

Homework 5

Due: Wednesday, Dec. 2, 2009

1. 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 $\alpha = .05$.

Solution:

$$H_0 : \mu \geq 30, H_1 : \mu < 30$$
$$z = \frac{21 - 30}{11/\sqrt{49}} = -5.73$$

Yes, reject H_0 since $z = -5.73 < -1.645$.

2. The following data are the oxygen uptakes (milliliters) during incubation of a random sample of 15 cell suspensions:

14.0, 14.1, 14.5, 13.2, 11.2, 14.0, 14.1, 12.2, 11.1, 13.7, 13.2, 16.0, 12.8, 14.4, 12.9

Do these data provide sufficient evidence at the .05 level of significance that the population mean is not 12 ml? What assumptions are necessary?

Solution:

$$H_0 : \mu = 12, H_1 : \mu \neq 12$$
$$t = \frac{13.427 - 12}{1.282/\sqrt{15}} = 4.311$$

Reject H_0 since $t = 4.311 > 2.1448$, $p = .005(2) = .010$.

3. The following are the systolic blood pressure (mm Hg) of 12 patients undergoing drug therapy for hypertension:

183, 152, 178, 157, 194, 163, 144, 114, 178, 152, 118, 158

Can we conclude on the basis of these data that the population mean is less than 165? Let $\alpha = 0.05$. What assumptions are necessary?

Solution:

$$H_0 : \mu \geq 165, H_1 : \mu < 165$$
$$t = \frac{157.5833 - 165}{24.3999/\sqrt{12}} = -1.0530$$

Failure to reject H_0 since $t = -1.0530 > -1.7959$.

4. A survey of 10 similar-sized hospitals revealed a mean daily census in the pediatric 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 $\alpha = .05$.

Solution:

$$H_0 : \mu \leq 25, H_1 : \mu > 25$$

$$t = \frac{27 - 25}{6.5/\sqrt{10}} = 0.973$$

Accept H_0 since $t = 0.973 < 1.8331$.

5. Protoporphyrin levels were measured in two samples of subjects. Sample 1 consisted of 50 adult male alcoholics with ring sideroblasts in the bone marrow. Sample 2 consisted of 40 apparently healthy adult nonalcoholic males. The mean protoporphyrin levels and standard deviations for the two samples were as follows:

Table 1: Problem 5

Sample	\bar{x}	s
1	340	250
2	45	25

Can one conclude on the basis of these data that protoporphyrin levels are higher in the represented alcoholic population than in the nonalcoholic population? Let $\alpha = 0.01$.

Solution:

$$H_0 : \mu_1 \leq \mu_2, H_1 : \mu_1 > \mu_2$$

$$z = \frac{340 - 45}{\sqrt{\frac{250^2}{50} + \frac{25^2}{40}}} = 8.29$$

Reject H_0 since $8.29 > 2.33$.

6. Subjects in a study included a sample of 40 men who claimed to engage in a variety of sports activities (multisport). The mean body mass index (BMI) for these men was 22.41 with a standard deviation of 1.27. A sample of 24 male rugby players had a mean BMI of 27.75 with a standard deviation of 2.64. Is there sufficient evidence for one to claim that, in general, rugby players have a higher BMI than the multisport men? Let $\alpha = 0.01$.

Solution:

$$H_0 : \mu_{MS} \geq \mu_R, H_1 : \mu_{MS} < \mu_R$$

$$s_p^2 = \frac{39(1.27^2) + 23(2.64^2)}{62} = 3.6001$$

$$t = \frac{22.41 - 27.75}{\sqrt{\frac{3.6001}{40} + \frac{3.6001}{24}}} = -10.9001$$

Reject H_0 since $-10.9001 < -2.388$.