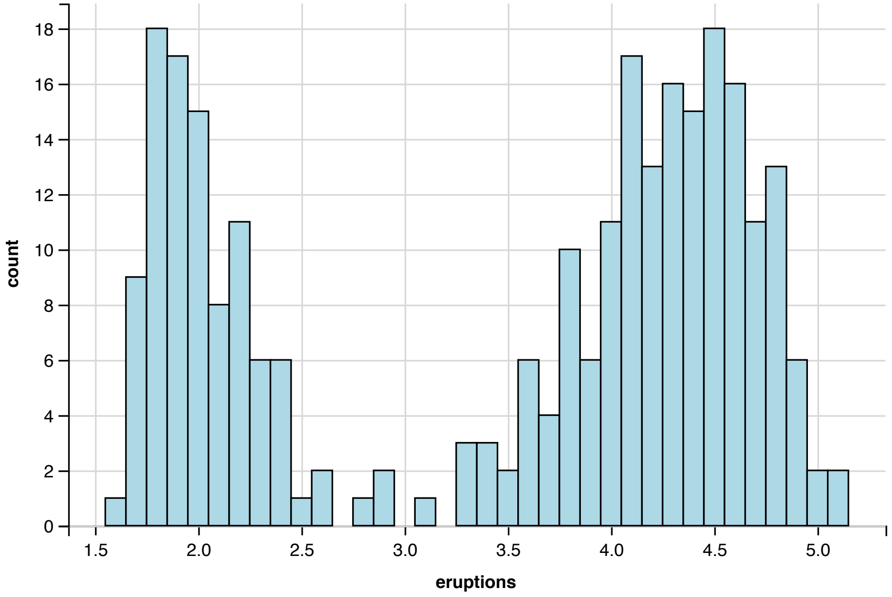


Fewer bins



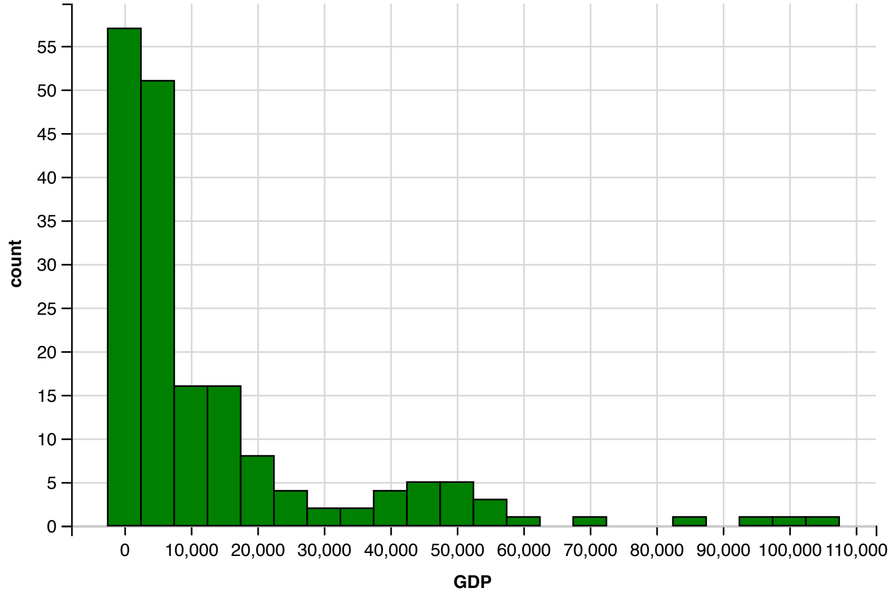
Change binwidth interactively

```
## Warning: Can't output dynamic/interactive ggvis plots in a knitr document.
## Generating a static (non-dynamic, non-interactive) version of the plot.
```



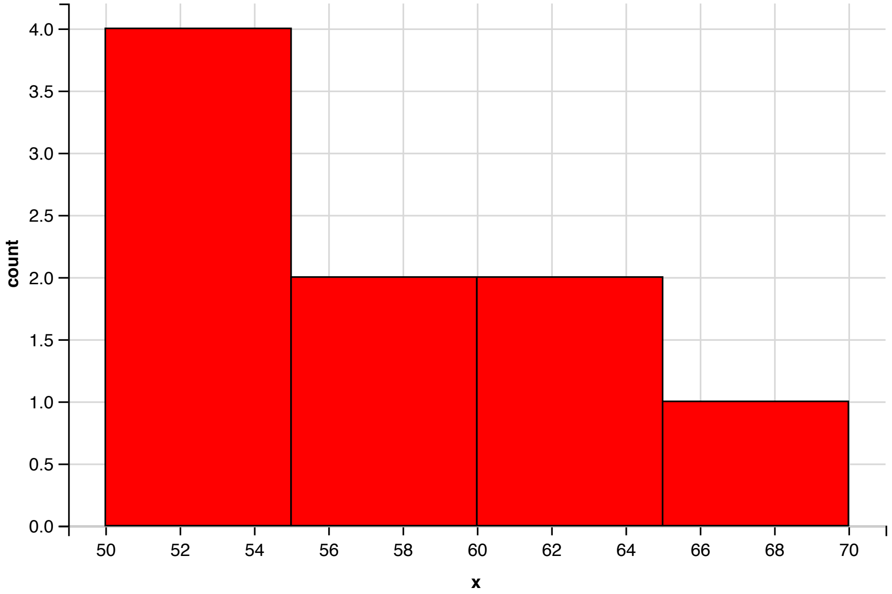
GDP

```
## Warning: Can't output dynamic/interactive ggvis plots in a knitr document.
## Generating a static (non-dynamic, non-interactive) version of the plot.
```



