

# Midterm Assessment Part 2 Dataset 3: Alzheimer disease

Due Apr 30 at 11:59pm

Points 32

Questions 11

Time Limit None

## Instructions

### ABOUT THIS ASSIGNMENT:

- This assessment is open-book and open-note. You may use lecture material, lab material, a computer, and your text to complete help you. However, it is to be completed on your own. You may not discuss this portion of the exam with your classmates or seek help from any faculty, or any other individuals. Please work on it yourself and do the best that you can. If you need any clarification, please ask me.
- As you progress through the assignment, you must answer each question in order. You will not be able to see the previous question or go back and change your answers.
- Throughout the assignment, you will see sections that are just text (not questions that need to be answered). These usually contain information that is meant to help you get back on track, in case you have started to go in the wrong direction. When you click "Next" to go on, you may get a warning message that ends with "...are you sure you want to leave it blank?". As long as you are on a text-only section, you can ignore this warning and go on.
- The highest score you can get before I grade the manually-graded answers is 26 out of 32.

### ABOUT THE DATASET:

Some people have suggested that Alzheimer disease may be at least partially caused by a contagious agent. If this were true, one might expect that people who come into contact with brain tissue may be more likely to be exposed to such contagion, and therefore may be more likely than the general population to develop Alzheimer disease.

### THE DATA:

Lollis et al. (2010) found that 14 of 7163 male neurosurgeons contracted Alzheimer disease during a 26-year study. The probability of Alzheimer disease in the general population of males of the same age group is 0.00084.

## Attempt History

	Attempt	Time	Score
LATEST	<a href="#">Attempt 1</a>	85 minutes	6 out of 32 *

❗ Correct answers will be available on May 3 at 8am.

Score for this quiz: **6** out of 32 \*

Submitted Apr 30 at 1:30pm

This attempt took 85 minutes.

**Question 1**

**Not yet graded / 1 pts**

The effectiveness of this assignment as a teaching and assessment tool depends upon the honors system. By typing your name below, you agree to complete work on this assignment by yourself, without help from anyone else.

Your Answer:

Lorenzo Ortiz

**Incorrect**

**Question 2**

**0 / 3 pts**

This dataset involves:

- ☐ an association between two categorical variables.
- ☐ the frequency distribution of a single categorical variable.
- ☐ the distribution of a single numerical variable.
- ☐ an association between a categorical explanatory variable and a numerical response variable.



an association between a numerical explanatory variable and a categorical response variable.



an association between two numerical variables.

This dataset involves a frequency distribution of a single categorical variable, whether someone does or does not contract Alzheimer disease. There are only two levels to this variable: Alzheimer disease or no Alzheimer disease. The data involve counting how many people fall into each category.

*Note: if we had information on the numbers of people from the general population that did or did not contract Alzheimer disease, this could be considered a case of testing for an association between two categorical variables: Alzheimer or not and Neurosurgeon or not. Since we only have frequency data from the neurosurgeons, this is a case of a single categorical variable.*

Partial

Question 3

1 / 2 pts

What is the **null** hypothesis associated with this dataset, in biological terms? Select all that apply (i.e., there may be different ways of stating the same null hypothesis, and therefore more than one correct answer).



Neurosurgeons will contract Alzheimer disease at a higher rate than the general population (of the same gender and age).



Exposure to brain tissue increases the chance of developing Alzheimer disease.



Neurosurgeons will contract Alzheimer disease at the same rate as the general population (of the same gender and age).



Exposure to brain tissue does not change the chance of developing Alzheimer disease.

**Question 4**

**2 / 2 pts**

What is the statistical null hypothesis in this study?



Probability of contracting Alzheimer disease for male neurosurgeons = Probability of contracting Alzheimer's disease for males of the same age from the general population.



Probability of contracting Alzheimer disease for male neurosurgeons = 0.05



Probability of contracting Alzheimer disease for male neurosurgeons = 0.5



Probability of contracting Alzheimer disease for male neurosurgeons > Probability of contracting Alzheimer's disease for males of the same age from the general population.

