Practice with Inference

Sleep deprivation, CA vs. OR

According to a report on sleep deprivation by the Centers for Disease Control and Prevention, the proportion of California residents who reported insufficient rest or sleep during each of the preceding 30 days is 8.0%, while this proportion is 8.8% for Oregon residents. These data are based on simple random samples of 11,545 California and 4,691 Oregon residents.

a) Calculate a 95% confidence interval for the difference between the proportions of Californians and Oregonians who are sleep deprived and interpret it in context of the data.
b) Conduct a hypothesis test to determine if these data provide strong evidence the rate of sleep deprivation is different for the two states. (Reminder: Check conditions)
c) It is possible the conclusion of the test in part (b) is incorrect. If this is the case, what type of error was made?

Parasitic worm

Lymphatic filariasis is a disease caused by a parasitic worm. Complications of the disease can lead to extreme swelling and other complications. Here we consider results from a randomized experiment that compared three different drug treatment options to clear people of the this parasite, which people are working to eliminate entirely. The results for the second year of the study are given below: (King et al., 2018)

group	Outcome		
	Clear at Year 2	Not Clear at Year 2	Total
Three drugs	52	2	54
Two drugs	31	24	55
Two drugs annually	42	14	56
Total	125	40	165

a) Conduct a hypothesis test to determine if these data provide strong evidence that drug effects outcome. (Reminder: Check conditions)

Fuel efficiency on the highway

Each year the US Environmental Protection Agency (EPA) releases fuel economy data on cars manufactured in that year. Below are summary statistics on fuel efficiency (in miles/gallon) from random samples of cars with manual and automatic transmissions manufactured in 2021. Do these data provide strong evidence of a difference between the average fuel efficiency of cars with manual and automatic transmissions in terms of their average highway mileage? (US DOE EPA, 2021)

HIGHWAY	Mean	SD	n
Automatic	23.7	3.90	25
Manual	30.9	5.13	25
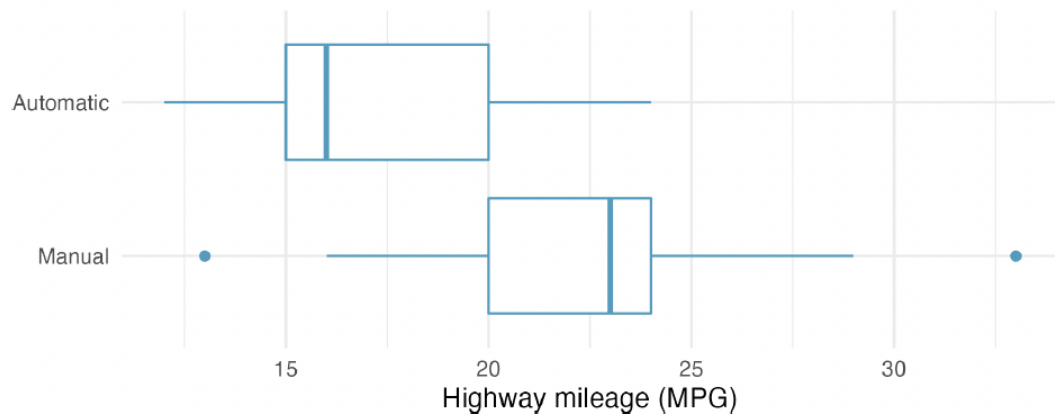
Friday the 13th accidents

In the early 1990's, researchers in the UK collected data the number of traffic accident related emergency room (ER) admissions on Friday the 13th with

the goal of addressing issues of how superstitions regarding Friday the 13th affect human behavior and whether Friday the 13th is an unlucky day. The histograms below show the distributions of numbers of ER admissions at specific emergency rooms on Friday the 6th and Friday the 13th for many such date pairs. Also provided are some sample statistics, where the difference is the ER admissions on the 6th minus the ER admissions on the 13th. (Scanlon et al., 1993)

	n	Mean	SD
sixth	6	8	3
thirteenth	6	11	4
diff	6	-3	3
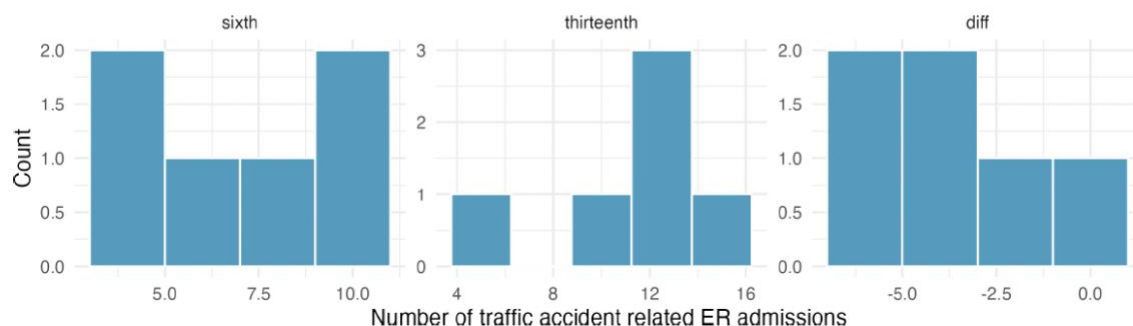
a) Conduct a hypothesis test using mathematical models to evaluate if there is a difference between the average numbers of traffic accident related emergency room admissions between Friday the 6th and Friday the 13th.
b) Calculate a 95% confidence interval using mathematical models for the difference between the average numbers of traffic accident related emergency room admissions between Friday the 6th and Friday the 13th.
c) The conclusion of the original study states, "Friday 13th is unlucky for some. The risk of hospital admission as a result of a transport accident may be increased by as much as 52%. Staying at home is recommended." Do you agree with this statement? Explain your reasoning.