

## Practice Problems for Z-Scores, Normal Distribution

(Problems from Rosner, Fundamentals of Biostatistics 8<sup>th</sup> Edition)

## Cardiovascular Disease

Because serum cholesterol is related to age and sex, some investigators prefer to express it in terms of z-scores, where  $Z = \frac{X-\mu}{\sigma}$ . Suppose Z is regarded as a standard normal random variable.



Suppose a person is regarded as having <u>high cholesterol if Z > 2.0 and borderline cholesterol if</u> 1.5 < Z < 2.0. = |-P(z>|) - 0.0668

\*5.4 What proportion of people have high cholesterol?



## \*5.5 What proportion of people have borderline cholesterol?



Serum cholesterol is an important risk factor for coronary disease. We can show that serum cholesterol is approximately normally distributed, with mean = 219 mg/dL and standard deviation = 50 mg/dL.

\*5.14 If the clinically desirable range for cholesterol is < 200 mg/dL, what proportion of people have clinically desirable levels of cholesterol? 
$$\overline{\chi} = 200 \text{ mg/dL}$$

$$Z = \frac{\overline{X} - 4}{5} = \frac{200 - 219}{50} = -0.38$$

$$I = \frac{100}{50} = -0.38$$

$$P(-24 - 0.38) = P(-2 > 0.38)$$

$$= 0.35197$$

$$\overline{X}$$

\*5.15 Some investigators believe that only cholesterol levels over 250 mg/dL indicate a highenough risk for heart disease to warrant treatment. What proportion of the population does this group represent?



\***5.16** What proportion of the general population has borderline high-cholesterol levels—that is, > 200 but < 250 mg/dL?

$$P(200 < \overline{x} < 250) = [-0.35[97 - 0.26763]$$

$$= 0.3804$$

$$= 0.3804$$

$$= 0.3804$$

$$= 0.3804$$

## Problem 2:

Suppose the average number of hours a typical college student sleeps is <u>6 hours with a</u> standard deviation of 1 hour. (This may or may not be true – I made this problem up). How many hours of sleep do the bottom 30% of students get?

