

HW-2: Question-2 R Notebook

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Question-2 [In Progress]

2.a. Three-Way Loglinear Model¹

$$\log(\mu_{ijk}) = \lambda + \lambda_i^X + \lambda_j^Y + \lambda_k^Z + \lambda_{ij}^{XY} + \lambda_{ik}^{XZ} + \lambda_{jk}^{YZ} + \lambda_{ijk}^{XYZ}$$

THREE-WAY LOGLINEAR ANALYSIS SUMMARY. [ToDo]

Call:

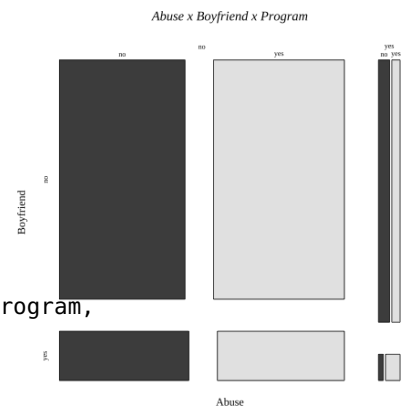
```
loglm(formula = ~Abuse:Boyfriend + Abuse:Program + Boyfriend:Program,  
data = tbl, digits = 4)
```

Statistics:

	X ²	df	P(> X ²)
Likelihood Ratio	3.318	1	0.06853
Pearson	3.245	1	0.07163

Q-2 Data: 'child.sav' & 'child2.sav'

¹ [In Progress]



2.b. Logistic Regression with an Interaction Term²² [In Progress]

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta X$$

$$\pi = \frac{e^{\alpha+\beta X}}{1 + e^{\alpha+\beta X}}$$

R

```
lgm <- glm(abuse ~ boyfriend + program + boyfriend * program, data = dat,
  family = "binomial")
```

LOGISTIC REGRESSION WITH INTERACTION SUMMARY. [ToDo]

Table 2: Fitting generalized (binomial/logit) linear model: abuse
~ boyfriend + program + boyfriend * program

	Estimate	Std. Error	z value	Pr(> z)
boyfriend	-1.586	0.7306	-2.171	0.02997
program	-0.3418	0.2352	-1.453	0.1461
boyfriend:program	1.461	0.8615	1.696	0.08997
(Intercept)	-2.326	0.1545	-15.06	3.016e-51

[2.c]³

³ [ToDo]

Look back at your findings from the analysis of the contingency table in HW 1 Problem 4. Briefly compare your results from HW 1 to the results from the loglinear analysis and the logistic regression model (no more than 2-3 sentences is needed). Refer to specific values when making your comparisons.

2.d% Multiple Logistic Regression⁴⁴ [In Progress]

DATA SUMMARY

	abuse	boyfriend	program	white
no	1129	1010	599	667
yes	84	203	614	546

MULTIPLE LOGISTIC REGRESSION MODEL SUMMARY STATISTICS
AND FIT INDICES

CONFIDENCE INTERVALS (CI) & ODDS RATIOS (OR)

Table 4: Logistic Regression Coefficients (β) &
Corresponding Confidence Intervals (CI)

	CI_{β}		
	β	2.5 %	97.5 %
(Intercept)	-2.983	-3.4407	-2.5676
program	-0.2454	-0.7143	0.2177
boyfriend	-0.8127	-1.6664	-0.0977
white	0.8045	0.3347	1.2902
welfare	0.8665	0.5839	1.1638

Table 5: Logistic Regression Odds Ratios (Φ) &
Corresponding Confidence Intervals (CI) ¹

	CI_{Φ}		
	Φ	2.5 %	97.5 %
(Intercept)	0.0506	0.032	0.0767
program	0.7824	0.4895	1.2432
boyfriend	0.4437	0.1889	0.9069
white	2.2356	1.3975	3.6335
welfare	2.3786	1.7931	3.2019

Note:

¹ Confidence intervals are based on the logistic regression model's profiled log-likelihood function, rather than the standard errors

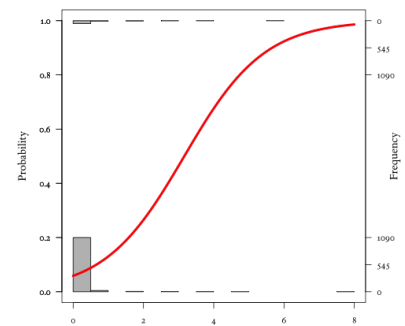


Table 6: Logistic Regression Model Fit Statistics

	Estimate	Degrees of Freedom
Null Deviance	610.61	1212
Residual Deviance	555.77	1208
AIC	565.77	

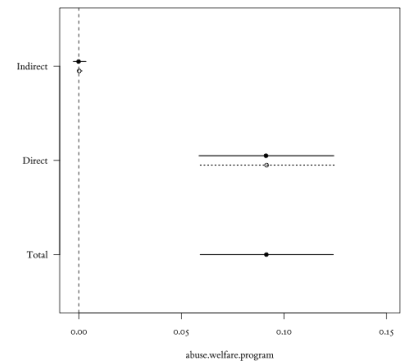
2.e. Moderation Analysis⁵⁵ [In Progress]

Table 7: Fitting generalized (binomial/probit) linear model: f2

	Estimate	Std. Error	z value	Pr(> z)
welfare	0.5103	0.08834	5.777	0.000000007623
program	-0.164	0.117	-1.402	0.1609
white	0.371	0.1165	3.185	0.001448
welfare:program	0.3526	0.1761	2.002	0.0453
(Intercept)	-1.565	0.06014	-26.03	2.225e-149

Table 8: Fitting generalized (gaussian/identity) linear model: f1

	Estimate	Std. Error	t value	Pr(> t)
welfare	-	0.02783	-0.1835	0.8544
	0.005106			
white	-	0.02893	-0.1485	0.882
	0.004296			
(Intercept)	3.098e-	0.01437	2.155e-	1
	17		15	



R

```
## 'interaction.plot()' from the {stats} package ##
with(dat2, {
  interaction.plot(abuse, program, welfare, col = c("darkgray", "#cd0000"),
    lwd = 2, main = "Interaction Effects", ylab = expression(mu[welfare]),
    xlab = "Abuse", trace.label = "Program")
})
```

Interaction Effects