

Analysis of data on canadian women Labour Force participation

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Data on Women's Labour-Force Participation

The data are transformed as follows.

```
library(carData)
data(Womenlf)

wlfddata <- Womenlf
wlfddata$hincome <- factor(0 + (Womenlf$hincome > 14))
wlfddata$partic <- factor(0 + (Womenlf$partic == "fulltime"))
wlfddata$children <- factor(0 + (Womenlf[,3]=="present"))
wlfddata$region <- Womenlf[,4]
colnames(wlfddata) <- c("L", "H", "C", "R")
head(wlfddata)
```

```
  L H C      R
1 0 1 1 Ontario
2 0 0 1 Ontario
3 0 1 1 Ontario
4 0 1 1 Ontario
5 0 1 1 Ontario
6 0 0 1 Ontario
```

Contingency table

```
ftable(R ~ H + C + L, data = wlfddata)
```

			R	Atlantic	BC	Ontario	Prairie	Quebec
H	C	L						
0	0	0		1	4	6	0	5
		1		1	4	11	3	10
	1	0		11	6	25	15	18
		1		2	0	4	4	4
1	0	0		1	4	6	1	5
		1		1	2	10	1	3
	1	0		11	8	44	7	19
		1		2	1	2	0	1

Test conditional independency

You need package **bnlearn** for this.

```
ci.test( "H", "C", "R", data = wlfdata, test = "mi")
```

Mutual Information (disc.)

data: H ~ C | R

mi = 3.7358, df = 5, p-value = 0.588

alternative hypothesis: true value is greater than 0

```
m_full0 <- glm(L ~ C * H * R, family = binomial, data = wlfdata)
round(summary(m_full0)$coef, 3)
```

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	0.000	1.414	0.000	1.000
C1	-1.705	1.610	-1.059	0.290
H1	0.000	2.000	0.000	1.000
RBC	0.000	1.581	0.000	1.000
ROntario	0.606	1.503	0.403	0.687
RPrairie	17.566	2284.102	0.008	0.994
RQuebec	0.693	1.517	0.457	0.648
C1:H1	0.000	2.276	0.000	1.000
C1:RBC	-15.861	1615.105	-0.010	0.992
C1:ROntario	-0.734	1.772	-0.414	0.679
C1:RPrairie	-17.183	2284.102	-0.008	0.994
C1:RQuebec	-0.492	1.788	-0.275	0.783
H1:RBC	-0.693	2.291	-0.303	0.762

H1:ROntario	-0.095	2.127	-0.045	0.964
H1:RPrairie	-17.566	2284.103	-0.008	0.994
H1:RQuebec	-1.204	2.198	-0.548	0.584
C1:H1:RBC	16.180	1615.106	0.010	0.992
C1:H1:ROntario	-1.163	2.553	-0.456	0.649
C1:H1:RPrairie	1.322	2730.025	0.000	1.000
C1:H1:RQuebec	-0.236	2.715	-0.087	0.931

```
m_red0 <- glm(L ~ C * H, family = binomial, data = wlfdata)
anova(m_red0, m_full0, test = "Chisq")
```

Analysis of Deviance Table

```
Model 1: L ~ C * H
Model 2: L ~ C * H * R
      Resid. Df Resid. Dev Df Deviance Pr(>Chi)
1          259      227.93
2          243      216.66 16    11.269   0.7926
```

Fit equation 1

```
m_full1 <- glm(L ~ C + H + R, family = binomial, data = wlfdata)
round(summary(m_full1)$coef, 3)
```

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.041	0.607	1.715	0.086
C1	-2.609	0.361	-7.234	0.000
H1	-0.768	0.348	-2.210	0.027
RBC	-0.944	0.745	-1.266	0.206
ROntario	-0.254	0.590	-0.430	0.667
RPrairie	0.168	0.695	0.241	0.809
RQuebec	-0.342	0.627	-0.545	0.586

```
m_red1 <- glm(L ~ C + H, family = binomial, data = wlfdata)
anova(m_red1, m_full1, test = "Chisq")
```

Analysis of Deviance Table

```
Model 1: L ~ C + H
```

Model 2: $L \sim C + H + R$

	Resid. Df	Resid. Dev	Df	Deviance	Pr(>Chi)
1	260	228.31			
2	256	225.50	4	2.8117	0.5898

```
`LRtest` <- function(m_red, m_full) {  
  l0 <- logLik(m_red)[1]  
  lsat <- logLik(m_full)[1]  
  w = 2 * (lsat - l0)  
  df = m_red$df.residual - m_full$df.residual  
  p = 1 - pchisq(w, df)  
  c(w = w, df = df, p = p)  
}
```

```
LRtest(m_red1, m_full1)
```

	w	df	p
	2.8117211	4.0000000	0.5898111

Fit equation 2

```
m_full2 <- glm(C~ H+R, family = binomial, data = wlfdata)  
round(summary(m_full2)$coef, 3)
```

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	1.671	0.551	3.030	0.002
H1	0.437	0.282	1.546	0.122
RBC	-1.827	0.656	-2.785	0.005
ROntario	-1.092	0.579	-1.886	0.059
RPrairie	-0.136	0.730	-0.186	0.852
RQuebec	-1.250	0.598	-2.089	0.037

```
m_red2 <- glm(C~ R, family = binomial, data = wlfdata)  
LRtest(m_red2, m_full2)
```

	w	df	p
	2.4134751	1.0000000	0.1202951

Fit equation 3

```
m_full3 <- glm(H ~ R, family = binomial, data = wldata)
round(summary(m_full3)$coef, 3)
```

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	0.000	0.365	0.000	1.000
RBC	0.069	0.521	0.132	0.895
ROntario	0.298	0.414	0.721	0.471
RPrairie	-0.894	0.538	-1.660	0.097
RQuebec	-0.279	0.443	-0.629	0.529

```
m_red3 <- glm(H ~ 1, family = binomial, data = wldata)
LRtest(m_red3, m_full3)
```

	w	df	p
	9.19254035	4.00000000	0.05646299