

## Final Exam – Take Home

### Reference Ranges for Senior Subjects

The data for your project comes from a nutritional study conducted at Youngstown State University during 1997-1998. One hundred seventy eight subjects completed the study in which the researchers investigated levels of calcium, inorganic phosphorous and alkaline phosphatase in subjects age 65 or higher. The research study wanted to determine if reference ranges established for the general population applied to subjects in this age range. Researchers also wanted to discover if a difference existed for men and women.

The data appears in the data file **ranges1.xls** which is available at <http://csuohio.edu/holcombj/mth147/exam2.htm> Note that some variables may not be used for this assignment, but may be used for the take-home Final Examination.

Variable guide:

<b>age</b>	Age in years
<b>sex</b>	1=male, 2=female
<b>alkphos</b>	Alkaline Phosphatase in IU/L (International Units Per Liter)
<b>ca</b>	Calcium (mg/dL)
<b>iphos</b>	Inorganic Phosphorus mg/dL
<b>agegroup</b>	1=65-69, 2=70-74, 3=75-79, 4=80-84, 5=85 or over
<b>lowca</b>	0=no, 1=yes, for calcium lower than 9 mg/dL
<b>lowphos</b>	0=no, 1=yes, for phosphorus level lower than 3.0
<b>highalp</b>	0=no, 1=yes, for alkaline phosphatase higher than 115
<b>over80</b>	0=no, 1=yes (subject is 80 or higher)

The Medical Laboratory Reviewer established reference range levels for the general population for calcium and inorganic phosphorus (among others). For calcium that range was 9.0-10.5 mg/dL. Thus the variable **lowca** is an indicator variable to show if the subject was below the level of 9.0. The reference range for inorganic phosphorus is 3.0-4.5. Thus **lowphos** indicates whether the subject was below 3.0. A study by Jernigan established a reference range of 30-115 for alkaline phosphatase. The variable **highalp** indicates whether a subject had a value higher than 115.

For the following tests of Hypothesis, be sure to state the hypotheses, the test statistic, the P-value or the P-value estimate, and your conclusion.

1. Assume that the subjects are a random sample of subjects 65 years or older. Is there sufficient evidence to conclude that the percentage of subjects with low calcium (**lowca=1**) is over 12%?
2. Is there sufficient evidence to conclude that the average age of mature subjects in this study is over 71?
3. Determine if sex and low calcium are independent.

Use the variable **age** to predict **ca** and answer the following:

1. Show the scatterplot.
2. Give the estimates for the slope and intercept for the regression line.
3. Is **age** useful in predicting **ca** level? Why or why not?
4. Give the  $r^2$  value, interpret its strength, and interpret its meaning.

Use the variable **ca** to predict **iphos** and answer the following:

1. Show the scatterplot.
2. Give the estimates for the slope and intercept for the regression line.
3. Is **ca** useful in predicting **iphos** level? Why or why not?
4. Give the  $r^2$  value, interpret its strength, and interpret its meaning.

Write a paragraph that describes your conclusions. Also, perform some kind of a test of hypothesis that I have not proposed. This could be a test involving a mean, a proportion, independence, or it could involve a regression analysis. Clearly state your null, alternative, test statistic, P-value, and conclusion.

Answers for Test

1.  $Phat=33/178=.185$ ,  $z=2.68$ ,  $pvalue=.0036$

2.

**One-Sample Test**

	Test Value = 71					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Age	3.599	177	.000	1.30	.59	2.02

3.

