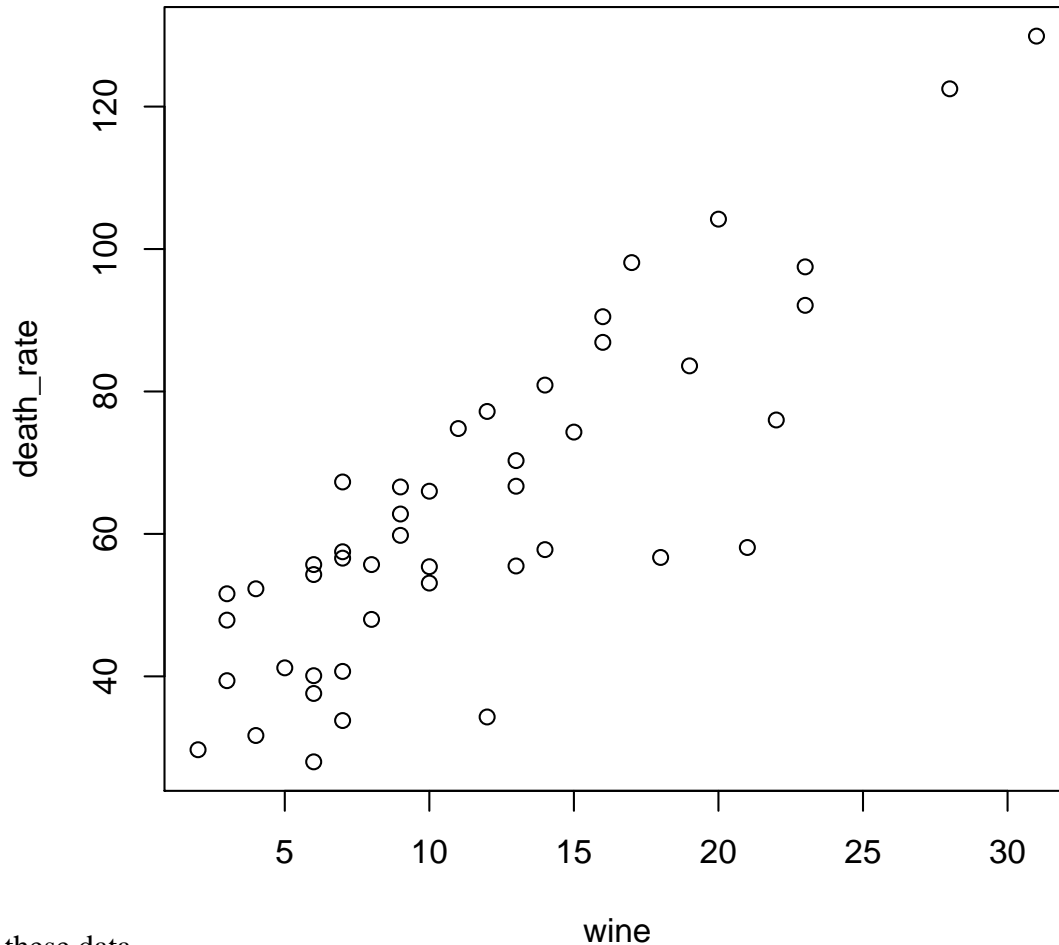


NAME:

Stat 205 Quiz 7

Take-Home Quiz due by beginning of class, Thursday April 7

Population and drinking data were recorded in $n = 46$ States in the U.S. X is the consumption of wine per capita (bottles/year) and Y is the death rate from cirrhosis (per 100,000). Here's a scatterplot:



For these data,

$$n = 46$$

$$\bar{y} = 63.49$$

$$\bar{x} = 11.59$$

$$\sum (x_i - \bar{x})(y_i - \bar{y}) = 6167$$

$$\sum (x_i - \bar{x})^2 = 2155$$

$$\sum (y_i - \bar{y})^2 = 24741$$

$$SS(resid) = 7091$$

1. Compute the least squares estimates b_0 and b_1 for regressing cirrhosis death rate on wine consumption. Answer

$$b_1 = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2} = \frac{6167}{2155} = 2.86,$$

$$b_0 = \bar{y} - \bar{x}b_1 = 63.49 - 11.59(2.86) = 30.33.$$

2. Draw the regression line onto the scatterplot (other side); describe the relationship. Answer
Pick two points on the fitted line and connect the dots. For example (0, 30.3) and (30, 116.2).
3. Interpret b_1 , the slope of the regression line, in the context of this setting. Answer The average cirrhosis death rate per 100,000 increases by 2.86 people for every (per capita) bottle increase in wine per year.
4. Compute s_Y and $s_{Y|X}$ and specify the units of each. Answer

$$s_Y = \sqrt{\frac{\sum (y_i - \bar{y})^2}{n - 1}} = \sqrt{\frac{24741}{45}} = 23.45 \text{ and } s_{Y|X} = \sqrt{\frac{SS(resid)}{n - 2}} = \sqrt{\frac{7091}{44}} = 12.69.$$

5. Is $s_{Y|X}$ considerably smaller than s_Y ? How does variability in cirrhosis death rate change when wine consumption is considered? Answer Yes, $s_{Y|X}$ is about half the size of s_Y . Wine consumption explains about half the variability in cirrhosis death.