

BIOE 440 - Homework #6

For each of the following exercises, carry out the hypothesis testing procedure for the given significance level. For each exercise, explain why you chose a one-sided test or a two-sided test. Remember to calculate the P value.

1. Exercise 7.2.5 (p. 235)
2. Exercise 7-28 (p. 287)
3. Exercise 7-31 (p. 288)

WOMAC mean function score (on a scale from 0 to 100 with a higher number indicating less function) was 70.7 with a standard deviation of 14.6. We wish to know if we may conclude that the mean function score for a population of similar women subjects with severe hip pain is less than 75. Let $\alpha = .01$.

- 7.2.2 A study by Thienprasiddhi et al. (A-4) examined a sample of 16 subjects with open-angle glaucoma and unilateral hemifield defects. The ages (years) of the subjects were:

62	62	68	48	51	60	51	57
57	41	62	50	53	34	62	61

Source: Phamornsak Thienprasiddhi, Vivienne C. Greenstein, Candice S. Chen, Jeffrey M. Liebmann, Robert Ritch, and Donald C. Hood, "Multifocal Visual Evoked Potential Responses in Glaucoma Patients with Unilateral Hemifield Defects," *American Journal of Ophthalmology*, 136 (2003), 34-40.

Can we conclude that the mean age of the population from which the sample may be presumed to have been drawn is less than 60 years? Let $\alpha = .05$.

- 7.2.3 The purpose of a study by Lugliè et al. (A-5) was to investigate the oral status of a group of patients diagnosed with thalassemia major (TM). One of the outcome measures was the decayed, missing, and filled teeth index (DMFT). In a sample of 18 patients the mean DMFT index value was 10.3 with a standard deviation of 7.3. Is this sufficient evidence to allow us to conclude that the mean DMFT index is greater than 9.0 in a population of similar subjects? Let $\alpha = .10$.
- 7.2.4 A study was made of a sample of 25 records of patients seen at a chronic disease hospital on an outpatient basis. The mean number of outpatient visits per patient was 4.8, and the sample standard deviation was 2. Can it be concluded from these data that the population mean is greater than four visits per patient? Let the probability of committing a type I error be .05. What assumptions are necessary?
- 7.2.5 In a sample of 49 adolescents who served as the subjects in an immunologic study, one variable of interest was the diameter of skin test reaction to an antigen. The sample mean and standard deviation were 21 and 11 mm erythema, respectively. Can it be concluded from these data that the population mean is less than 30? Let $\alpha = .05$.
- 7.2.6 Nine laboratory animals were infected with a certain bacterium and then immunosuppressed. The mean number of organisms later recovered from tissue specimens was 6.5 (coded data) with a standard deviation of .6. Can one conclude from these data that the population mean is greater than 6? Let $\alpha = .05$. What assumptions are necessary?
- 7.2.7 A sample of 25 freshman nursing students made a mean score of 77 on a test designed to measure attitude toward the dying patient. The sample standard deviation was 10. Do these data provide sufficient evidence to indicate, at the .05 level of significance, that the population mean is less than 80? What assumptions are necessary?
- 7.2.8 We wish to know if we can conclude that the mean daily caloric intake in the adult rural population of a developing country is less than 2000. A sample of 500 had a mean of 1985 and a standard deviation of 210. Let $\alpha = .05$.
- 7.2.9 A survey of 100 similar-sized hospitals revealed a mean daily census in the pediatrics service of 27 with a standard deviation of 6.5. Do these data provide sufficient evidence to indicate that the population mean is greater than 25? Let $\alpha = .05$.

dexterity before and after 7 months of occupational therapy. Higher values indicate stronger fine motor skills. The scores appear in the following table.

Subject	Pre	Post	Subject	Pre	Post
1	91	94	20	76	112
2	61	94	21	79	91
3	85	103	22	97	100
4	88	112	23	109	112
5	94	91	24	70	70
6	112	112	25	58	76
7	109	112	26	97	97
8	79	97	27	112	112
9	109	100	28	97	112
10	115	106	29	112	106
11	46	46	30	85	112
12	45	41	31	112	112
13	106	112	32	103	106
14	112	112	33	100	100
15	91	94	34	88	88
16	115	112	35	109	112
17	59	94	36	85	112
18	85	109	37	88	97
19	112	112			

Source: Susan Bazyk, M.H.S. Used with permission.

