

Claims about Two Proportions or Two Means

Math 122 - Introduction to Statistics and
Probability

Two Proportions

H_0 will be $p_1 = p_2$

H_1 will be one of $p_1 < p_2$ or $p_1 > p_2$ or $p_1 \neq p_2$

Online Calculator: `twopropz`

TI: `2-PropZTest`

Polio

In a famous 1954 experiment to test the effectiveness of the Salk Polio vaccine, 200,000 children were given the vaccine and 200,000 were given a placebo. These were the results:

	Vaccine	Placebo
Contracted Polio	33	115
Treated	200,000	200,000

Test the claim that:

“The rate of polio among children receiving the Salk vaccine is lower than the rate among children not receiving the vaccine.”

H1N1 and Obesity

Here are the results of two recent studies:

In a sample of 268 adult H1N1 patients, 47% were found to be obese.

In a sample of 700 adults, 34% were found to be obese.

Use this information to test the claim that the rate of obesity among H1N1 patients is greater than the rate of obesity in the general population.

Two Independent Means

H_0 will be $\mu_1 = \mu_2$

H_1 will be one of $\mu_1 < \mu_2$ or $\mu_1 \neq \mu_2$ or $\mu_1 > \mu_2$

Online Calculator: twomeant

TI: 2-SampTTest

Two Means

This is about
INDEPENDENT MEANS
that are not necessarily naturally related.

Later we will talk about
DEPENDENT MEANS or MATCHED PAIRS OF
MEANS
where data comes in natural pairs.

Age and promotions

A large company conducted a competition for promotions in which employees were asked to apply for promotion and the “most qualified” applicants received promotions or raises.

Many of the applicants complained of age discrimination in granting the promotions.

There were 23 unsuccessful applicants whose average age was 47 with a standard deviation of 7.2.

There were 30 successful applications whose average age was 43.9 with a standard deviation of 5.9.

Age and Promotions

	Number	Average Age	St Dev
Unsuccessful	23	47	7.2
Successful	30	43.9	5.9

Use this data to test the claim that the successful applicants come from a population whose average age is less than the average age of the population from which the unsuccessful applicants come.

Hours of sleep

Collect the number of hours slept last night by each female in class and the number of hours slept last night by each male.

Use this data to test the claim:

“Men sleep more than women.”

Matched Pairs

There are times when data comes naturally in pairs and the first number is to be compared to the second.

- ① High School GPA – College GPA
- ② Pre-Season “Maxes” – Post-Season “Maxes”
- ③ Height of Husband – Height of Wife
- ④ Age of Husband at Death – Age of Wife at Death
- ⑤ Days of school missed by first child – Days of school missed by second child
- ⑥ Predicted Temperature – Actual Temperature

Claims about Matched Pairs

We can address claims about matched pairs of data
such as

- 1 The first number is (on average) larger than the second.
- 2 The first number is (on average) smaller than the second.
- 3 The first number is (on average) no different from the second.

Differences

Mathematically, we address the
DIFFERENCES
FIRST NUMBER MINUS THE SECOND.
AVERAGE DIFFERENCE = μ_d

Possible Claims:

$$\mu_d = 0 \quad \mu_d \neq 0 \quad \mu_d > 0 \quad \mu_d \geq 0 \quad \mu_d < 0 \quad \mu_d \leq 0$$

Practically, we will phrase H_0 and H_1 as we did for independent means.

Online Calculator: matchedpairs

Matched Pairs - TI

We need to create a list of the differences.

- 1 Enter one data list in L1
- 2 Enter other data list in L2
- 3 Enter L1-L2 in L3
- 4 Run a T-TEST from data with the data in L3

Reported Heights vs. Measured Heights

Claim: There is a difference between the heights that people report and their actual measured heights.

Reported:	68	71	63	70	71
Measured:	67.9	69.9	64.9	68.3	70.3

Fall Track

Claim: The Fall Track program improves athletes' 30m times.

Before	After
4.53	4.31
4.67	4.56
4.34	4.29
4.57	4.31
4.48	4.43
4.38	4.34
4.64	4.60
4.92	4.95
4.61	4.46
4.07	4.00

Heights of Presidential Candidates

Listed below are the heights of the winning and losing presidential candidates for several years

W	71	74.5	74	73	69.5	71.5	75	72	70.5	69
L	73	74	68	69.5	72	71	72	71.5	70	68

Use this data to test the claim that the winning candidate is usually taller than the losing candidate.