All notations are from the lectures.

11.1 The following independence loglinear model describes the counts in a 2x2 contingency table, which cross-classifies data according to the levels of variables $X$ and $Y$:

$$\log \mu_{ij} = \lambda + \lambda_i^X + \lambda_j^Y.$$ 

The parameter estimations are:

$$\lambda = 4, \lambda_1^X = -0.6, \lambda_0^X = 0.0, \lambda_1^Y = -1.2, \lambda_0^Y = 0.0.$$ 

a) What are the expected counts $\mu_{ij}$?

b) Find the predicted odds of $P(X = 1)$.

c) Find the predicted probability of $Y = 0$.

d) If we force $\lambda_1^Y = 0$, what will be the value of $\lambda_0^Y$?

e) If we force $\lambda_1^Y + \lambda_0^Y = 0$, what are the values of $\lambda_1^Y$, $\lambda_0^Y$?

f) What is the predicted odds ratio of having $X = 1$ for different categories of $Y$?

11.2 The following loglinear model describes the counts in a 2x2 contingency table, which cross-classifies data according to the levels of variables $X$ and $Y$:

$$\log \mu_{ij} = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_{ij}^{XY}.$$ 

The parameter estimations are:

$$\lambda = 2.5, \lambda_1^X = 1.5, \lambda_0^X = 0.0, \lambda_1^Y = -1.0, \lambda_0^Y = 0.0, \lambda_{11}^{XY} = 2.0, \lambda_{i\neq 1j\neq 1}^{XY} = 0.0.$$ 

a) Find the predicted odds ratio of having $X = 1$ for different categories of $Y$.

b) Find the predicted odds ratio of having $X = 0$ for different categories of $Y$.

c) Find the predicted odds ratio of having $Y = 1$ for different categories of $X$.

d) Find the predicted odds ratio of having $Y = 0$ for different categories of $X$. 

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11.3 Construct an independence loglinear model for counts in a 2x2 table if we know that the total count is 1000, the probability of $X = 1$ is 0.6 and the odds of $Y = 0$ equal to 3.