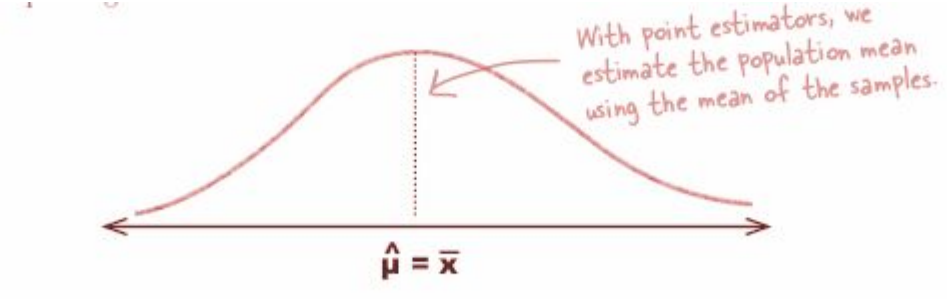
Confidence Intervals

Interval Estimate

Problem with point estimate

- Sometimes samples don’t give quite the right result.
- We have seen how you can use point estimators to estimate the precise value of the population mean, variance, or proportion, but the trouble is, how can you be certain that your estimate is completely accurate?
- We need another way of estimating population statistics, one that allows for uncertainty.

Confidence Intervals (CI)



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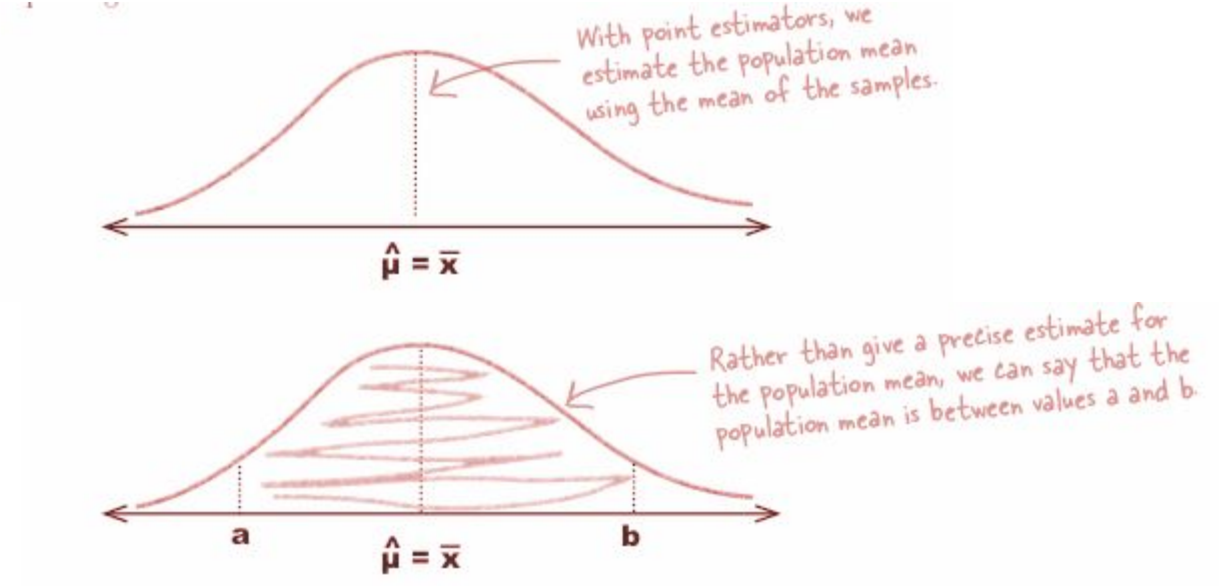