**Sex \* LOWCA Crosstabulation**

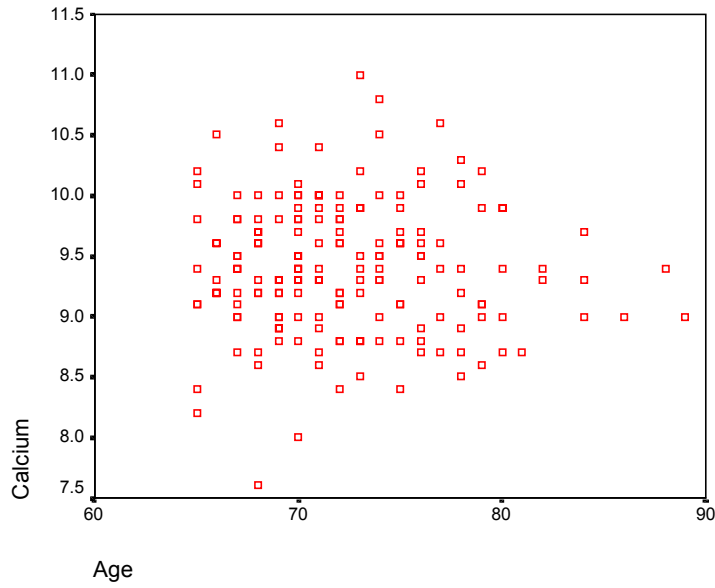
			LOWCA		Total
			No	Yes	
Sex	Male	Count	70	21	91
		Expected Count	74.1	16.9	91.0
	Female	Count	75	12	87
		Expected Count	70.9	16.1	87.0
Total		Count	145	33	178
		Expected Count	145.0	33.0	178.0

**Chi-Square Tests**

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.538 <sup>b</sup>	1	.111		
Continuity Correction <sup>a</sup>	1.961	1	.161		
Likelihood Ratio	2.568	1	.109		
Fisher's Exact Test				.126	.080
Linear-by-Linear Association	2.524	1	.112		
N of Valid Cases	178				

a. Computed only for a 2x2 table

b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.13.



**Model Summary**

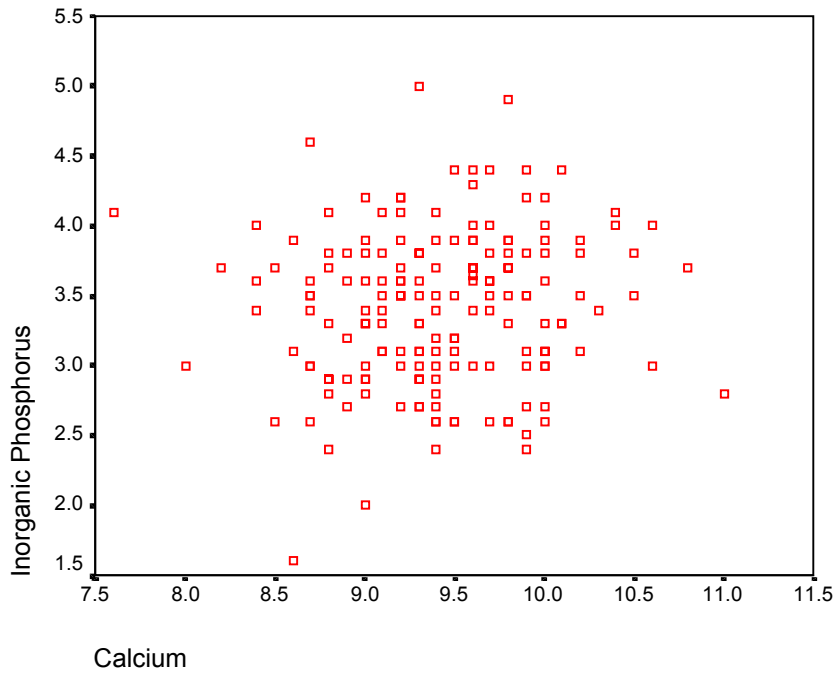
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.042 <sup>a</sup>	.002	-.004	.544

a. Predictors: (Constant), Age

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.751	.613		15.902	.000
	Age	-4.70E-03	.008	-.042	-.555	.580

a. Dependent Variable: Calcium



**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.101 <sup>a</sup>	.010	.004	.548

a. Predictors: (Constant), Calcium

**Coefficients<sup>a</sup>**

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.457	.716		3.430	.001
	Calcium	.102	.076	.101	1.339	.182

a. Dependent Variable: Inorganic Phosphorus