

Final Exam – Take Home

Bone Mass Density Screening

The data for your project comes from a study conducted in Youngstown, OH from 1997-2000. Health Professions professors and students screened anyone interested in obtaining an estimate of their bone mass density at health and county fairs. Subjects placed their ankle in a portable scanning machine to determine if they were at risk for osteoporosis. Over the course of the study, a total of 1792 subjects were screened. Your data set contains only a portion (250 observations) of the total data set. The file **osteo1a.xls** is available at <http://csuohio.edu/holcombj/mth147/finalexam.htm> Note that some variables may not be used for this assignment, but may be used for the take-home Final Examination.

Variable guide:

subjectno	An identifying number to keep track of subjects
sex	1=Female, 2=Male
age	Age in years
weight	Pounds
height	Inches
bmd	Bone Mass Density
tscore	Calculation of Risk for Osteoporosis
fracture	0=No, 1=Yes
osteo	0=No, 1=Yes at risk for Osteoporosis
calcium	0=No, 1=Yes
treat	0=No, 1=Yes
count	Column of 1's

The variable **bmd** indicates whether a subject is at risk for osteoporosis. The lower the bmd, the greater the chance of having osteoporosis. The variable **osteo** indicates whether a subject was identified as being at risk for osteoporosis. A subject with osteoporosis is at high risk for fractures, especially fractures of the wrist, hip, and spine. A fall that leads to a fracture can be devastating for an elderly subject. The variable above treat indicates whether a subject is currently taking a medication such as estrogen, Fosxamax, Miacalcin, or Didronel which have all shown in clinical trials to increase bone mass density, or at least slow its deterioration. After screening, letters were sent to a subject's primary care physician if their T-score indicated they might have osteoporosis.

For this study, the population of interest is not the general public, but ambulatory subjects who are willing to participate in health fairs. Treat the dataset as a random sample of subjects from this population.

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. Assume that the subjects are a random sample of first year students.

1. Is there sufficient evidence to conclude that over 20% of this population has had a fracture occur?
2. Is there sufficient evidence to conclude that the mean age of this population is over 50?
3. Is there sufficient evidence to conclude that being diagnosed with osteoporosis and reporting a fracture are independent?

Use the variable **age** to predict **bmd**:

1. Show the scatterplot.
2. Give the model for the regression line.
3. Give the r^2 value, interpret its strength, and interpret its meaning.
4. Use the model to predict the **bmd** when the **age** is 65. Are there any influential observations? Why or why not?
5. Include the residual plot. Are there any outliers? If so, how many?

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

Sum of COUNT	FRACTURE		
OSTEO	0	1	Grand Total
0	121	30	151
1	59	40	99
Grand Total	180	70	250

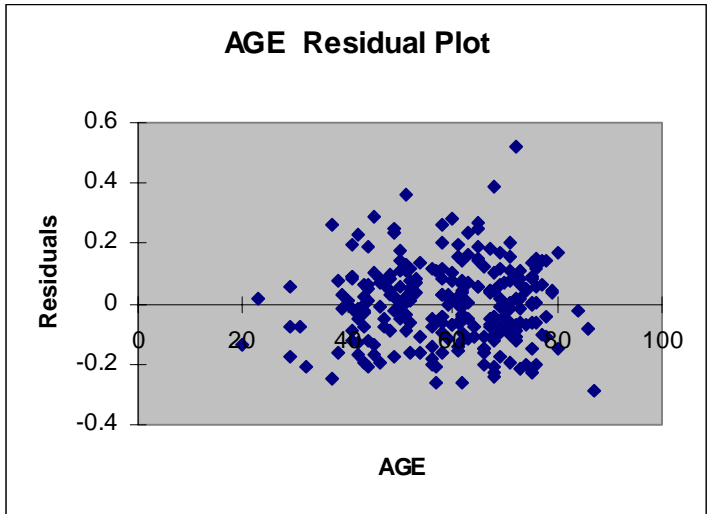
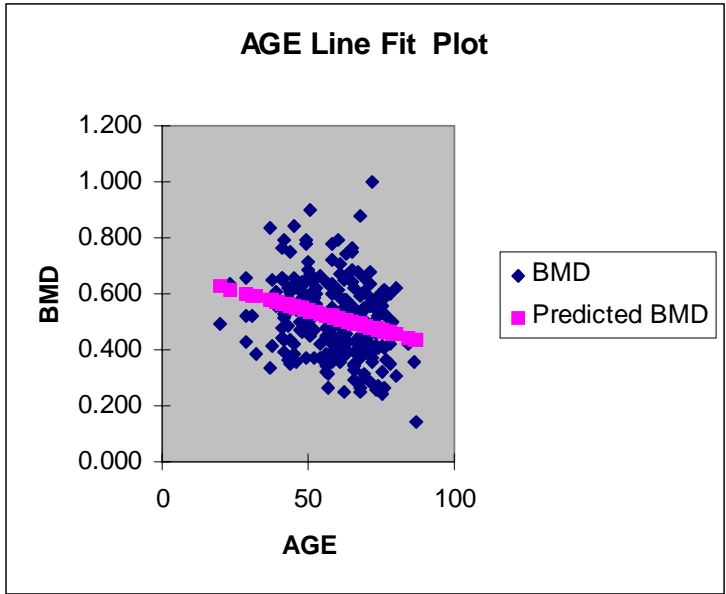
phat 0.28
z 3.16227766

Chi-Square 12.509
df 1
p-value 4.05E-04

AGE

Mean 59.188
Standard Error 0.806362
Median 61
Mode 62
Standard Deviation 12.7497
Sample Variance 162.5549
Kurtosis -0.4185
Skewness -0.38877
Range 67
Minimum 20
Maximum 87
Sum 14797
Count 250

z 11.39439



Regression Statistics

Multiple R	0.271604
R Square	0.073768
Adjusted R Square	0.070034
Standard Error	0.128482
Observations	250

	<i>Standard</i>			
	<i>Coefficients</i>	<i>Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.68298	0.038662	17.66531	9.13E-46
AGE	-0.00284	0.000639	-4.44428	1.33E-05