**Question 5**

**3 / 3 pts**

Creating a polished figure to display the results of a dataset is often described as the last step in an analysis. However, I encourage you to graph your data early and often. This is the most intuitive way to see what patterns are present and to make sure the results of your statistical analysis make sense.

What kind(s) of graph(s) would be appropriate to display this dataset? Select all that apply.

☐ Histogram

☐ Boxplot

☒ Bar graph

☐ Scatter plot

☐ Mosaic plot

☐ Contingency table

Unanswered

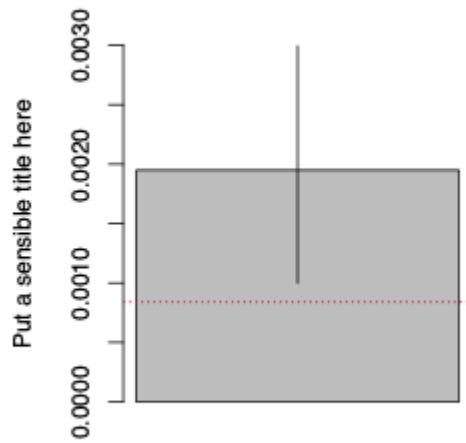
Question 6

Not yet graded / 4 pts

Make a polished figure to display this dataset, following the rules of good graphing that we have talked about in lab and class. Upload it here.

*Hint: a bar graph with a single bar is appropriate for this dataset. For a perfect score, make sure to add error bars and a visual indication of the null hypothesis. You may have to run your analysis first to help you plot the error bars.*

In case you had trouble with the figure above, it should look like this:



Unanswered

### Question 7

Not yet graded / 3 pts

Write a figure caption for the figure you submitted above, using the rules we have learned in this class.

Your Answer:

Unanswered

### Question 8

0 / 3 pts

What statistical test(s) would be most appropriate for this dataset, as long as the data are consistent with the assumptions related to that test? Mark True (i.e., appropriate, if assumptions are met) or false (i.e., not appropriate) for each choice.

Binomial test [ Select ]

Linear Regression [ Select ]

Linear Correlation [ Select ]

Contingency analysis [ Select ]

2-sample t-test [ Select ]

**Answer 1:**

(You left this blank)

**Answer 2:**

(You left this blank)

**Answer 3:**

(You left this blank)

**Answer 4:**

(You left this blank)

**Answer 5:**

(You left this blank)

Because this dataset involves comparing the proportion of neurosurgeons contracting Alzheimer disease to a hypothesized value, a binomial test is appropriate. (Note: A  $\chi^2$  Goodness-of-fit test with two categories could also be used, but I did not offer that as a choice above to limit confusion).

Unanswered

**Question 9**

**0 / 3 pts**

What are the assumptions of a binomial test? (Remember that random sampling is an assumption of every test we'll use in this class, even though we don't always say so explicitly in the labs).

☐ The observations follow a Normal distribution.

☐ The observations ("trials") are independent.

☐

No more than 20% of categories have expected frequencies of less than 5.

☐

Random sampling

☐

The probability of success or failure is fixed (not varying between trials).

Unanswered

Question 10

0 / 4 pts

Let's say for now that the assumptions of a binomial test are true for this dataset. Perform the statistical test. What **P-value** do you get from your test? Report the number to four decimal places.

\*Note that I am asking for the **P-value**, not the proportion ( $p$ ).

Unanswered

Question 11

0 / 4 pts

Based on the  $P$ -value for your test, which statement on Canvas best represents your conclusion?

Since the  $P$ -value is [ Select ] 0.05, we [ Select ] the null hypothesis. Our data [ Select ] the alternative hypothesis. We can conclude that neurosurgeons [ Select ] contract Alzheimer disease more often than the general population. This [ Select ] that a contagious agent may be involved in the development of Alzheimer disease.

Answer 1:

(You left this blank)

Answer 2:



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(You left this blank)

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**Answer 3:**

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(You left this blank)

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**Answer 4:**

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(You left this blank)

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**Answer 5:**

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(You left this blank)

Quiz Score: **6** out of 32