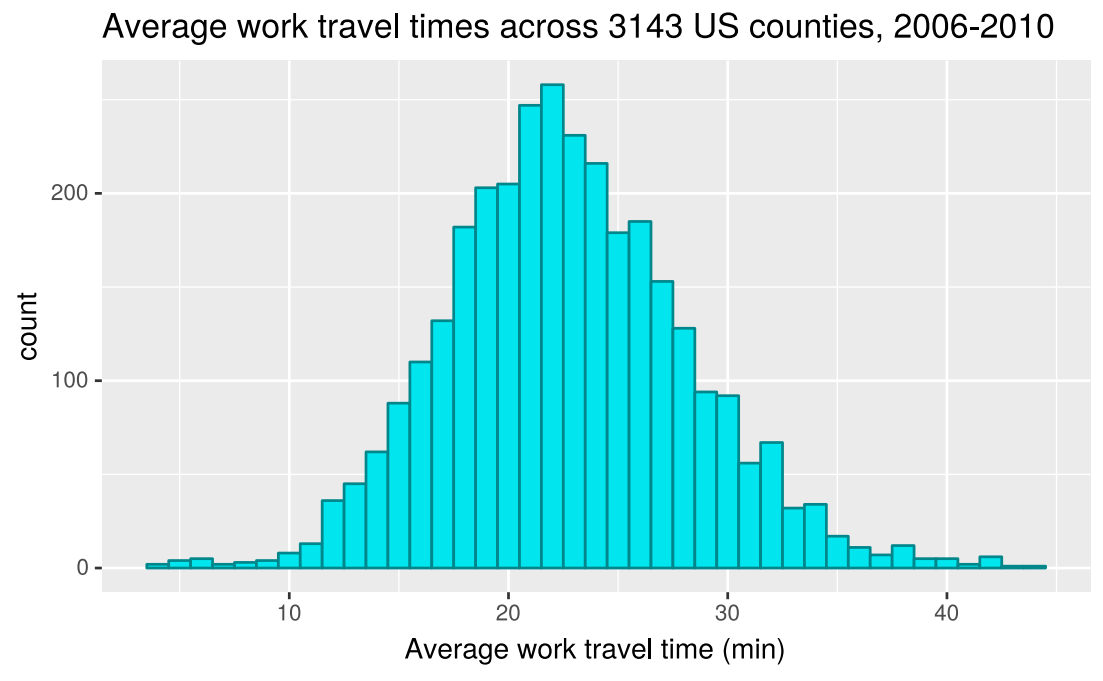
Online CDS 101 *Introduction to Computational and Data Sciences*

