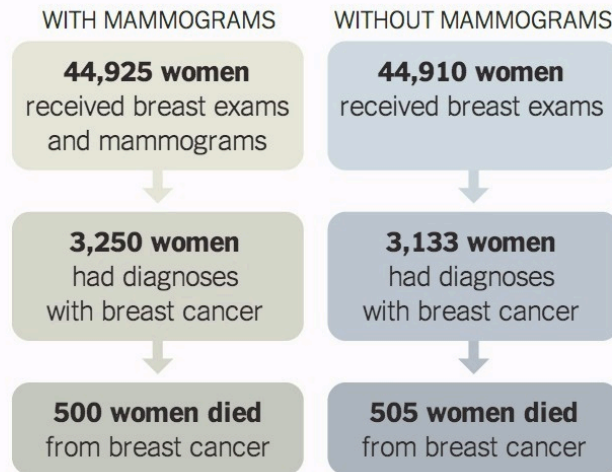


Quiz 1

Name: _____

In the US and Europe, most women over 50 have yearly mammograms (breast X-rays) for early detection of breast cancer. However, breast cancer can also be detected by regular physical breast exams. On February 11, 2014, the New York Times reported on a longitudinal study in which Canadian women had been randomly assigned to have regular mammograms and breast exams or just breast exams. The results were the following:¹



(a) How many women were involved in the study?

Leave probabilities as un-simplified fractions.

(b) What is the probability that a woman died from breast cancer?

(c) If a woman had mammograms, what was the probability that she died from breast cancer?

(d) Give the conditional probability notation for your answer to part (c).

(e) If a woman did not have mammograms, what is the probability that she died from breast cancer?

(f) What is the probability that a woman who died of breast cancer had had mammograms?

(g) Give the conditional probability notation for your answer to part (f).

(h) Are mammograms and death from breast cancer Independent _____ Not independent _____? (check one)
Reason for your answer (*Now you will need to calculate some probabilities. Give proportions with exactly three digits after the decimal point.*):

¹ http://www.nytimes.com/2014/02/12/health/study-adds-new-doubts-about-value-of-mammograms.html?_r=0, Gina Kolata Feb 11, 2014

ANSWERS

The totals are:

	Mammo	No Mammo	Total
Died of breast cancer	500	505	1005
Did not die of breast cancer	44425	44405	88830
Total	44925	44910	89835

- (a) How many women were involved in the study?

There were 89,835 involved.

Leave probabilities as un-simplified fractions.

- (b) What is the probability that a woman died from breast cancer?

$$\frac{1005}{89,835}$$

- (c) If a woman had mammograms, what was the probability that she died from breast cancer?

$$\frac{500}{44,925}$$

- (d) Give the conditional probability notation for your answer to part (c).

$$P(\text{Died}|\text{Mammo})$$

- (e) If a woman did not have mammograms, what is the probability that she died from breast cancer?

$$\frac{505}{44,910}$$

- (f) What is the probability that a woman who died of breast cancer had had mammograms?

$$\frac{500}{1005}$$

- (g) Give the conditional probability notation for your answer to part (f).

$$P(\text{Mammo}|\text{Died})$$

- (h) Are mammograms and death from breast cancer Independent X Not independent ? (check one)
Reason for your answer (*Now you will need to calculate some probabilities. Convert to proportions with exactly **three digits** after the decimal point.*):

To decide if dying and mammograms are independent, we need to find out of those who had mammograms are less/or more likely to have died. We have

$$P(\text{Died}) = 1005/89,835 = 0.011 = 1.1\%$$

$$P(\text{Died}|\text{Mammo}) = 500/44,925 = 0.011 = 1.1\%$$

$$P(\text{Died}|\text{No Mammo}) = 505/44,910 = 0.011 = 1.1\%$$

Since these probabilities are equal (to the accuracy shown), having a mammogram and dying of breast cancer are independent. (Noticing any two of these probabilities are equal means that all three are equal.)

You also can use

$$P(\text{Mammo}) = 44,925/89,835 = 0.500$$

$$P(\text{Died}) = 0.011 = 1.1\%$$

$$P(\text{Mammo and Died}) = 500/89,835 = 0.006$$

$$P(\text{Mammo}) \cdot P(\text{Died}) = (0.500)(0.011) = 0.006$$