- Can one conclude on the basis of these data that after 7 months, the fine motor skills in a population of similar subjects would be stronger? Let $\alpha = .05$. Determine the p value.
25. A survey of 90 recently delivered women on the rolls of a county welfare department revealed that 27 had a history of intrapartum or postpartum infection. Test the null hypothesis that the population proportion with a history of intrapartum or postpartum infection is less than or equal to .25. Let $\alpha = .05$. Determine the p value.
 26. In a sample of 150 hospital emergency admissions with a certain diagnosis, 128 listed vomiting as a presenting symptom. Do these data provide sufficient evidence to indicate, at the .01 level of significance, that the population proportion is less than .92? Determine the p value.
 27. A research team measured tidal volume in 15 experimental animals. The mean and standard deviation were 45 and 5 cc, respectively. Do these data provide sufficient evidence to indicate that the population mean is greater than 40 cc? Let $\alpha = .05$.
 28. A sample of eight patients admitted to a hospital with a diagnosis of biliary cirrhosis had a mean IgM level of 160.55 units per milliliter. The sample standard deviation was 50. Do these data provide sufficient evidence to indicate that the population mean is greater than 150? Let $\alpha = .05$. Determine the p value.
 29. Some researchers have observed a greater airway resistance in smokers than in nonsmokers. Suppose a study, conducted to compare the percent of tracheobronchial retention of particles in smoking-discordant monozygotic twins, yielded the following results:

Percent Retention		Percent Retention	
Smoking Twin	Nonsmoking Twin	Smoking Twin	Nonsmoking Twin
60.6	47.5	57.2	54.3
12.0	13.3	62.7	13.9
56.0	33.0	28.7	8.9
75.2	55.2	66.0	46.1
12.5	21.9	25.2	29.8
29.7	27.9	40.1	36.2

Do these data support the hypothesis that tracheobronchial clearance is slower in smokers? Let $\alpha = .05$. Determine the p value for this test.

30. Circulating levels of estrone were measured in a sample of 25 postmenopausal women following estrogen treatment. The sample mean and standard deviation were 73 and 16, respectively. At the .05 significance level can one conclude on the basis of these data that the population mean is higher than 70?
31. Systemic vascular resistance determinations were made on a sample of 16 patients with chronic congestive heart failure while receiving a particular treatment. The sample mean and standard deviation were 1600 and 700, respectively. At the .05 level of significance do these data provide sufficient evidence to indicate that the population mean is less than 2000?
32. The mean length at birth of 14 male infants was 53 cm with a standard deviation of 9 cm. Can one conclude on the basis of these data that the population mean is not 50 cm? Let the probability of committing a type I error be .10.

For each of the studies described in Exercises 33 through 38, answer as many of the following questions as possible: (a) What is the variable of interest? (b) Is the parameter of interest a mean, the difference between two means (independent samples), a mean difference (paired data), a proportion, or the difference between two proportions (independent samples)? (c) What is the sampled population? (d) What is the target population? (e) What are the null and alternative hypotheses? (f) Is the alternative one-sided (left tail), one-sided (right tail), or two-sided? (g) What type I and type II errors are possible? (h) Do you think the null hypothesis was rejected? Explain why or why not.

33. During a one-year period, Hong et al. (A-40) studied all patients who presented to the surgical service with possible appendicitis. One hundred eighty-two patients with possible appendicitis were randomized to either clinical assessment (CA) alone or clinical evaluation and abdominal/pelvic CT. A true-positive case resulted in a laparotomy that revealed a lesion requiring operation. A true-negative case did not require an operation at one-week follow-up evaluation. At the close of the study, they found no significant difference in the hospital length of stay for the two treatment groups.
34. Recall the study reported in Exercise 7.8.2 in which Nagy et al. (A-32) studied 50 stable patients admitted for a gunshot wound that traversed the mediastinum. They found that eight of the subjects had a mediastinal injury, while 42 did not have such an injury. They performed a student's t test to determine if there was a difference in mean age (years) between the two groups. The reported p value was .59.
35. Dykstra et al. (A-41) studied 15 female patients with urinary frequency with or without incontinence. The women were treated with botulinum toxin type B (BTX-B). A t test of the