SOLUTIONS

# CHAPTER 9: HYPOTHESIS TESTS INVOLVING TWO POPULATION MEANSOR PROPORTIONS

1. Prisoner reentry into conventional society is a real problem because it is difficult for ex-offenders to get a full-time job (40 hours per week). To illustrate this, you take a random sample of 61 persons who have been released from prison who were returned to Iron City and 61 persons who live in the same neighborhoods as these but who have never been to prison. Among other questions, you ask persons in both groups how many hours per week they usually work. Here is the data you get:

**Non-Prisoners    Released Prisoners**

***n*1 = 61                      *n*2 = 61**

***X*1= 42.5                      *X*2 = 30.1**

***s*1 = 7.9                        *s*2 = 8.3**

**Test the null hypothesis that there is no difference between the two groups in the number of hours a week they work versus the alternative hypothesis that those who had not been in prison work more hours. Use an alpha of .05 and label each step of your hypothesis test. Assume that the two population standard deviations are equal (σ1 = σ2), and make sure to state each step of the hypothesis test and properly interpret your results.**

**Step 1:**

**H0: *µ* Non Prisoner = µPrisoner**

**H1: *µ*Non Prisoner > µPrisoner**

**Step 2: t test for two independent sample means, pooled variance t test, t distribution**

**Step 3: α = .05 df = n1 + n2 – 2(61 + 61) – 2 = 120**

**tcrit = 1.658**

**Decision Rule: Reject the null if tobt > 1.658.**

**Step 4:**

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**tobt= 8.32**

**Step 5: 8.32 > 1.658 Reject the null hypothesis and conclude that those who are have not been in prison work more hours than those released from prison and returned to the same community.**

2. It is often said that the criminal sentences given to minority offenders are more severe than those given to Whites. You examine how this works in a federal district court. You take a sample of 80 bank robbery cases where the convicted offender was White and a second independent sample of 80 cases where the convicted offender was either African American or Hispanic. Here’s the data that you get:

**White                Minority**

n1 = 80                      n2 = 80

X1= 67 months            X2 = 73 months

s1 = 18                        s2 = 29

Test the null hypothesis that there is no difference between the two groups versus the alternative hypothesis that White suspects are sentenced on average to fewer months. Use an alpha of .05 and label each step of your hypothesis test. You cannot assume that the two population standard deviations are equal (σ1 ≠ σ2), make sure to state each step of the hypothesis test and properly interpret your results, and use 155 as your degrees of freedom. What conclusion would you draw from these data?

*Step 1:*

H0: *µWhite = µMinority*

H1: *µWhite < µMinority*

*Step 2: t test for two independent sample means, separate variance t test, t distribution*

*Step 3: α = .05 df = 155*

*tcrit = -1.658*

*Decision Rule: Reject the null if tobt < -1.658.*

*Step 4:*



*Step 5: -1.56 > -1.658 I would fail to reject the null hypothesis and conclude that on average White offenders and minority offenders are sentenced to the same degree of severity in federal court. (There is not a statistically significant relationship between race of the offender and length of prison sentence).*

3. Researchers are very interested in predicting who will and will not become a criminal as an adult. One of the strongest predictors of adult criminality is whether the person was a juvenile delinquent. You want to determine whether juvenile delinquents are more likely to become adult criminals. In a sample of 376 juvenile delinquents, you find that 58.5% become criminals as adults. In another sample of 510 people who were not juvenile delinquents, you find that 31.4% become criminals as adults. Test the hypothesis that delinquents are more likely to become adult criminals (use α = .05).

= .585 = .314

 *n*1 = 376 *n*2 = 510

*Step 1: H0: PJD = PNJD*

*H1: PJD > PNJD*

*Step 2: Z-test for 2 population proportions*

*Step 3: α = .05; one-tail; Zcrit = 1.65; reject if Zobt > 1.65*



*Zcrit*

1.65

*Step 4: *

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*Step 5: 8.05>1.65 I would reject the null hypothesis. Juvenile delinquents are more likely to become adult offenders. (There is a statistically significant relationship between juvenile delinquency and adult offending).*

4. The District of Columbia Police Department has recently tried to increase the number of arrests made by police officers. You want to know if arrests have actually increased. You look at a sample of 6 police officers, and measure the number of arrests each month for the month before and after the policy change. Test the null hypothesis that the before and after number of arrests are equal, against the alternative that the number of arrests are higher after the policy change. Use an alpha of .05. What are your conclusions?

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| --- | --- | --- | --- | --- | --- |
| Person | Before*x*1 | After*x*2 | *xD*(*x*2 – *x*1) |  |  |
| 1 | 1 | 3 | 2 | .5 | .25 |
| 2 | 0 | 2 | 2 | .5 | .25 |
| 3 | 2 | 3 | 1 | -.5 | .25 |
| 4 | 3 | 2 | -1 | -2.5 | 6.25 |
| 5 | 1 | 4 | 3 | 1.5 | 2.25 |
| 6 | 0 | 2 | 2 | .5 | .25 |
|  |  |  | Σ = 9 |  | Σ = 9.5 |
|  |  |  |  |  |  |
|  |  |  | = (9/6) = 1.5 | Variance = 9.5/5 = 1.9 |
|  |  |  |  | Standard Deviation = 1.378 |



*Step 1: H0: µD = 0, or µAfter = µBefore*

 *H1: µD > 0, or µAfter > µBefore*

*Step 2: Dependent Sample t-test*

*tcrit  =* 2.015

*Step 3 : α = 0.05, one-tail; df = (n-1) = 5; tcrit = 2.015; reject if tobt > 2.015*

*Step 4:*

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 *Step 5: 2.67>2.015. I would reject the null hypothesis and conclude that arrests are greater after the implementation of the policy.*