

# BIOS 600 · Quiz 10.2: Categorical Data

Fall 2011

1. **Honor Pledge:** I have neither given nor received unauthorized aid on this assignment.  
(Sign and print your name.)

2. Area 51 is a military base located in southern Nevada. Because the area is shrouded in secrecy, conspiracy theorists speculate about its purpose and function. For example, some individuals claim that engineers at Area 51 have reverse-engineered alien spacecraft.

A researcher is interested in the relationship between *state of residence* and a *belief in alien conspiracy theories*. To investigate the possible relationship, the research questioned 100 individuals from both Nevada and North Carolina. (There is a total of 200 observations.) The researcher asked: "Do you believe the US government is in possession of extraterrestrial spacecraft technology?" Of the Nevadans, 31 responded that they believed. Of North Carolinians, 45 said they believed.

(a) Fill in the observed table and the expected (under no association) table.

Observed Table		Expected Table	
Do you believe ... ?		Do you believe ... ?	
		Yes	No
Nevada	Yes		
	No		
North Carolina	Yes		
	No		

(b) Calculate the observed odds ratio. Denote your estimate of the odds ratio with  $\widehat{OR}$ .

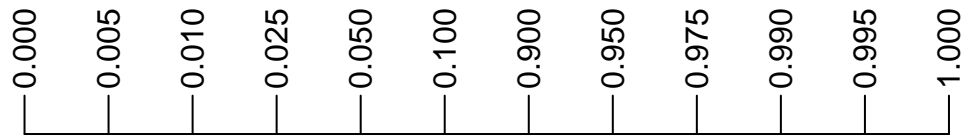
(c) Complete the statement: The hypothesis of no association in terms of odds ratios is

$$H_0 : OR$$

$$H_1 : OR$$

(d) Calculate the Pearson  $\chi^2$  test statistic.

- (e) Use the  $\chi^2$ -Table to calculate the p-value of the hypothesis test. Mark the bin in which the p-value falls. (*Bins not drawn to scale.*)



- (f) Assume a test significance level of  $\alpha = 0.01$ . Write one or two sentences to interpret the results of this hypothesis test.

## $\chi^2$ -Table

(left)	p=0.005	0.01	0.025	0.05	0.1	0.9	0.95	0.975	0.99	0.995
(right)	p=0.995	0.99	0.975	0.95	0.9	0.1	0.05	0.025	0.01	0.005
df=1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188