2.16 PB & J. Suppose 80% of people like peanut butter, 89% like jelly, and 78% like both. Given that a randomly sampled person likes peanut butter, what's the probability that he also likes jelly?

.78/.80 = **.975**

**CHALLENGE QUESTION** (apologies for taking the easy way out on this)

like\_both <- function(peanutbutter, jelly, both){

x = both / peanutbutter

return(x)

}

like\_both(.8, .89, .78)

2.18 Weight and health coverage, Part II. Exercise 2.14 introduced a contingency table

summarizing the relationship between weight status, which is determined based on body mass index (BMI), and health coverage for a sample of 428,638 Americans. In the table below, the counts have been replaced by relative frequencies (probability estimates).

(a) What is the probability that a randomly chosen individual is obese?

**.2839**

(b) What is the probability that a randomly chosen individual is obese given that he has health coverage?

.2503/.8954 = **.27954**

(c) What is the probability that a randomly chosen individual is obese given that he doesn't have health coverage?

.0336/.1046 = **.3212**

(d) Do being overweight and having health coverage appear to be independent?

Looking at the results of the data, they appear to be dependent; those without healthcare are more likely to be obese than those with healthcare.

Further, if they were independent P(Obese|Healthcare) would equal P(Obese), but it doesn’t, so they are dependent.

2.20 Assortative mating. Assortative mating is a nonrandom mating pattern where individuals

with similar genotypes and/or phenotypes mate with one another more frequently than what would be expected under a random mating pattern. Researchers studying this topic collected data on eye colors of 204 Scandinavian men and their female partners. The table below summarizes the results. For simplicity, we only include heterosexual relationships in this exercise.

(a) What is the probability that a randomly chosen male respondent or his partner has blue eyes?

((108 + 114) – 78)/204 = **.706**

(b) What is the probability that a randomly chosen male respondent with blue eyes has a partner with blue eyes?

78/114 = **.684**

(c) What is the probability that a randomly chosen male respondent with brown eyes has a partner with blue eyes?

19/54 = **.352**

What about the probability of a randomly chosen male respondent with green eyes having a partner with blue eyes?

11/36 = **.306**

(d) Does it appear that the eye colors of male respondents and their partners are independent?

Explain your reasoning.

Blue/blue = .684

Brown/brown = 23/54 = .426

Green/green = 16/36 = .444

It appears that they are dependent, as there are higher percentages of matched pairs than non-matched, even with a small sample size of 204, it’s outside the margin of error.

Further, the standard test of independence fails, ie P(partner = blue | self = blue) <> P(Partner = blue)

2.26 Twins. About 30% of human twins are identical, and the rest are fraternal. Identical

twins are necessarily the same sex { half are males and the other half are females. One-quarter of fraternal twins are both male, one-quarter both female, and one-half are mixes: one male, one female. You have just become a parent of twins and are told they are both girls. Given this information, what is the probability that they are identical?

P(both girls) = .5(.30) + .25(.70) = .325

P(identical | both girls) = .15 / .325 = **.462**