

$r \times c$ ($I \times J$) Contingency Tables (ctd.)

Column Percentages for the Purum Marriage Data

	Marrim	Makan	Parpa	Thao	Kheyang
Marrim	-	5/27(18.5%)	17/25(68.0%)	-	6/29(20.7%)
Makan	5/21(23.8%)	-	0/25(0.0%)	16/26(61.5%)	2/29(6.9%)
Parpa	-	2/27(7.4%)	-	10/26(38.5%)	11/29(37.9%)
Thao	10/21(47.6%)	-	-	-	9/29(31.0%)
Kheyang	6/21(28.6%)	20/27(74.1%)	8/25(32.0%)	0/26(0.0%)	1/29(3.4%)

Standardized Residuals for the Purum Marriage Data

	Marrim	Makan	Parpa	Thao	Kheyang
Marrim		-3.32	3.01		-0.30
Makan	0.08		-5.17	3.98	-1.35
Parpa		-4.14		0.25	2.97
Thao	-0.24				0.24
Kheyang	0.15	5.10	0.12	-6.25	-2.52

Standardized Residuals for the Job Satisfaction Data

	-	-	+	++
< 6,000	1.72	-0.17	1.15	-1.99
6,000-15,000	0.59	0.73	0.25	-1.03
15,000-25,000	-0.98	-0.04	-0.35	0.84
> 25,000	-1.73	-0.67	-1.18	2.29

Log-linear Models using Ordinal Scores

Analysis of Deviance Table

```
Model 1: counts ~ income + jobSat
Model 2: counts ~ income + jobSat + as.integer(income):as.integer(jobSat)
Model 3: counts ~ income + jobSat + income:as.integer(jobSat)
Model 4: counts ~ income * jobSat
  Resid. Df Resid. Dev Df Deviance P(>|Chi|)
1         9    12.0369
2         8     2.3859  1   9.6509  0.0019
3         6     2.1372  2   0.2487  0.8831
4         0  3.308e-14  6   2.1372  0.9067
```

Fitted Proportions under the *Ordinal* \times *Ordinal* Model

income	satisfaction			
	--	-	+	++
<6,000	9.39	14.29	36.37	39.95
6,000-15,000	7.41	12.61	35.89	44.09
15,000-25,000	5.78	11.01	35.05	48.16
>25,000	4.47	9.52	33.90	52.10

Original proportions

income	satisfaction			
	--	-	+	++
<6,000	9.71	11.65	38.83	39.81
6,000-15,000	7.61	13.15	35.99	43.25
15,000-25,000	5.53	11.91	34.47	48.09
>25,000	4.09	10.53	31.58	53.80

Tests on the Margins of Two-Way tables

In the first handout on 2×2 tables the following data was provided summarizing a study examining the relationship between marijuana smoking and sleep disturbances. The study involved 17 smokers and paired controls.

smoker	control	
	+	-
+	4	9
-	3	1

Testing Marginal Homogeneity

The data below describes social status for 3497 father-son pairs. Of interest is whether the distribution of social class is the same for fathers and sons, or in statistical terms are the two marginal distributions equal. The distributions by father and son separately indicate a shift towards lower class for the sons.

	Upper	Middle	Lower
Upper	588	395	159
Middle	349	714	447
Lower	114	320	411

Fathers

Upper	Middle	Lower
1142/3497(32.7%)	1510/3497(43.2%)	845/3497(24.2%)

Sons:

Upper	Middle	Lower
1051/3497(30.1%)	1429/3497(40.9%)	1017/3497(29.1%)

Measuring Agreement using the Kappa coefficient

The following table represents the results of assessments of 100 liver-spleen scans as read by two physicians:

	Physician 2	
Physician 1	Abnormal	Normal
Abnormal	21	14
Normal	8	57

Higher Way Tables: Stratified 2 x 2 tables

The data below shows the breakdown in admission by sex of the applicants to 6 programs at a university.

Program	Sex	Admittance	
		Yes	No
A	M	512/825(62.1%)	313/825(37.9%)
	F	89/108(82.4%)	19/108(17.6%)
B	M	353/560(63.0%)	207/560(37.0%)
	F	17/25(68.0%)	8/25(32.0%)
C	M	120/325(36.9%)	205/325(63.1%)
	F	202/593(34.1%)	391/593(65.9%)
D	M	138/417(33.1%)	279/417(66.9%)
	F	131/375(34.9%)	244/375(65.1%)
E	M	53/191(27.7%)	138/191(72.3%)
	F	94/393(23.9%)	299/393(76.1%)
F	M	22/373(5.9%)	351/373(94.1%)
	F	24/341(7.0%)	317/341(93.0%)

Here is the *collapsed* table, ignoring the information on the program of application.

		admit	
sex	Y	N	
	M	1198/2691(44.5%)	1493/2691(55.5%)
F	557/1835(30.4%)	1278/1835(69.6%)	

The Mantel-Haenszel procedure provides an estimate of the common odds ratio and a test of whether the common odds ratio is 1.

Mantel-Haenszel chi-squared test with continuity correction

```
data: berkAdmits
Mantel-Haenszel X-squared = 1.4269, df = 1, p-value = 0.2323
alternative hypothesis: true common odds ratio is not equal to 1
95 percent confidence interval:
 0.7719074 1.0603298
sample estimates:
common odds ratio
 0.9046968
```