

## Module 4 Hypothesis Testing Using Z-Score

1. How do UMD students measure up on the older version of the verbal GRE? We know that the population average on the old version of the GRE (from ETS) was 554 with a standard deviation of 99. Our sample of 90 UMD students had an average of 568. Is the 14 point difference in averages enough to say that UMD students perform better than the general population at significance level 0.05?

### Solution:

Step 1: Develop Hypotheses  $H_0 : \mu = 554$  vs  $H_a : \mu > 554$ .

Step 2: Test Statistic  $z = \frac{568-554}{99/\sqrt{90}} = 1.34$

Step 3: Determine P-value P-value =  $P(Z > 1.34) = 0.0901$

Step 4: Make A Conclusion: With a P-value of 0.0901 which exceeds our significance level, we do not reject the null hypothesis. There is not enough evidence to say that UMD students perform better than the general population at significance level 0.05

2. Suppose it is up to you to determine if a certain state (Michigan) receives a significantly different amount of public school funding (per student) than the USA average. You know that the USA mean public school yearly funding is \$6800 per student per year, with a standard deviation of \$400. Next, suppose you collect a sample ( $n = 100$ ) from Michigan and determine that the sample mean for Michigan (per student per year) is \$6873. Run a hypothesis test to determine if Michigan receives a significantly different amount of funding for public school education (per student per year).

### Solution:

Step 1: Develop Hypotheses  $H_0 : \mu = 6800$  vs  $H_a : \mu \neq 6800$

Step 2: Test Statistic  $z = \frac{6873-6800}{400/\sqrt{100}} = 1.825$

Step 3: Determine P-value P-value =  $P(Z > 1.825) + P(Z < -1.825) = 2 * P(Z < -1.825) = 0.068$

Step 4: Make A Conclusion: With a P-value of 0.068 which exceeds our significance level 0.05. Therefore, this result is NOT significant. We CANNOT reject  $H_0$ . We CANNOT conclude that there is a significant difference between the funding for Michigan and the average funding for the USA.