

Exercise walk-through

6.5

Interpreting p-Values

AP Statistics

What we will cover

- 1 Confidence interval for p
- 2 Interpreting an interval
- 3 Setting up a test
- 4 p-values and conclusions
- 5 Type I and II errors
- 6 Comparing two proportions



Setting up a test

A **significance test** weighs evidence against a claim.

■ **null** $H_0 : p = p_0$ (“no effect”)

■ **alternative** $H_a : p >, <, \text{ or } \neq p_0$

The **test statistic** (one-sample z-test), using p_0 :

$$z = \frac{\hat{p} - p_0}{\sqrt{p_0(1 - p_0)/n}}$$

Check conditions with the **assumed** p_0 , not $\hat{p}$.

A coin

58 heads in 100: $\hat{p} = 0.58$, $H_0 : p = 0.5$, $H_a : p > 0.5$.

$$z = \frac{0.58 - 0.50}{0.05} = 1.6$$

Check yourself

- 1 What is z^* for a 95% confidence interval?
- 2 A small p-value is evidence for or against H_0 ?
- 3 Rejecting a true H_0 is which type of error?
- 4 What value must a difference interval exclude to show a real gap?



Answers 1. 1.96 2. against H_0 3. Type I 4. zero

Exercises 2.1-2.3

2.1 Define a p-value.

[1]

2.2 State what a small p-value suggests.

[1]

2.3 State the assumption made when computing a p-value.

[1]

Exercises 2.1-2.3

2.1 Define a p-value.

[1]

2.1

- the probability of a result at least as extreme as the one observed, assuming H_0 is true

2.2 State what a small p-value suggests.

[1]

2.2

- evidence against H_0

2.3 State the assumption made when computing a p-value.

[1]

2.3

- that the null hypothesis is true

Exercises 3.1-3.2

3.1 A p-value is computed assuming

[1]

☐

A H_a is true

B H_0 is true

C the sample is biased

D nothing

3.2 A small p-value gives evidence

[1]

☐

A for H_0

B against H_0

C of bias

D of nothing

Exercises 3.1-3.2

3.1 A p-value is computed assuming

[1]

☐

A H_a is true

B H_0 is true

C the sample is biased

D nothing

3.1 B

- H_0 is true.

3.2 A small p-value gives evidence

[1]

☐

A for H_0

B against H_0

C of bias

D of nothing

3.2 B

- against H_0 .

Exercise 3.3 (a)

3.3 A test gives a p-value of 0.02.

(a) State what this value measures.

[1]

Exercise 3.3 (a)

3.3 A test gives a p-value of 0.02.

(a) State what this value measures.

[1]

(a)

- the probability of a result this extreme if H_0 is true

Exercise 3.3 (b)

3.3 A test gives a p-value of 0.02.

(b) State whether it is strong or weak evidence against H_0 .

[1]

Exercise 3.3 (b)

3.3 A test gives a p-value of 0.02.

(b) State whether it is strong or weak evidence against H_0 .

[1]

(b)

- strong

Exercise 3.3 (c)

3.3 A test gives a p-value of 0.02.

(c) State the assumption behind it.

[1]

Exercise 3.3 (c)

3.3 A test gives a p-value of 0.02.

(c) State the assumption behind it.

[1]

(c)

- that H_0 is true