**TEACHING BIVARIATE CATEGORICAL DATA ANALYSIS**

**TASK 1 (Smoking):** In a medical center 250 people have been observed in order to determine whether the habit of smoking has some relationship with bronchial disease. The following results have been obtained:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Bronchial disease | No bronchial disease | Total |
| Smoke | 90 | 60 | 150 |
| Not smoke | 60 | 40 | 100 |
| Total | 150 | 100 | 250 |

For this sample of people, is bronchial disease associated with smoking? Explain your answer.

**TASK 2 (Drug):** We are interested in assessing if a certain drug produces digestive troubles in old people. For a sufficient period, 25 old people have been studies, and these results have been obtained:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Digestive troubles | No digestive troubles | Total |
| Drug taken | 9 | 8 | 17 |
| No drug | 7 | 1 | 8 |
| Total | 16 | 9 | 25 |

Using the information in this table, for this sample of old people is digestive trouble associated with taking the drug?

**SAMPLE STUDENT RESPONSES**

What we are going to do next is look at some sample student responses to these tasks that illustrate misconceptions students have when doing tasks like these. These student responses are real student responses to these tasks, or ones like them, which have come out of research studies done by statistics educators.

***Set 1***

*David (Smoking task): Yes, there is an association. Although both the percentage of smokers with bronchial disease and the percentage of non-smokers with bronchial disease are 60%, there are more smokers with bronchial disease than nonsmokers.*

*Nathan (Smoking task)*: *Ummm wouldn’t it make more sense though that they would have to interview the same amount of people because if they did then they would have more yeses and more nos for the not-smoking population.*

With your group, discuss and document:

1. What misconceptions do these students have? How are their misconceptions related? i.e., what pre-requisite knowledge are they both lacking?
2. Your response to this pair of students as their teacher. Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

***Set 2***

*Molly (smoking task): There is no association between smoking and bronchial disease because if there were, all smokers would have bronchial disease and none of the nonsmokers would.*

*Tank (smoking task): There is an influence of smoking, but it is not very great, because there are smokers without bronchial disease and nonsmokers with the disease.*

With your group, discuss and document:

1. What misconceptions do these students have? How are their misconceptions related? i.e., what pre-requisite knowledge are they both lacking?
2. Your response to this pair of students as their teacher. Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

***Set 3***

*Dana (drug task): Taking the drug lowers the chance of digestive troubles, instead of raising it, so there is no association.*

*Katie (drug task): There is really no dependence because almost all of the people who didn’t take the drug had digestive troubles and only half of the people who took the drug did. It’s decreasing the chances instead of increasing it.*

With your group, discuss and document:

1. What misconceptions do these students have? How are their misconceptions related? i.e., what pre-requisite knowledge are they both lacking?
2. Your response to this pair of students as their teacher. Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

***Set 4***

*Liesel (smoking task): I personally believe there is an association between smoking and having or not having bronchial disease because if we observe the table, in people with bronchial disease there is a higher percentage of smokers.*

*Ivy(drug task): The biggest number in the table is 9, for people who take the drug and have digestive troubles, so they are dependent.*

With your group, discuss and document:

1. What misconceptions do these students have? How are their misconceptions related? i.e., what pre-requisite knowledge are they both lacking?
2. Your response to this pair of students as their teacher. Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.

***Set 5***

*Bob (smoking): I know that smoking causes lung cancer, so I’m sure that people who smoke are more likely to have bronchial disease.*

With your group, discuss and document:

1. What misconception does this student have?
2. Your response to Bob as his teacher. Be specific in your description of your response, writing exactly what you would say and/or drawing anything you would use in your response.