

BIOL 300 Assignment 6, Spring 2012

Chapter 9

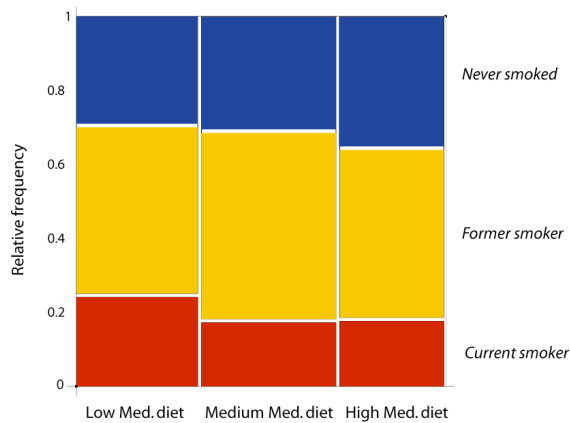
13. (a) 156 pairs out of 5895 involved two species, or 0.0265. The standard error of this proportion is $\sqrt{p(1-p)/(n-1)}$, or 0.002.

(b)

Observed				Expected				$\frac{(Observed - Expected)^2}{Expected}$			
	fem coll	fem pied	total		fem coll	fem pied	total		fem coll	fem pied	total
male coll	5567	84	5651	male coll	5405.60	245.40	5651	male coll	4.82	106.16	
male pied	72	172	244	male pied	233.40	10.60	244	male pied	111.61	2458.57	
total	5639	256	5895	total	5639	256	5895	total			$\chi^2 = 2681$

We compare the chi-squared value with the critical value for the chi-squared distribution for $df=1$. This tells us that 0.001 of the chi-squared distribution is larger than a chi-squared value of 10.83. The chi-squared from our data is much higher than this value, so we can conclusively reject the hypothesis that the flycatchers mate randomly: $P \ll 0.001$. (Most pied flycatchers should mate with the more-common collared flycatchers if this were true.)

16. This would call for Fisher's exact test. All of the predicted outcomes will be less than five, which would violate the assumptions of the chi-square contingency test.
19. The researchers assume an order of cause and effect. It may be that people who are depressed are more likely to keep a diary. It may also be that a third factor influences both of these variables. This is an observational study, so it is not possible to ascribe cause and effect.



20.

	obs					exp			
	low	med	high	total		low	med	high	total
never	2516	2920	2417	7853	nev	2618.7	2943.5	2290.8	7853
former	3657	4653	3449	11759	form	3921.3	4407.5	3430.2	11759
current	2012	1627	1294	4933	curr	1645.0	1849.0	1439.0	4933
totals	8185	9200	7160	24545	totals	8185	9200	7160	24545

$$\frac{(Observed - Expected)^2}{Expected}$$

	low	med	high	total
never	4.03	0.19	6.95	
form	17.81	13.67	0.10	
curr	81.88	26.65	14.60	
totals				166

There are $(3-1)(3-1) = 4$ degrees of freedom in this test. Our test statistic is much above the critical value for $P = 0.001$ (18.47), so we conclude that there is a non-random association between diet and smoking: current smokers appear more likely to have a “low” component of the Mediterranean diet in their daily meals.