CI and HT for differences via CLT

Difference in proportions

A study in 1994 examined over 1400 randomly sampled dogs, some of which had been exposed to the herbicide 2,4-Dichlorophenoxyacetic acid. They wanted to do know if there is an increased risk in dogs in developing cancer due to exposure to 2,4-D.

group	cancer	no cancer	total
control	300	641	941
herbicide	191	304	495
total	491	945	1436

Confidence interval

Let population 1 be dogs exposed to 2,4-D, and population 2 be dogs not exposed to 2,4-D. We want a 95% CI for $p_1 - p_2$, where p_i is the rate of cancer in population i.

Obtain useful statistics:

- Check conditions for CLT:

- Are conditions for CLT met?

- Collect the components of confidence interval:

- Construct interval:

- Interpret:

Hypothesis test

Do the data provide strong evidence at the 0.05 level that the rate of cancer is higher for dogs exposed to 2,4-D than that of dogs not exposed to the herbicide?

- Define hypotheses

- Obtain pooled proportion

- Check conditions for CLT

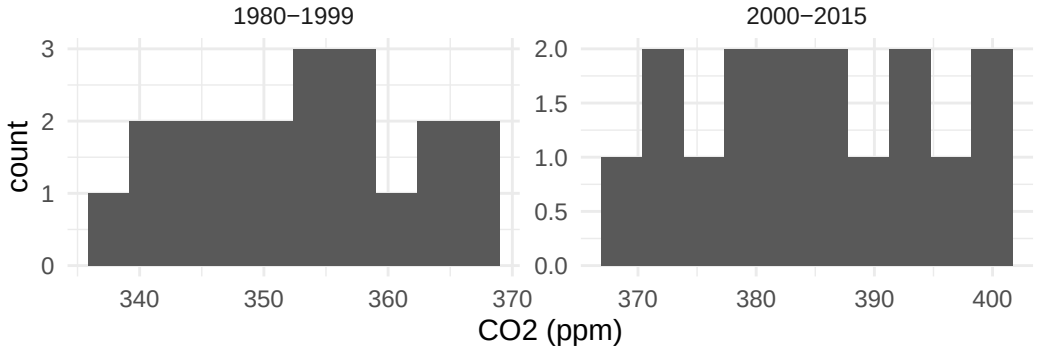
- Are conditions for CLT met?
- What is the null distribution of $\hat{p}_1 - \hat{p}_2$?

- Find the value of the test-statistic

- Draw picture and write code to obtain p-value

Difference in means

The Mauna Loa Observatory in Hawaii of monitors atmospheric solar, atmospheric, and meteorological parameters. We have data on annual atmospheric CO2 concentrations from 1980-2015. Specifically, we are interested in comparing CO2 levels between years 2000-2015 and years 1980-1999.



years	n	$\bar{x}$	s
1980-1999	20	353.12	9.0
2000-2015	16	385.02	9.9

Confidence interval

Obtain a 90% confidence interval for the difference between the average atmospheric C02 levels (ppm) from years 2000-2015 and years 1980-1999.

- Define parameters

- Check conditions for CLT

- Are conditions for CLT met?

- Collect the components of confidence interval:

- Construct interval:

- Interpret:

Hypothesis test

- Define hypotheses

- We already checked conditions!
- Find the value of the test-statistic and its distribution

- Draw picture and write code to obtain p-value

- What code would you write if H_A was two-sided?