Data distributions

Quantifying data distributions in R

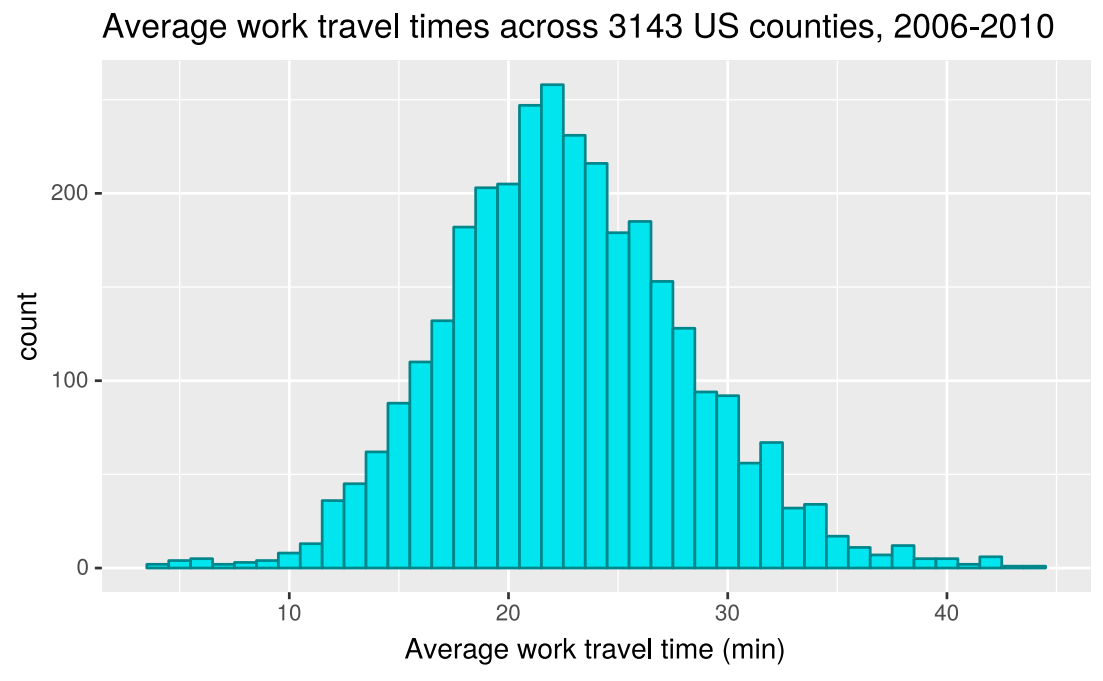
Example data distribution

The following distribution comes from data posted by the US Census Bureau:



Example data distribution

The following distribution comes from data posted by the US Census Bureau:



How can we quantify the shape of this distribution?

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median
- `min()`: Finds the minimum value

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median
- `min()`: Finds the minimum value
- `max()`: Finds the maximum value

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median
- `min()`: Finds the minimum value
- `max()`: Finds the maximum value
- `sd()`: Computes the standard deviation

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median
- `min()`: Finds the minimum value
- `max()`: Finds the maximum value
- `sd()`: Computes the standard deviation
- `IQR()`: Computes the interquartile range

Useful statistical functions

The following R functions will be useful for computing basic statistical measures of any numerical data column (variable)

- `mean()`: Computes the average
- `median()`: Computes the median
- `min()`: Finds the minimum value
- `max()`: Finds the maximum value
- `sd()`: Computes the standard deviation
- `IQR()`: Computes the interquartile range
- `percent_rank()`: Computes percentiles

Using the statistical functions

Using the statistical functions

Every function except `percent_rank()` will always return a single quantity

Using the statistical functions

Every function except `percent_rank()` will always return a single quantity

The `summarize()` function is appropriate here:

Using the statistical functions

Every function except `percent_rank()` will always return a single quantity

The `summarize()` function is appropriate here:

```
county %>%
  summarize(
    mean = mean(mean_work_travel),
    median = median(mean_work_travel),
    min = min(mean_work_travel),
    max = max(mean_work_travel),
    sd = sd(mean_work_travel),
    iqr = IQR(mean_work_travel)
  )
```

Using the statistical functions

Every function except `percent_rank()` will always return a single quantity

The `summarize()` function is appropriate here:

```
county %>%
  summarize(
    mean = mean(mean_work_travel),
    median = median(mean_work_travel),
    min = min(mean_work_travel),
    max = max(mean_work_travel),
    sd = sd(mean_work_travel),
    iqr = IQR(mean_work_travel)
  )
```

mean	median	min	max	sd	iqr
22.72558	22.4	4.3	44.2	5.514159	7.1

Using the statistical functions

`percent_rank()` operates on the full column of values, so it needs to be paired with `mutate()`

Using the statistical functions

`percent_rank()` operates on the full column of values, so it needs to be paired with `mutate()`

Once we have the percentiles, we can find the cutoff value for each percentile

Using the statistical functions

`percent_rank()` operates on the full column of values, so it needs to be paired with `mutate()`

Once we have the percentiles, we can find the cutoff value for each percentile

```
county %>%
  mutate(
    percentile = percent_rank(mean_work_travel),
    quartile = case_when(                      # case_when() similar to if_else()
      percentile < 0.25 ~ "Q1",                # label between 0 and 0.25 as Q1,
      between(percentile, 0.25, 0.50) ~ "Q2",  # between 0.25 and 0.50 as Q2,
      between(percentile, 0.50, 0.75) ~ "Q3",  # between 0.50 and 0.75 as Q3,
      percentile >= 0.75 ~ "Q4"                # and 0.75 to 1.00 as Q4
    )
  ) %>%
  group_by(quartile) %>%
  summarize(cutoff = max(mean_work_travel))    # cutoff is maximum in quartile
```

Using the statistical functions

`percent_rank()` operates on the full column of values, so it needs to be paired with `mutate()`

