# Stat13 Homework 2

http://www.stat.ucla.edu/~dinov/courses_students.html

## Suggested Solutions

Question 3.7:

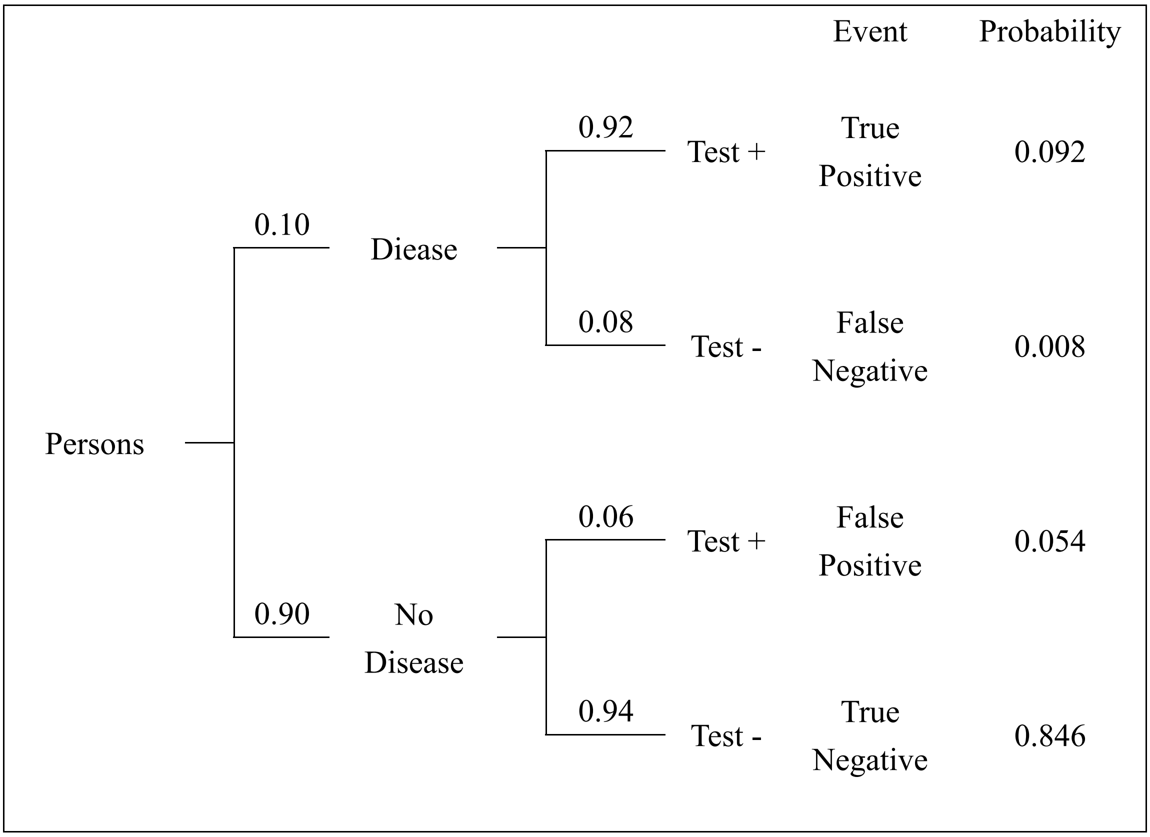
$$\begin{aligned} P(disease) &= P(male)P(disease \mid male) \\ &= (0.513)(0.5) \\ &= 0.2565 \end{aligned}$$

Question 3.8:

$$\begin{aligned} P(correct) &= P(sure) + P(unsure) \\ &= (0.4)(1) + (0.6)(0.2) \\ &= 0.52 \end{aligned}$$

Question 3.11:

Part (a):




There are two ways to test positive. A true positive happens with probability (0.1)(0.92) = 0.092. A false positive happens with probability (0.9)(0.06) = 0.054. Thus,

$P(Test+) = 0.092 + 0.054 = 0.146$

Part (b):
$P(disease \mid Test+) = 0.092/0.146 = 0.63$

Question 3.13:
Part (a):
$P(stressed) = 1016/6549 = 0.1551$
Part (b):
$P(low\_income) = 2480/6549 = 0.3787$
Part (c):
$P(stressed \quad or \quad low\_income) = (1016 + 2480 - 526)/6549 = 0.4535$
Part (d):
$P(stressed \quad and \quad low\_income) = 526/6549 = 0.0803$

Question 3.14:
No; if smoking status of husband were independent of smoking status of wife, then the probability that in a couple both husband and wife would smoke would be (0.3)(0.2)=0.06, rather than 0.08. Note that Pr{husband and wife both smoke} = Pr{husband smokes}Pr{wife smokes|husband smokes}. If smoking status of husband were independent of smoking status of wife, then we would have Pr{husband and wife both smoke} = Pr{husband smokes}Pr{wife smokes} = (0.3)(0.2) = 0.06. But Pr{husband and wife both smoke} = 0.08 not 0.06.

Question 3.18:
Part (a):
$P(Y = 3) = 610/5000 = 0.122$
Part (b):
$P(Y \geq 7) = (130 + 26 + 3 + 1)/5000 = 0.084$
Part (c):
$P(4 \leq Y \leq 6) = (1400 + 1760 + 750)/5000 = 0.782$

Question 3.19:
Part (a):
$P(Y' = 3) = (3)(610)/22435 = 0.0816$
Part (b):
$P(Y' \geq 7) = [(7)(130) + (8)(26) + (9)(3) + (10)(1)]/22435 = 0.032$
Part (c):
Choosing a young at random gives a selection of broods which is not random, but is

biased toward larger broods (because a larger brood has more chances to be selected). Therefore, Pr{Y'≥7} is larger than Pr{Y≥7}.

Question 3.24:

$$\mu_{score} = \sum_i yP(y)$$
$$= (0)(0.15) + (1)(0.50) + (2)(0.35)$$
$$= 1.2$$

Question 3.25:

$$\sigma_{score} = \sqrt{\sum_i (y_i - \mu)^2 P(y)}$$
$$= \sqrt{(0-1.2)^2(0.15) + (1-1.2)^2(0.50) + (2-1.2)^2(0.35)}$$
$$= \sqrt{0.46} = 0.678$$

Question 3.28:

Part (a):

P(all 20 will be cured) $= \binom{20}{0}(0.9)^{20}(0.1)^{0} = 0.1216$

Part (b):

P(all but 1 will be cured)= $\binom{20}{1}(0.9)^{19}(0.1)^{1} = 0.2702$

Part (c):

P(exactly 18 will be cured) $= \binom{20}{2}(0.9)^{18}(0.1)^{2} = 0.2852$

Part (d):

P(exactly 90% will be cured) $= \binom{20}{2}(0.9)^{18}(0.1)^{2} = 0.2852$

Question 3.33:

Part (a):

P(none will be albino) $= \binom{6}{0}(0.75)^{6}(0.25)^{0} = 0.1780$

Part (b):

P(at least 1 will be albino) = 1 – P(none will be albino)
= 1 – 0.1780 = 0.8220