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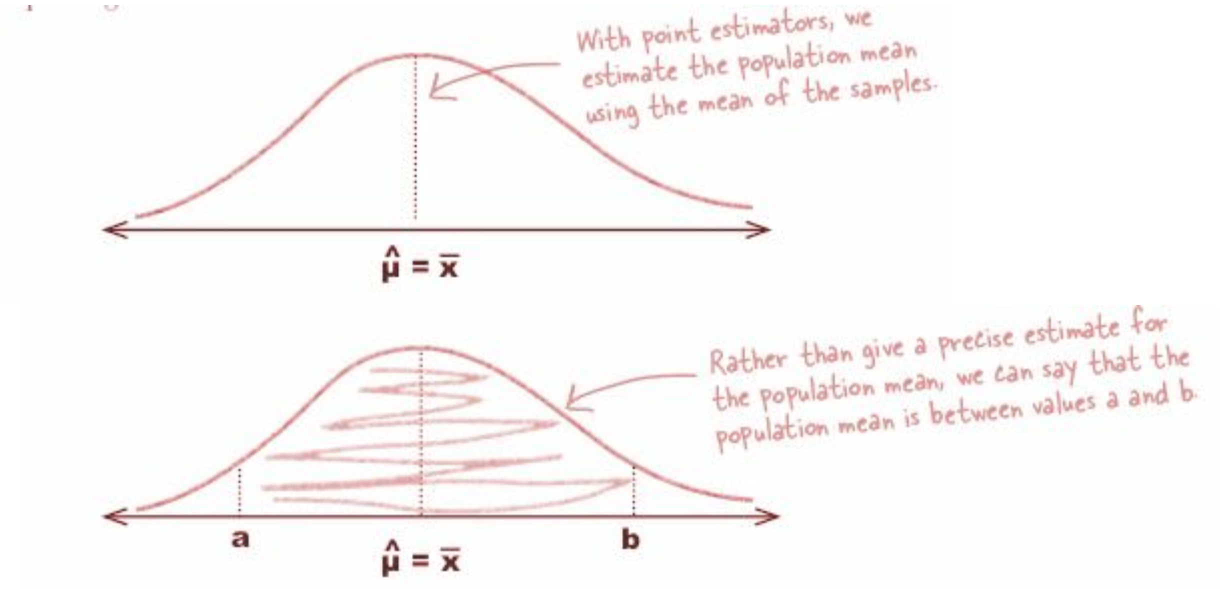

We need to find a and b such that $P(a < \mu < b) = 0.95$
(a,b) is called the confidence interval

Finding Confidence Interval

1. Choose your population statistic

2. Find its sampling distribution

3. Decide on the level of confidence

4. Find the confidence limits

Cheat sheet for CI

Population statistic	Population distribution	Conditions	Confidence interval
μ	Normal	You know what σ^2 is n is large or small $\bar{x}$ is the sample mean	$\left(\bar{x} - c\frac{\sigma}{\sqrt{n}}, \bar{x} + c\frac{\sigma}{\sqrt{n}}\right)$
μ	Non-normal	You know what σ^2 is n is large (at least 30) $\bar{x}$ is the sample mean	$\left(\bar{x} - c\frac{\sigma}{\sqrt{n}}, \bar{x} + c\frac{\sigma}{\sqrt{n}}\right)$
μ	Normal or non-normal	You don't know what σ^2 is n is large (at least 30) $\bar{x}$ is the sample mean s^2 is the sample variance	$\left(\bar{x} - c\frac{s}{\sqrt{n}}, \bar{x} + c\frac{s}{\sqrt{n}}\right)$
p	Binomial	n is large p_s is the sample proportion q_s is $1 - p_s$	$\left(p_s - c\sqrt{\frac{p_s q_s}{n}}, p_s + c\sqrt{\frac{p_s q_s}{n}}\right)$

INTERNSHIPSTUDIO

Confidence Interval

Level of confidence	Value of c
90%	1.64
95%	1.96
99%	2.58

CI -> statistic ± (margin of error)

margin of error = c × (standard deviation of statistic)

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Substituting we get (0.092, 0.408)