ASM201: Epidemics and Outbreaks

Assignment 3 Homework Template

Instructions: This assignment is worth 100 points. Please use the following template to record your answer and upload this document by the due date.

Data Cleaning

Before working with a dataset, it is important to examine the dataset for errors. Does the data make sense? Are there any missing or out of range values?

1. Are there any missing values in your dataset? If so, indicate the ID and the variable name for each missing value.
2. Are there any values that appear to be formatted incorrectly? For example, for a variable such as the number of papillae, you might see a “yes” instead of a number. Or someone indicates the number of papillae as 50, but classifies themselves as a non-taster. If you see any formatting errors, please replace the values with a “.” and indicate which values (ID and variable name) you changed to missing.
3. Are there any out of range values that might be indicative of a data entry error? Please create a histogram to show the distribution of the number of papillae. Paste the graph below. Are there any values that seem out of range- way too high or too low (use your best judgement)? If you see any extreme values, please replace the number with a “.” and indicate which values (ID and variable name) you changed to missing.

Descriptive Epidemiology:

Now that your dataset is clean, it is time to start doing to simple descriptive epidemiology. Descriptive epidemiology allows us to identify patterns in the data.

1. Studies have shown that about 25% of the population is extremely sensitive to the taste of PROP, 45% are “average” in their ability to taste it and 30% cannot taste it. What is the distribution of Super-tasters, Average-tasters, and Non-tasters (based on taste sensitivity to PROP) in our class? Make a pie chart and paste it below? Does the distribution in our class match the expected distribution in the population? Can you speculate as to why or why not?
2. For the variable papillae, please calculate the mean, median, minimum and maximum values and list them below.

Mean:

Median:

Minimum:

Maximum:

1. Let’s look at the relationship between gender and PROP. Please prepare a table to look at the distribution of PROP by gender. Indicate the number (N) and percentage (%) of men and women for each category of taster: Supertaster, Average Taster, Non-Taster. Are women more or less likely to be Supertasters as compared to men?

|  |  |  |  |
| --- | --- | --- | --- |
|  | PROP Result | | |
| Gender | Supertaster | Average Taster | Non-Taster |
| Male, N (%) |  |  |  |
| Female, N (%) |  |  |  |

1. Create a scatterplot graph showing the relationship between the survey score result and the number of papillae on the tongue. Paste the graph in the space below. Be sure to label your x- and y-axis. Does there appear to be a correlation between the score on the survey and the number of papillae observed on the tongue?
2. Extra credit (5 points): Create a bar graph of the mean number of papillae for each category of taster (super taster, average taste, non-taster). You will need to reorganize your dataset into a format that can help your analyze the data.

Screening:

Now, we will examine the sensitivity and specificity of the screening tests compared to the gold standard test (PROP).

1. Please complete the table to compare Supertasters identified by PROP results vs. Supertasters identified by survey test results. Indicate the number of people in each cell and then calculate sensitivity of the survey results, specificity of the survey results and PPV of the survey.

|  |  |  |  |
| --- | --- | --- | --- |
|  | “True” Diagnosis (PROP) | |  |
| Survey Test Result: | Supertaster | Not a Supertaster  (Includes Average Tasters and Non-Tasters) | Total |
| Supertaster |  |  |  |
| Not a Supertaster (Includes Average Tasters and Non-Tasters) |  |  |  |
| Total |  |  |  |

**Compute the following:**

Sensitivity:

Specificity:

Predicted Value of a Positive Test (PVP):

1. Please complete the table to compare Supertasters identified by PROP results vs. Supertasters identified by papillae count results. Indicate the number of people in each cell and then calculate sensitivity of the papillae results, specificity of the papillae results and PPV of the papillae count.

|  |  |  |  |
| --- | --- | --- | --- |
|  | “True” Diagnosis (PROP) | |  |
| Papillae Test Result | Supertaster | Not a Supertaster  (Includes Average Tasters and Non-Tasters) | Total |
| Supertaster |  |  |  |
| Not a Supertaster (Includes Average Tasters and Non-Tasters) |  |  |  |
| Total |  |  |  |

**Compute the following:**

Sensitivity:

Specificity:

Predicted Value of a Positive Test (PVP):

1. How does using the survey results affect the number of false positives and false negatives as compared to the papillae test results? Which screening test (tongue papillae or online survey) would you recommend using for a future epidemiological study and why?

Causality:

There is a growing body of literature suggesting that there is a strong relationship between our sense of taste and our overall health. There are numerous correlations of health outcomes with sensitivity to PROP. Please read the article [Super-Tasters and Non-Tasters: Is it Better to Be Average?](https://www.hsph.harvard.edu/nutritionsource/2016/05/31/super-tasters-non-tasters-is-it-better-to-be-average/) by the Harvard School of Public Health for an overview of some of these findings. One particularly interesting study suggests that Super-tasters with greater sensitivity to PROP tend to eat fewer vegetables because of their bitter taste and have been found to have higher colon polyp counts, both of which are potential risk factors for colon cancer (Giovannucci, E., Modifiable Risk Factors for Colon Cancer. Gastroenterol Clin North Am, 2002; 31:925-943). Assume that you are part of a team of epidemiologists that has been hired to review the evidence linking Super-tasters and colon cancer. Your job is to assemble evidence that might help prove that being a Supertaster causes colon cancer. Please identify 3 of the 9 criteria for causality discussed in class and explain what type of evidence you would be looking for to support each of the criteria that you have listed.

Criteria 1 and evidence:

Criteria 2 and evidence:

Criteria 3 and evidence:

Bibliography:   These websites have more information about taste, taste buds, and tongues:

Chudler, E. (2008).That's Tasty. Retrieved July 16, 2008,  from <http://faculty.washington.edu/chudler/tasty.html>

BBC Science & Nature. (n.d.). Science of supertasters. Retrieved July 16, 2008, from   http://www.bbc.co.uk/science/humanbody/body/articles/senses/supertaster.shtml

23andme. (n.d.). *Bitter Taste Perception*. Retrieved August 20, 2011, from https://www.23andme.com/health/Bitter-Taste-Perception/howitworks/

Baroshuk, L. V. (1994, 56(6)). PTC/PROP tasting: anatomy, psychophysics, and sex effects. *Physiol Behav* , pp. 1165-71.

Bowen, R. (2006, December 10). *Physiology of Taste.* Retrieved October 31, 2011, from http://www.vivo.colostate.edu/hbooks/pathphys/digestion/pregastric/taste.html

Chudler. (n.d.). *Bitter*. Retrieved from http://faculty.washington.edu/chudler/bitter.html

F. D. Kitchin, W. H.-E. (1959 April 25: 1069-1074, April 25 :1(5129):). P.T.C. Taste Response and Thyroid Disease. pp. 1069-1074.