536 Homework 4

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Problem 1 (100 points). You will analyze data from a study of the effects of aspirin on myocardial infarction – see Table 1.

	Myocardial Infarction	
	Yes	No
Placebo	28	656
Aspirin	18	658

Table 1: Study on Aspirin Use and Myocardial Infarction.

Please answer the following questions:

1. Calculate the row and colums totals of this table. What is the grand total?

2. Calculate the upper and lower bounds for each of the four cell entries given the row and column totals.

3. How many tables are in the set T of tables consistent with the row and columns totals of Table 1? Give an analytic expression for these tables as a function of the $(1,1)$ cell count.

4. Calculate the expected cell values under the saturated log-linear model.

5. Calculate the expected cell values under the log-linear model of independence of Aspirin Use and Myocardial Infarction.

6. Perform an asymptotic test of independence of Aspirin Use and Myocardial Infarction based on Pearson's chi-square statistic:

$$X^2 = \sum_{\text{all cells}} \frac{(\text{Observed} - \text{Expected})^2}{\text{Expected}}.$$

7. Perform an asymptotic test of independence of Aspirin Use and Myocardial Infarction based on the likelihood ratio statistic G^2:

$$G^2 = 2 \sum_{\text{all cells}} (\text{Observed}) \log \left(\frac{\text{Observed}}{\text{Expected}} \right).$$

8. Perform the Fisher's exact test of independence of Aspirin Use and Myocardial Infarction. Clearly state which hypothesis you chose to test vs. which alternative.

9. Use your chosen log-linear model to describe the conditional distribution of Aspirin Use given Myocardial Infarction:

$$\log \frac{P(\text{Aspirin Use} = \text{“}Placebo''|\text{Myocardial Infarction})}{P(\text{Aspirin Use} = \text{“}Aspirin''|\text{Myocardial Infarction})}$$

10. Draw conclusions related to the effect of aspirin on the occurrence of myocardial infarction. Summarize your findings in a concise statement.