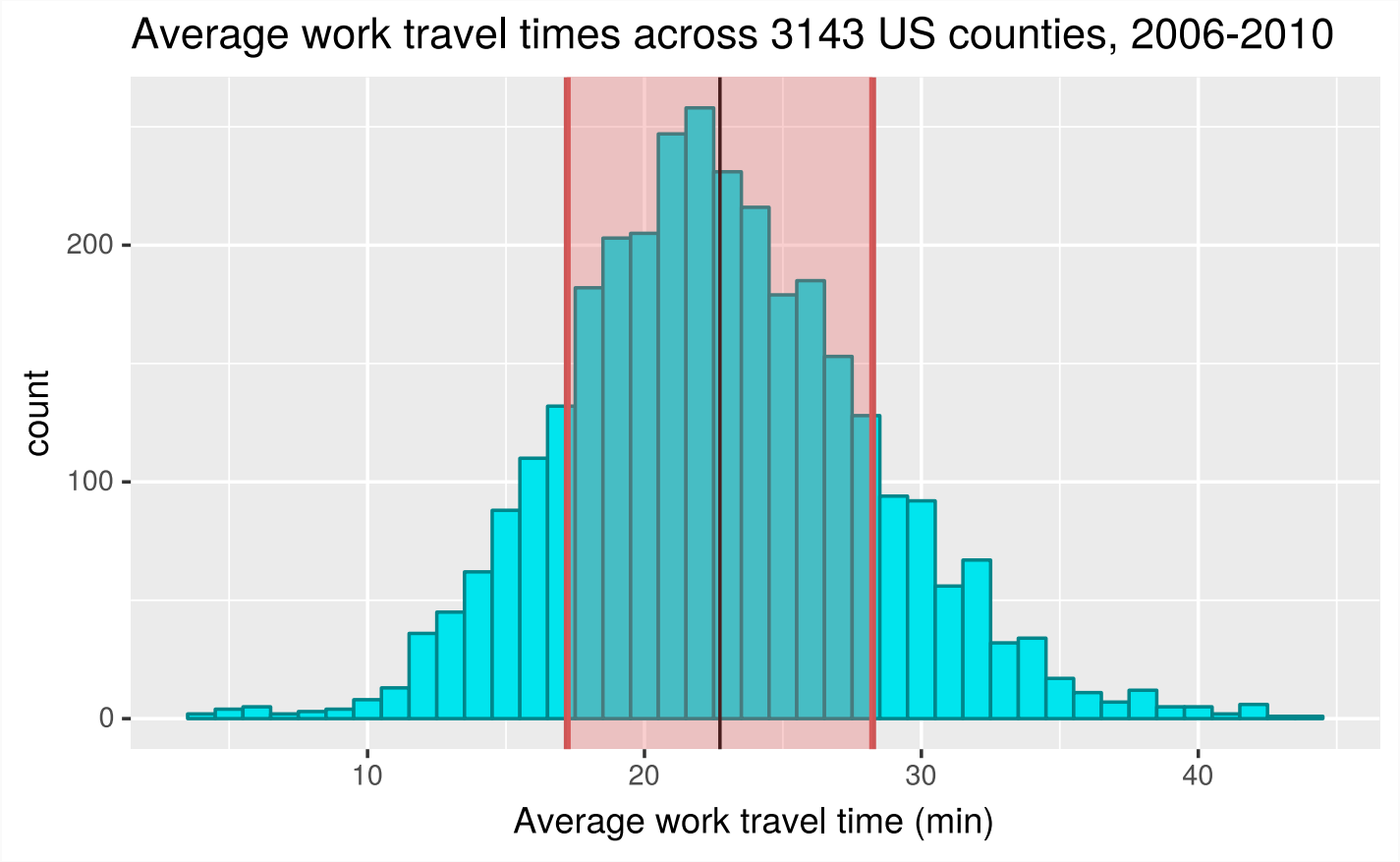
Once we have the percentiles, we can find the cutoff value for each percentile

```
county %>%
  mutate(
    percentile = percent_rank(mean_work_travel),
    quartile = case_when(                      # case_when() similar to if_else()
      percentile < 0.25 ~ "Q1",                # label between 0 and 0.25 as Q1,
      between(percentile, 0.25, 0.50) ~ "Q2",  # between 0.25 and 0.50 as Q2,
      between(percentile, 0.50, 0.75) ~ "Q3",  # between 0.50 and 0.75 as Q3,
      percentile >= 0.75 ~ "Q4"                # and 0.75 to 1.00 as Q4
    )
  ) %>%
  group_by(quartile) %>%
  summarize(cutoff = max(mean_work_travel))    # cutoff is maximum in quartile
```

