2510-001: QUIZ WEEK 12

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Your name (print clearly in capital letters): _____

(4 points) Tylenol is placebo?!

To test the effectiveness of Tylenol for relieving flu symptoms, 200 flu patients were randomly selected and divided into two groups. One group (of $n_1 = 100$ patients) was administered Tylenol while the complementary group (of $n_2 = 100$ patients) was given placebo. Surveys at 6 hours after ingestion found that

80 of those patients who received Tylenol felt a “positive” effect, and

65 of the patients who received placebo felt a “positive” effect.

(1) What statistical test should one use to determine if Tylenol *produced* a “positive" effect in patients?

(2) Why is this test appropriate?

(3) State the null and alternate hypotheses of your chosen test.

(4) Using a level of significance $\alpha = 0.05$, what is an appropriate conclusion of your chosen hypothesis test?

(4 points) Microsoft discriminates?!

A social scientist is interested in determining if the average salary of an openly LGBTQ+ employee at Microsoft differs from the salary of an employee who chooses not to identify as LGBTQ+. Independent random samples of 8 openly LGBTQ+ and 8 employees not identifying as LBGTQ+ yielded the following weekly salaries (in USD).

$$\texttt{openly\_LBGTQ\_salaries} = (655, 621, 607, 705, 635, 661, 614, 665)$$

$$\texttt{not\_identifying\_salaries} = (847, 720, 689, 702, 788, 783, 824, 681)$$

Let μ_+ be the population mean for *openly LGBTQ+* employees' salaries and let μ_- be the population mean for *not identifying as LGBTQ+* employees' salaries.

(1) What statistical test should one use to determine if openly LGBTQ+ employees at Microsoft have a *different* mean salary than employees at Microsoft who do not identify as LGBTQ+?

(2) Why is this test appropriate? (In particular, are these random samples dependent or independent?)

(3) State the null and alternate hypotheses of your chosen test.

(4) Using a level of significance $\alpha = 0.05$, what is an appropriate conclusion of your chosen hypothesis test?

(2 points) Namaste in bed?!

A researcher wishes to determine whether people with high blood pressure can lower their blood pressure by practicing yoga. A treatment group (of $n_1 = 100$ individuals) and a control group (of $n_2 = 100$ individuals) are randomly selected from American adults. Individuals in the treatment group practice yoga for 30 days, while individuals in the control group do nothing necessarily different from their usual routines for 30 days. The average systolic blood pressure of individuals practicing yoga over 30 days was found to be

$$\bar{x}_1 = 178 \text{ mmHg} \quad \text{with sample standard deviation} \quad s_1 = 35 \text{ mmHg}.$$

Likewise, the average systolic blood pressure of individuals in the control group over 30 days was found to be

$$\bar{x}_2 = 193 \text{ mmHg} \quad \text{with sample standard deviation} \quad s_2 = 37 \text{ mmHg}.$$

Let μ_1 be the mean systolic blood pressure of the population of American adults who practice yoga, and let μ_2 be the mean systolic blood pressure of American adults who do not practice yoga.

(1) Centered at the point estimate $\bar{x}_1 - \bar{x}_2$, what is a %90 confidence interval for the difference $\mu_1 - \mu_2$? (Hint: You may assume the critical t-value is $t_{0.9} = 1.66$. What is the standard error SE in this situation?)

(2) Would you reject someone's claim that practicing yoga *does not reduce* average systolic blood pressure in American adults? (Hint: Is 0 contained in your confidence interval? Can you explain with %90 confidence why this matters?)