Long Question 4 - Neyman Analysis and Fisher Exact Test

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Suppose that the 8 large regions of Vietnam were randomized into one of the following groups: in some regions, the local health care centers continued to be run by the government (control group: 4 regions) or in others, the health centers were subcontracted out to a NGO (treatment group: 4 regions).

You have access to information from a child health survey, which covers 1,000 children per region and gives you information on whether or not the children have been fully immunized.

Question 14

0.5/1.0 point (graded)

A collaborator proposes to run a standard Neyman analysis, on the sample of $4,000$ treatment and $4,000$ control children, ignoring the region altogether.

Denote $\overline{Y_T} = 0.80$ the sample average immunization rate in the treatment group, $\overline{Y_C} = 0.58$ the sample average immunization rate in the control group, $\sigma_T = 1.2^2$ the estimated variance in the treatment group and $\sigma_C = 2.3^2$ the estimated variance in the control group.

For each of the following questions, please round your answer to 2 decimal points

What is the collaborator's estimate of the average treatment effect?

0.22 ✔ **Answer:** 0.22

0.22

What is the collaborator's estimate of the associated variance?

0.00 ✖ **Answer:** 1.44

0.00

Explanation

$$\hat{\tau} = \bar{Y}_t - \bar{Y}_c = 0.80 - 0.58 = 0.22$$

$$\hat{V}_{\text{Neyman}} = \frac{\sigma_T}{N_T} + \frac{\sigma_C}{N_C} = \frac{1.2^2}{4000} + \frac{2.3^2}{4000} = \frac{6.73}{4000} = 1.44$$

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Question 15

1.0/1.0 point (graded)

You object to the collaborator's approach, and instead propose to use the fact that the randomization was done at the region level very seriously and aggregate the data at the region level. Since the sample is small, you propose to run a Fisher exact test.

True or False: The test will test the hypothesis H_0 that the average treatment effect is significantly different from 0.

- ○ True
- ◉ False ✔

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Question 16

0.5/1.0 point (graded)

At the regional level, the rates of fully immunized children in treatment regions are as follows:

- Treatment regions: $85\%,\ 99\%,\ 100\%,\ 76\%$
- Control regions: $26\%,\ 45\%,\ 97\%,\ 72\%$

(Round your answer to 2 decimal points)

I. Using a Permutation Table or R code, construct your Fisher exact test. Please enter the test statistic you obtained from the test you constructed.

0.74 ✖ **Answer:** 0.11

0.74

II. True or False? You can you reject H_0 at the 5% level.

- True
- False ✔

Explanation

Refer back to Homework 8. There are ${}_8C_4$ possible permutations of the treatment assignments, so 70 combinations. In 8 of them the test statistic is greater than $30,$ which implies that the p-value is $0.11.$ Hence, we fail to reject H_0 at the 5% level.

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