Biostatistics: Sheet 6 – Test of Hypotheses

1. Consider the following: H_o: m = 50, H_a: m ≠ 50. A sample of 100 observations yields an average of 51.5 and standard deviation of 10. At a confidence level of 95%, is this enough evidence to reject H_o in favor of H_a or is this just chance variation? (ans: don't reject H_0)

2. Trying to encourage people to stop driving to campus, the university claims that on average it takes people 30 minutes to find a parking space on campus. I don't think it takes so long to find a spot. In fact I have a sample of the last five times I drove to campus, and I calculated $\bar{x}$ = 20. Assuming that the time it takes to find a parking spot is normal, and that σ = 6 minutes, then perform a hypothesis test with level α = 0.10 to see if my claim is correct. (ans: lower tailed, my claim H1 is correct)

3. A sample of 40 sales receipts from a grocery store has $\bar{x}$ = \$137 and σ = \$30.2. Use these values to test whether or not the mean is sales at the grocery store are different from \$150. Take α = 0.01 (ans: two sided, mean is significantly different from \$150, H1)

4. The lifetime of a certain brand of heat pump is known to be normally distributed with a standard deviation of 2. A sample of 6 heat pumps yielded the following observations: 2.0 1.3 6.0 1.9 5.1 4 At α = .05 is there reason to believe that the mean life of the heat pumps is greater than 2? (ans: mean life time >2)

5. The maker of a certain model car claimed that his car averaged at least 31 miles per gallon of gasoline. A sample of nine cars was selected and each car was driven with one gallon of regular gasoline. The sample showed a mean of 29.43 miles with a standard deviation of 3 miles. α = .05 what do you conclude about the manufacturers claim? What is the p-value? (ans: There is insufficient evidence to doubt the manufacturers claim concerning the gas mileage. P-value = .0775)

6. Suppose a production line operates with a mean filling weight of 16 grams per container. Since over- or under-filling can be dangerous, a quality control inspector samples 30 items to determine whether or not the filling weight has to be adjusted. The sample revealed a mean of 16.32 grams. From past data, the standard deviation is known to be .8 grams. Using a 0.10 level of significance, can it be concluded that the process is out of control (not equal to 16 grams)? (ans: the process is out of control)

7. Joon believes that 50% of first-time brides in the United States are younger than their grooms. She performs a hypothesis test to determine if the percentage is the same or different from 50%. Joon samples 100 first-time brides and 53 reply that they are younger than their grooms. For the hypothesis test, she uses a 1% level of significance. (ans: no sufficient evidence that the percentage of first-time brides who are younger than their grooms is different from 50%.)

8. Suppose a consumer group suspects that the proportion of households that have three cell phones is not known to be 30%. A cell phone company has reason to believe that the proportion is 30%. Before they start a big advertising campaign, they conduct a hypothesis test (α = .05). Their marketing

people survey 150 households with the result that 43 of the households have three cell phones. (ans: no sufficient evidence to conclude that the proportion of households that have three cell phones is not 30%.)