

## Exer 17.1

[F/F106]

Often we are interested in whether two groups are different. For example, we might ask if girls have a different mean footlength than do boys. We can answer this question by constructing a suitable model.

```
> kids = ISMdata("kidsfeet.csv")
> summary( lm( length ~ sex, data=kids ) )
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
(Intercept)	25.1050	0.2847	88.180	<2e-16
sexG	-0.7839	0.4079	-1.922	0.0623

Interpret this report, keeping in mind that the foot length is reported in centimeters. (The reported value <2e-16 means  $p < 2 \times 10^{-16}$ .)

1. What is the point estimate of the difference between the lengths of boys and girls feet.

- A Girls' feet are, on average, 25 centimeters long.
- B Girls' feet are 0.4079 cm shorter than boys'.
- C Girls' feet are 0.7839 cm shorter than boys'.
- D Girls' feet are 1.922 cm shorter than boys'.

Exer 17.1-1

2. The confidence interval can be written as a point estimate plus-or-minus a margin of error:  $P \pm M$ . What is the 95% margin of error,  $M$ , on the difference between boy's and girl's foot lengths.  # Exer 17.1-2

3. What is the Null Hypothesis being tested by the reported p-value 0.0623?

- A Boys' feet are, on average, longer than girls' feet.
- B Girls' feet are, on average, shorter than boys' feet.
- C All boys' feet are longer than all girls' feet.
- D No girl's foot is shorter than all boys' feet.
- E There is no difference, on average, between boys' footlengths and girls' footlengths.

Exer 17.1-3

4. What is the Null Hypothesis being tested by the p-value on the intercept?

- A Boys' and girls' feet are, on average, the same length
- B The length of kids' feet is, on average, zero.
- C The length of boys' feet is, on average, zero.
- D The length of girls' feet is, on average, zero.
- E Girls' and boys' feet don't intercept.

Exer 17.1-4

Here is the report from a related, but slightly different model:

```
> summary( lm( length~sex-1, data=kids ))
```

Coefficients:

	Estimate	Std. Error	t value	Pr(> t )
sexB	25.1050	0.2847	88.18	<2e-16
sexG	24.3211	0.2921	83.26	<2e-16

Note that the p-values for both coefficients are practically zero,  $p < 2 \times 10^{-16}$ .

What is the Null Hypothesis tested by the p-value on sexG?

- A Girls' feet have a different length, on average, than boys'.
- B Girls' feet are no different in length, on average, than boys'.
- C Girls' footlengths are, on average, zero.
- D Girls' footlengths are, on average, greater than zero.

Exer 17.1-5