Q1	Q2	Q3	Q4
19	22.4	26.1	44.2

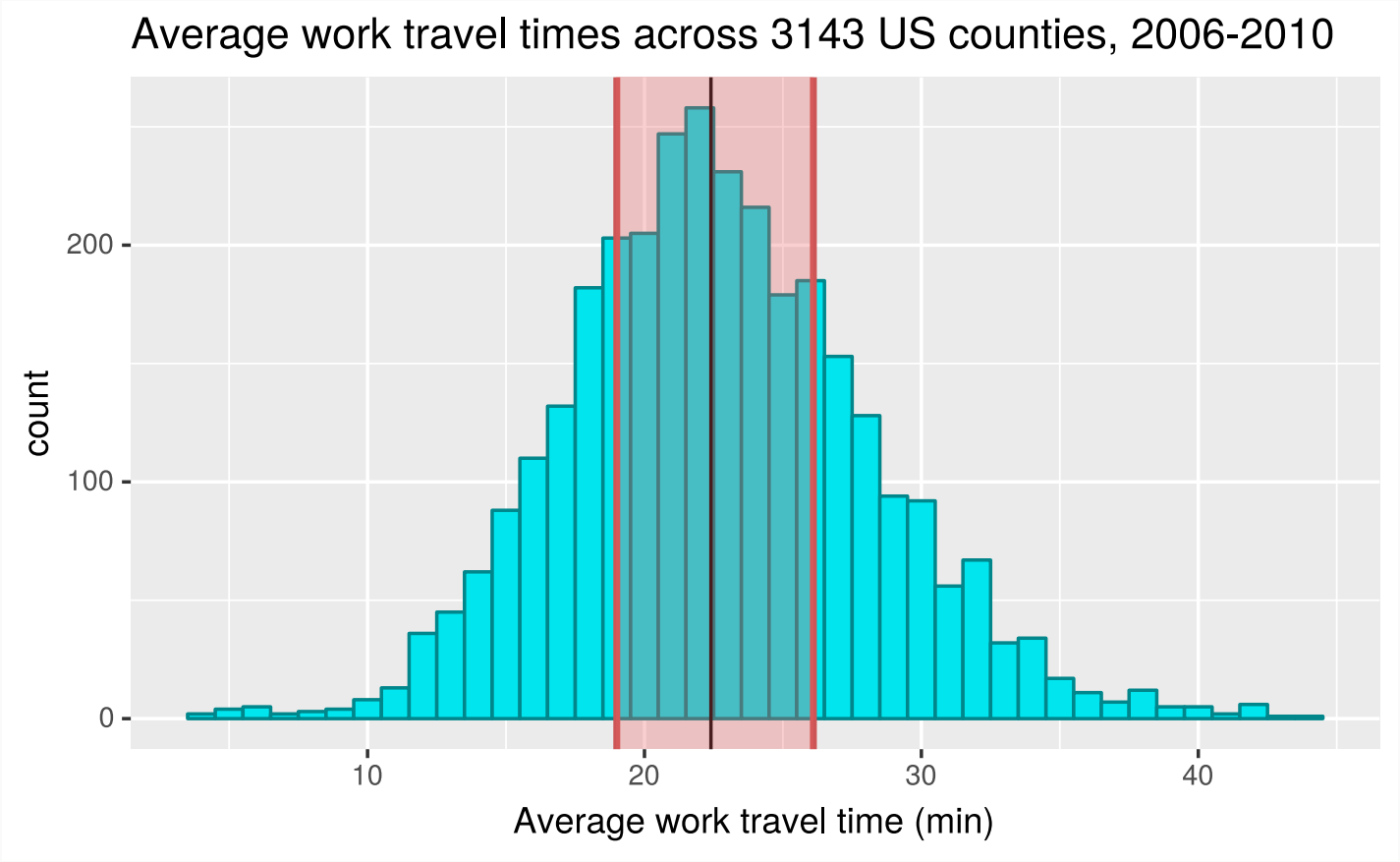
Interpreting summary statistics: mean, sd

One standard deviation above and below the mean



Interpreting summary statistics: median, IQR

The median and inter-quartile range



Credits

License

Creative Commons Attribution-NonCommerical-ShareAlike 4.0 International