⚠ Lagunita is retiring and will shut down at 12 noon Pacific Time on March 31, 2020. A few courses may be open for self-enrollment for a limited time. We will continue to offer courses on other online learning platforms; visit http://online.stanford.edu.

Course › Inference: Estimation › Estimation: Point Estimation › Point Estimation: Introduction

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Point Estimation: Introduction

> **Learning Objective: Determine point estimates in simple cases, and make the connection between the sampling distribution of a statistic, and its properties as a point estimator.**

Point estimation is the form of statistical inference in which, based on the sample data, we estimate the unknown parameter of interest using a **single** value (hence the name **point** estimation). As the following two examples illustrate, this form of inference is quite intuitive.

Example

Suppose that we are interested in studying the IQ levels of students at Smart University (SU). In particular (since IQ level is a quantitative variable), we are interested in estimating μ, the mean IQ level of all the students at SU.

A random sample of 100 SU students was chosen, and their (sample) mean IQ level was found to be $\overline{x} = 115$

If we wanted to estimate μ, the population mean IQ level, by a single number based on the sample, it would make intuitive sense to use the corresponding quantity in the sample, the sample mean $\overline{x} = 115$. We say that 115 is the **point estimate** for μ, and in general, we'll always use $\overline{x}$ as the **point estimator** for μ. (Note that when we talk about the **specific value** (115), we use the term **estimate**, and when we talk in general about the **statistic** $\overline{x}$, we use the term **estimator**. The following figure summarizes this example:
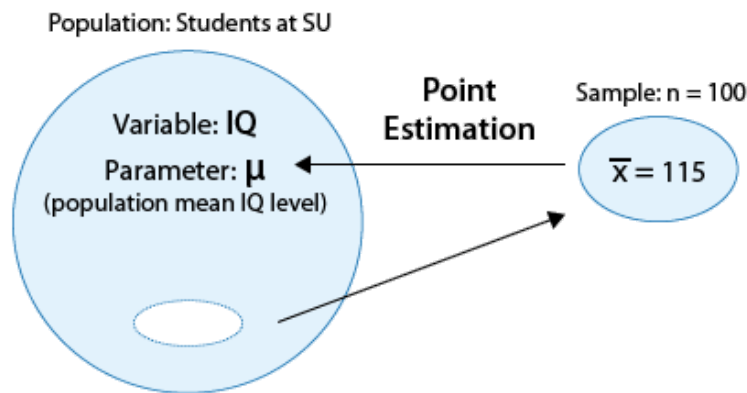
Here is another example.

Example

Suppose that we are interested in the opinions of U.S. adults regarding legalizing the use of marijuana. In particular, we are interested in the parameter p, the proportion of U.S. adults who believe marijuana should be legalized.

Suppose a poll of 1,000 U.S. adults finds that 560 of them believe marijuana should be legalized. If we wanted to estimate p, the population proportion, using a single number based on the sample, it would make intuitive sense to use the corresponding quantity in the sample, the sample proportion $\hat{p} = \frac{560}{1000} = 0.56$. We say in this case that 0.56 is the **point estimate** for p, and in general, we'll always use $\hat{p}$ as the **point estimator** for p. (Note, again, that when we talk about the **specific value** (0.56), we use the term estimate, and when we talk in general about the **statistic $\hat{p}$**, we use the term **estimator.** Here is a visual summary of this example:
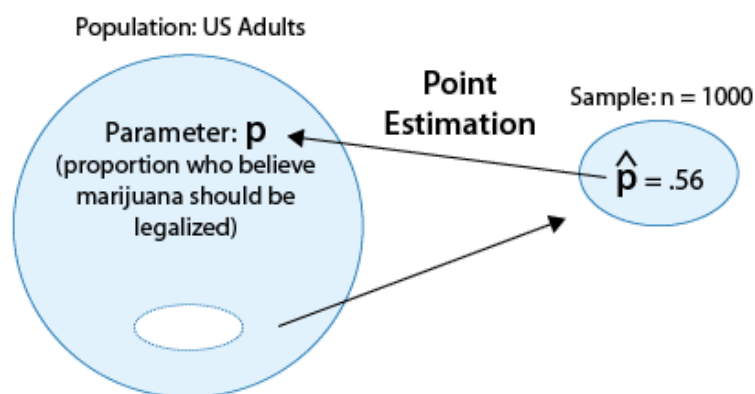
Scenario: Exercise Habits of College Students

A study on exercise habits used a random sample of 2,540 college students (1,220 females and 1,320 males).

The study found the following:

- 818 of the females in the sample exercise on a regular basis.

- 924 of the males in the sample exercise on a regular basis.

- The average time that the 1742 students who exercise on a regular basis (818 + 924) spend exercising per week is 4.2 hours.

Learn By Doing

1/1 point (graded)

What is the point estimate for the proportion of all female college students who exercise on a regular basis? (Numbers are rounded to two decimal places as needed.)

○   0.32

◉   0.67 ✔

○   0.69

○   0.48

Answer

Correct:

Of the 1,220 females in the sample, 818 exercise on a regular basis, so the sample proportion is 818 / 1,220 = 0.67.

[Submit]

Learn By Doing

1/1 point (graded)

What is the point estimate for the proportion of all college students who exercise on a regular basis? (Numbers are rounded to two decimal places as needed.)

○   0.67

○ 0.70

○ 0.32

● 0.69 ✔

Answer
Correct:
Of the 2,540 students in the sample, 1,742 exercise on a regular basis, so the sample proportion of students who exercise on a regular basis is 1,742 / 2,540 = 0.69.

Submit

Learn By Doing

1/1 point (graded)
Which of the following has a point estimate of 4.2?

○ The percentage of all college students who exercise on a regular basis

○ The mean time that all college students spend exercising per week

● The mean time that all college students who exercise on a regular basis spend exercising per week ✔

Answer
Correct:
The value 4.2 was calculated using data only from the 1,742 students who exercise on a regular basis, and therefore, it is the point estimate for the mean number of exercise hours per week in the population of college students who exercise on a regular basis.

Submit

Scenario: Newlywed Couples

A psychology researcher was conducting a study about newlywed heterosexual couples during the first two years of their marriage. 513 newlywed couples were randomly chosen for the study. One of the questions that the researcher was interested in was "During a typical week, how many times do you have sex?" The 513 responses had an average of 2.35 and standard deviation of 1.2. Another question that was asked is "During a typical week, how many evenings do you go out?" 171 of the couples answered that they go out more than twice a week.

Did I Get This (1/1 point)

What is the point estimate for the proportion of all newlyweds who go out more than twice during a typical week?

Your Answer:

> 171/513, so 33%

Our Answer:

The point estimate is the sample proportion of newlyweds that go out more than twice a week: 171/513 = 0.33.

[Resubmit] [Reset]

Did I Get This

1/1 point (graded)

2.35 is the point estimate for which of the following?

○   The proportion of all newlyweds who have sex more than twice in a typical week.

○   The mean number of times all newlyweds go out during a typical week.

◉   The mean number of times all newlyweds have sex during a typical week. ✔

Answer

Correct:

We are told that the mean number of times that the newlyweds in our sample have sex in a typical week is 2.35. 2.35 is, therefore, the point estimate for the mean in the entire population (all newlyweds).

[Submit]