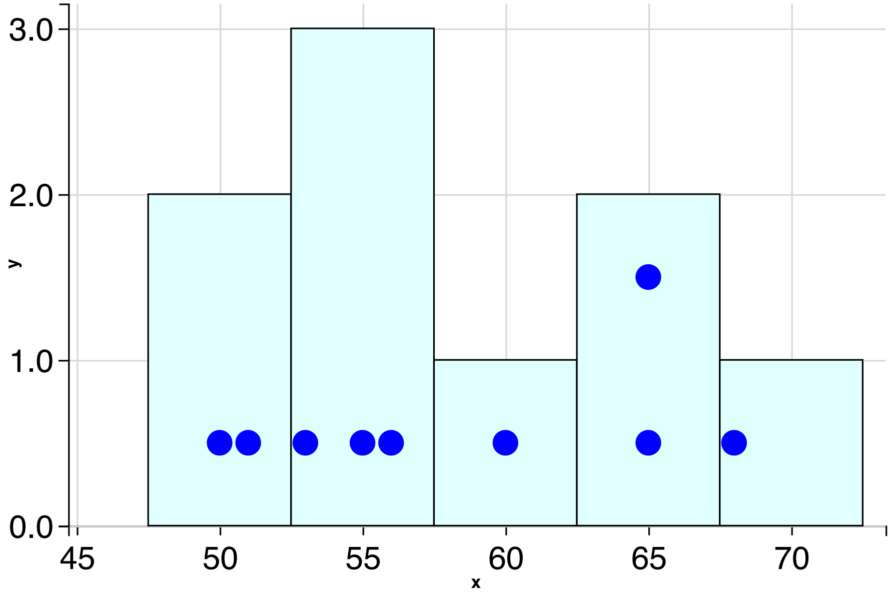
Center

```
## Warning: Can't output dynamic/interactive ggvis plots in a knitr document.
## Generating a static (non-dynamic, non-interactive) version of the plot.
```



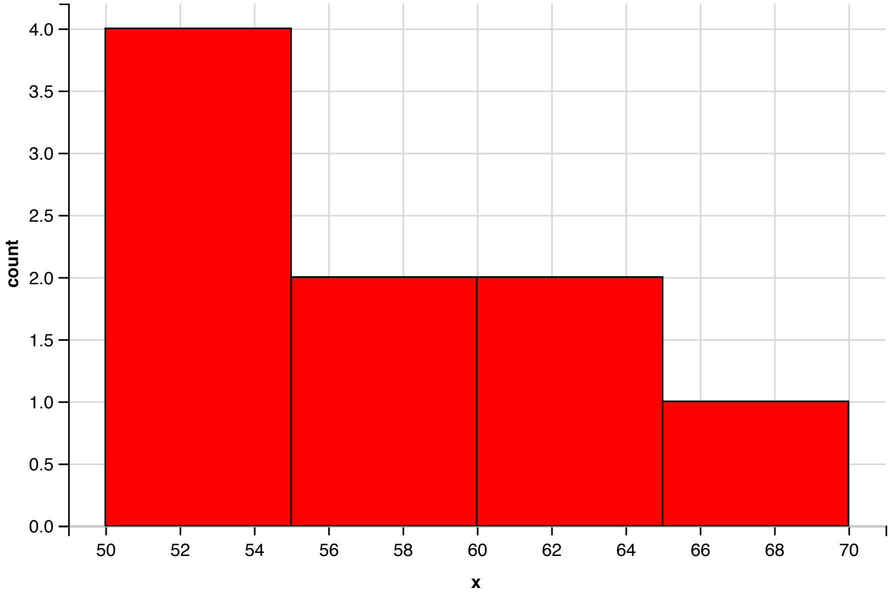
Center (with data values shown)

```
## Warning: Can't output dynamic/interactive ggvis plots in a knitr document.
## Generating a static (non-dynamic, non-interactive) version of the plot.
```



Boundary

```
## Warning: Can't output dynamic/interactive ggvis plots in a knitr document.
## Generating a static (non-dynamic, non-interactive) version of the plot.
```


count
x