

Exam II – 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 **osteo3.xls** 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:

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.

Begin your report by providing a summary for the discrete variables of **sex**, **fracture**, **osteo**, and **treat**, (raw numbers and percents). Treat the variables of **age**, and **bmd**, as continuous variables and create a summary of these variables (5 number summary and histogram). Describe the shape of the histograms and determine if the mean or the median is the better measure of center.

Create a 2x2 contingency table of **osteo** vs. **fracture**. Let A be the event of having osteoporosis, B be the event of reporting having a fracture occur. Determine the following (Be careful of missing values):

1. $P(A)$
2. $P(B)$
3. $P(A \cap B)$
4. $P(A \cup B)$
5. $P(B|A)$
6. $P(B|A')$

Consider having osteoporosis (**osteo=1**) as the risk factor and having a fracture occur (**fracture=1**) as the disease, calculate the relative risk and interpret its meaning.

Many physicians and people themselves believe that osteoporosis only affects women. Investigate that claim with the following.

Create a 2x2 contingency table of **gender** vs. **osteo**. Let A be the event of having being a woman, B be the event of having osteoporosis. Determine the following (Be careful of missing values):

1. $P(A)$
2. $P(B)$
3. $P(A \cap B)$
4. $P(A \cup B)$
5. $P(B|A)$
6. $P(B|A')$

Consider being a woman as the risk factor and having osteoporosis as the disease, calculate the relative risk and interpret its meaning. What does this result indicate?

Write a summary paragraph that describes what results were surprising or interesting to you. Remember that is not a random sample of data since people voluntarily attend a health fair and then voluntarily put their ankle in the machine. You might want to comment on the value of the data despite not being random. This paragraph should be at least 6 sentences in length.

Answers for Test

Sum of COUNT		
SEX	Total	
1.00		209
2.00		41
Grand Total		250

Sum of COUNT		
FRACTURE	Total	
0		192
1		58
Grand Total		250

Sum of COUNT		
OSTEO	Total	
0		134
1		116
Grand Total		250

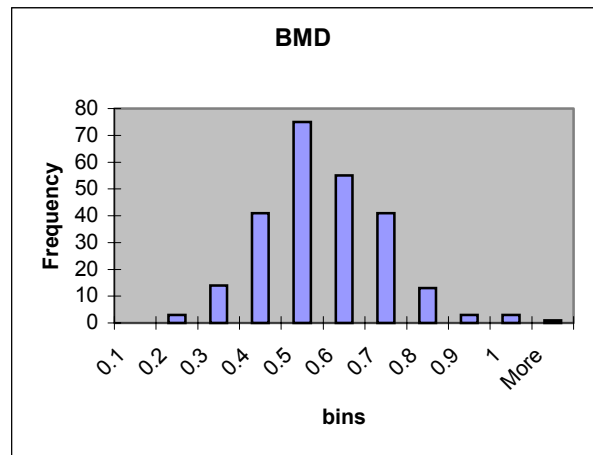
Sum of COUNT		
TREAT	Total	
0		188
1		62
Grand Total		250

AGE

Mean	57.276
Standard Error	0.897833
Median	57
Mode	70
Standard Deviation	14.19598
Sample Variance	201.5259
Kurtosis	-0.55847
Skewness	-0.31001
Range	66
Minimum	20
Maximum	86
Sum	14319
Count	250

BMD

Mean	0.50298
Standard Error	0.009317
Median	0.487
Mode	0.566
Standard Deviation	0.147024
Sample Variance	0.021616
Kurtosis	0.870407
Skewness	0.558829
Range	0.925
Minimum	0.167
Maximum	1.092
Sum	125.242
Count	249



Sum of COUNT	FRACTURE		
OSTEO	0	1	Grand Total
0	107	27	134
1	85	31	116
Grand Total	192	58	250

Sum of COUNT	OSTEO		
SEX	0	1	Grand Total
1.00	112	97	209
2.00	22	19	41
Grand Total	134	116	250