

Hypothesis Testing

Example: Testing the Gender Choice Product. Product claims that using this product can increase significantly the chance that one will give birth to a girl.

Testing method: Choose a random sample of 100 babies born to women who used the Gender choice product.

Null Hypothesis: The claim that gender choice does not work, and therefore the proportion of baby girls born when the Gender Choice Product is used is less than or equal to the expected proportion of girls born in the when the product is not used (50%).

Alternative Hypothesis: The claim that the Gender Choice does work and the proportion of girls is greater than 50%.

Definition of Null and Alternative Hypotheses:

Null Hypothesis: Claims a specific value for a population parameter (such as the mean of the underlying population or proportion of the population that have a particular characteristic.)

Alternative Hypothesis: The claim that is accepted if the null hypothesis is false. (I.e., its negation).

Form of null hypothesis, and corresponding alternative hypothesis.

One of three forms

Null Hypothesis	Alternative Hypothesis
1. Population parameter = claimed value.	1. Population parameter is not equal to claimed value.
2. Population parameter \geq claimed value.	2. Population parameter < claimed value.
3. Population parameter \leq claimed value.	3. Population parameter > claimed value.

Steps for Hypothesis Testing: Testing for the Mean with a large sample (Size ≥ 30).

1. For the claim being tested, state the Null H_0 and Alternative Hypothesis H_a .
2. Specify the level of significance, α . This is the maximum allowable probability of making an error of rejecting the null hypothesis when it is actually true.
3. Determine the critical value z_0 and rejection regions.

If a two- tailed hypothesis test (Case 1 above), find the two z-scores corresponding to percentage $\alpha/2$ and $1-\alpha/2$.

If a left tailed hypothesis test (Case 2 above), find the z-score in text corresponding to percentage α .

If a right tailed hypothesis test (Case 3 above), find the z-score corresponding to percentage $1-\alpha$.

4. Find the standardized z score for your sample mean (and if desired, corresponding P-value)

$$z - score = \frac{\text{sample mean} - \text{population mean}}{\text{sample standard deviation}/\sqrt{n}}$$

where n is the sample size.

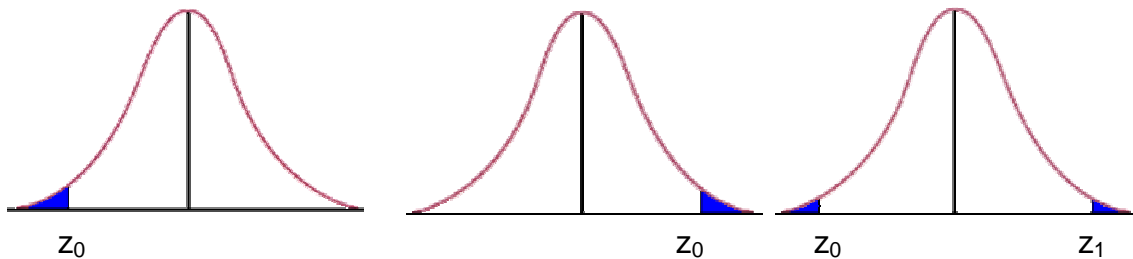
5. Determine whether to reject or fail to reject the null hypothesis.
If the standardized z-score is in the rejection region, reject the null hypothesis.
(and thus accept the alternative hypothesis).
If the standardized z-score is NOT in the rejection region fail to reject the null hypothesis. (However you do not accept the alternative hypothesis in this case!)

Rejection Regions (Shaded Area):

Left Tail
Z-score $< z_0$

Right Tail
Z-score $> z_0$

Two-Tail
Either Z-score $< z_0$
or Z-score $> z_1$



6. Interpret decision in context of original claim.