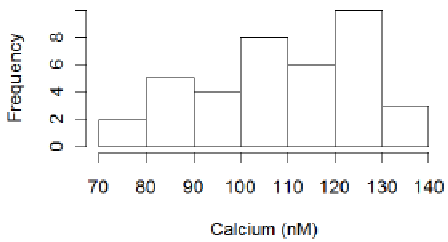



The histogram is fairly symmetric.

**2.S.22** The median is 28, which is consistent with any of the histograms. Likewise the minimum and maximum values agree for all three histograms. However, the boxplot shows that the distribution has a small IQR and is skewed to the right, which means that histogram (a) is correct.

**2.S.23** The mean is pulled down by the long left-hand tail, which results in the mean being less than the median.

**2.S.24** Approximately 15% of the area in the histogram is to the left of 40.



# CHAPTER 3

## Probability and the Binomial Distribution

• **3.2.1 (a)** In the population, 51% of the fish have 21 vertebrae. Thus, $\Pr\{Y = 21\} = 0.51$.

**(b)** In the population, the percentage of fish with 22 or fewer vertebrae is 3 + 51 + 40 = 94%. Thus, $\Pr\{Y \le 22\} = 0.94$.

**(c)** In the population, the percentage of fish with more than 21 vertebrae is 40 + 6= 46%. Thus, $\Pr\{Y > 21\} = 0.46$.

**(d)** In the population, the percentage of fish with no more than 21 vertebrae is 3 + 51= 54%. Thus, $\Pr\{Y \le 21\} = 0.54$.

**3.2.2 (a)** 0.27

**(b)** 0.14 + 0.13 + 0.14 = 0.41

**(c)** 0.19 + 0.13 = 0.32

**(d)** 1 – 0.27 – 0.14 = 0.59

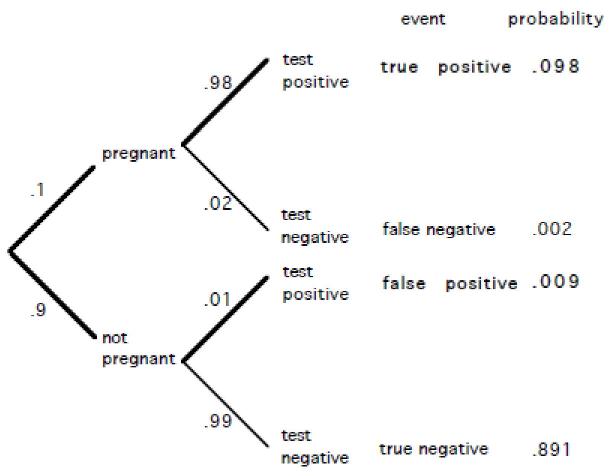
**3.2.3 (a)** (0.55)(0.55) = 0.3025

**(b)** (0.55)(0.55) + (0.55)(0.45) + (0.45)(0.55) = 0.7975
or 1 - (0.45)(0.45) = 1 - 0.2025 = 0.7975

**3.2.4** (0.513)(0.50) = 0.2565

**3.2.5** 0.4 + (0.6)(0.2) = 0.52

• **3.2.6 (a)**




There are two ways to test positive. A true positive happens with probability (0.1)(0.98) = 0.098. A false positive happens with probability (0.9)(0.01) = 0.009. Thus, Pr{test positive} = 0.098 + 0.009 = 0.107.

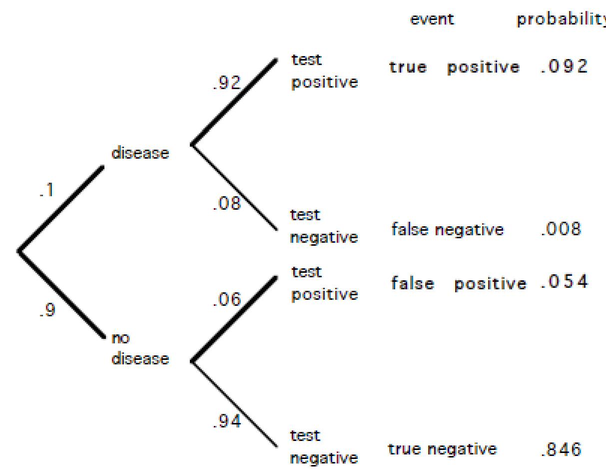
**(b)** Using the same reasoning as in part (a), Pr{test positive} = (0.05)(0.98) + (0.95)(0.01) = 0.049 + 0.095 = 0.0585.

• **3.2.7 (a)** 0.098/0.107 = 0.916

**(b)** 0.049/0.0585 = 0.838

**3.2.8 (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, Pr{test positive} =0 .092 + 0.054 = 0.146.






**(b)** Pr{have disease given test positive} = 0.092/0.146 = 0.63.

• **3.3.1 (a)** 1213/6549 = 0.1852 ≈ 0.185

**(b)** 247/2115 = 0.1168 ≈ 0.117

**(c)** No; the probability of a person being a smoker depends on whether or not the person has high income, since the answers to (a) and (b) differ.

**3.3.2 (a)** 634/6549 = 0.0968 ≈ 0.097

**(b)** 1 - 2480/6549 = 1 - 0.3787 ≈ 0.621

**(c)** 1954/6549 = 0.2984 ≈ 0.298

**(d)** (2480 + 1954)/6549 = 0.677 or 1 – 2115/6549 = 1 - 0.323 = 0.677

**3.3.3 (a)** 1016/6549 = 0.1551 ≈ 0.155

**(b)** 216/2115 = 0.1021 ≈ 0.102

**(c)** No; the probability of a person being stressed depends on whether or not the person has high income, since the answers to (a) and (b) differ.

**3.3.4 (a)** 2480/6549 = 0.3787 ≈ 0.379

**(b)** (1016 + 1954)/6549 = 2970/6549 = 0.4535 ≈ 0.454

**(c)** 526/6549 = 0.0803 ≈ 0.08

**3.3.5** 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 (0.30)(0.20) = 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} = (0.30)(0.20) = 0.06. But Pr{husband and wife both smoke} = 0.08, not 0.06.