

Stat 312: Lecture 7

Confidence Intervals III.

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Concepts

- If n is sufficiently large, approximate $100(1 - \alpha)\%$ confidence interval for μ is $\bar{x} \pm z_{\alpha/2}s/\sqrt{n}$, where s is the sample standard deviation.
- Let p denote the proportion of an individual with a specified property. $100(1 - \alpha)\%$ CI for a *population proportion* p is

$$\hat{p} \pm z_{\alpha/2} \sqrt{\hat{p}\hat{q}/n}.$$

- One-sided confidence interval: An upper confidence bound for μ is

$$\mu < \bar{x} + z_{\alpha}s/\sqrt{n}$$

and a lower confidence bound for μ is

$$\mu > \bar{x} - z_{\alpha}s/\sqrt{n}.$$

In-class problems

Ex. Toss $n = 100$ biased coins with $P(H) = p$. Suppose you observe 38 heads. Construct 95% CI of p . `rbinom(n,1,p)` will generate a Bernoulli random sample of size n with $P(X_i = 1) = p$.

```
> X<-rbinom(100,1,0.4)
> X
[1] 1 0 0 0 0 0 0 0 0 1 0 1 1 0 0 0 0
[17] 0 0 1 1 0 1 0 1 1 0 1 0 1 0 1 0
```

```
[33] 1 1 0 0 0 0 1 0 1 0 0 0 0 0 1 0
[49] 0 1 0 0 0 0 1 1 0 1 0 1 1 0 0 1
[65] 0 0 1 0 0 1 0 0 0 1 0 0 1 0 0 0
[81] 1 0 1 0 0 1 1 0 0 0 1 0 0 1 1 1
[97] 0 1 1 0
> sd(X)
[1] 0.4878317
> 0.38+1.96*0.49/sqrt(100)
[1] 0.47604
> 0.38-1.96*0.49/sqrt(100)
[1] 0.28396
```

Exercise 7.23. Use Concept 2.

When 37 helmets were subjected to a certain impact test, 24 showed damage. Let p denote the proportion of helmets that would show damage under the test. Find a 99% CI for p .

Self-study problems

Example 7.8., 7.8. Use Concept 2.