

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 **ranges2.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:

age	Age in years
sex	1=male, 2=female
alkphos	Alkaline Phosphatase in IU/L (International Units Per Liter)
ca	Calcium (mg/dL)
iphos	Inorganic Phosphorus mg/dL
agegroup	1=65-69, 2=70-74, 3=75-79, 4=80-84, 5=85 or over
lowca	0=no, 1=yes, for calcium lower than 9 mg/dL
lowphos	0=no, 1=yes, for phosphorus level lower than 3.0
highalp	0=no, 1=yes, for alkaline phosphatase higher than 115
over80	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 phosphorus (**lowphos=1**) is over 15%?
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 phosphorus are independent.

Use the variable **age** 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 **age** useful in predicting **iphos** level? Why or why not?
4. Give the r^2 value, interpret its strength, and interpret its meaning.

Use the variable **iphos** 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 **iphos** useful in predicting **ca** 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. \hat{p} is .202, $z=1.532$, $p\text{value}=.0255$

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 * LOWPHOS Crosstabulation

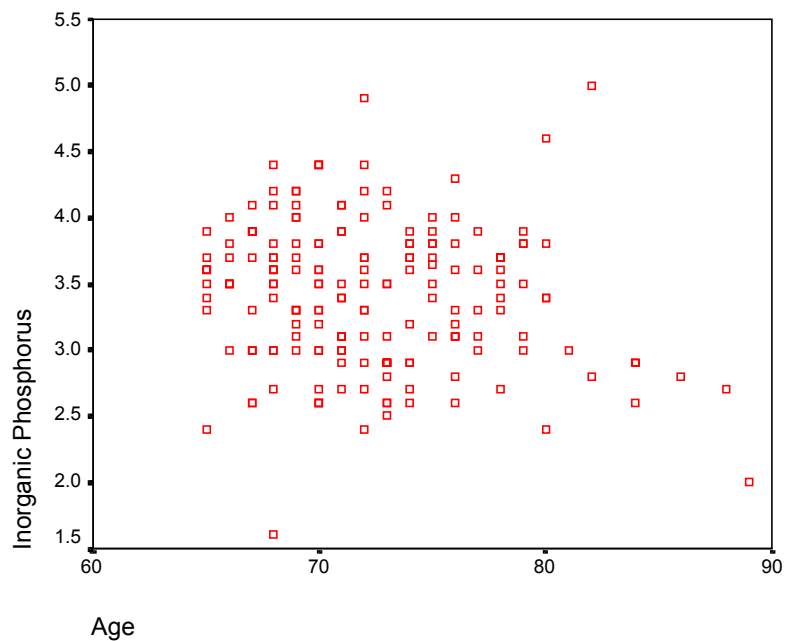
			LOWPHOS		Total
			No	Yes	
Sex	Male	Count	66	25	91
		Expected Count	72.6	18.4	91.0
	Female	Count	76	11	87
		Expected Count	69.4	17.6	87.0
Total		Count	142	36	178
		Expected Count	142.0	36.0	178.0

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	6.062 ^b	1	.014		
Continuity Correction ^a	5.178	1	.023		
Likelihood Ratio	6.206	1	.013		
Fisher's Exact Test				.016	.011
Linear-by-Linear Association	6.028	1	.014		
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 17.60.



Model Summary

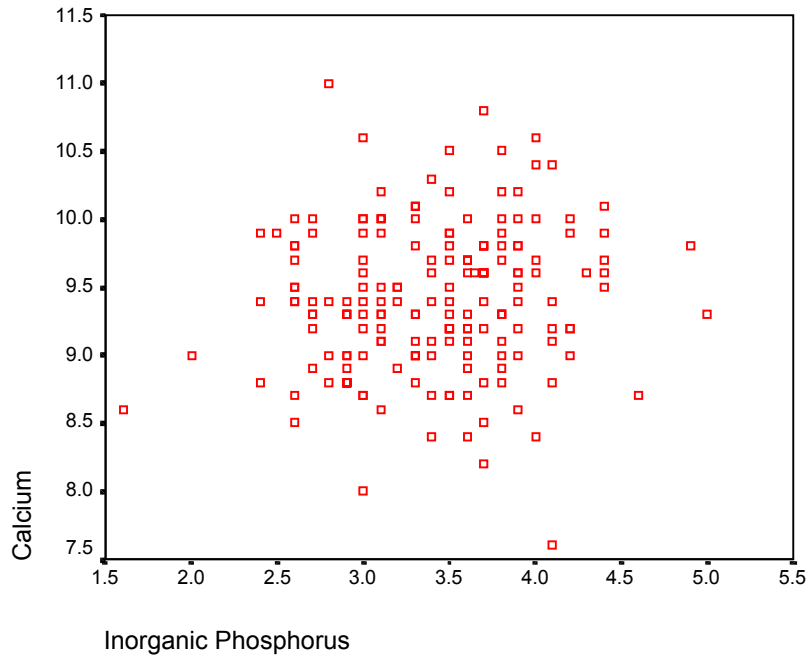
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.148 ^a	.022	.016	.545

a. Predictors: (Constant), Age

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.632	.615		7.534	.000
	Age	-1.68E-02	.008	-.148	-1.983	.049

a. Dependent Variable: Inorganic Phosphorus



Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.101 ^a	.010	.004	.543

a. Predictors: (Constant), Inorganic Phosphorus

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.073	.257		35.240	.000
	Inorganic Phosphorus	9.965E-02	.074	.101	1.339	.182

a. Dependent Variable: Calcium