**Exercise 1**

Consider a $I \times J \times K$ contingency table, with classification variables $X$, $Y$, $Z$. Prove that if

1. $X$ and $Y$ are conditionally independent on $Z$; and

2. $X$ and $Z$ are conditionally independent on $Y$

then:

$Y$ and $Z$ are jointly independent from $X$

**Hint:** Write down the probability forms involved, and try to derive the result by using simple probability calculus.

**Exercise 2**

Consider a $I \times J \times K$ contingency table, with classification variables $X$, $Y$, $Z$. Prove that if $Y$ and $Z$ are jointly independent from $X$,

then

1. $X$ and $Y$ are conditionally independent on $Z$; and

2. $X$ and $Z$ are conditionally independent on $Y$

**Hint:** Write down the probability forms involved, and try to derive the result by using simple probability calculus.

**Exercise 3**

[1] The 1988 General Social Survey compiled by the National Opinion Research Center asked: "Do you support or oppose the following measures to deal with AIDS? (1) Have the government pay all of the health care costs of AIDS patients; (2) Develop a government information program to promote safe sex practices, such as the use of condoms. Table 1 summarizes opinions about health care costs (H) and the information program (I), classified also by the respondent's gender (G).

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[1]R-script is available to double check.

| Gender (G) | Information Opinion (I) | Health Opinion (H) | |
|---|---|---|---|
| | | Support | Oppose |
| Male | Support | 76 | 160 |
| | Oppose | 6 | 25 |
| Female | Support | 114 | 181 |
| | Oppose | 11 | 48 |

Table 1: Source: 1988 General Social Survey, National Opinion Research Center.

1. Compute the marginal GH-table

2. For the GH-table, compute the MLE of the marginal odds ratio, the confidence intervals. Interpret the result. (sig. level 5%)

3. Perform a hypothesis test, in order to test if the Information Opinion and the Health Opinion are independent at each level of the Gender. (sig. level 5%)

4. Compute the conditional IH odds ratio at each level of the Gender. Interpret the result.