HYPOTHESIS TESTS: ONE FORMAT

1. Define parameter(s).
These are the population parameters to be used in the statement of the hypotheses.

2. State hypotheses (null hypothesis H_0 and alternate hypothesis H_a).
The statements should be in terms of the population parameters defined. The alternate hypothesis is the one requiring strong evidence. The null hypothesis will be retained if there is not strong evidence to doubt it.

3. Define the test statistic and its (possibly approx.) probability distribution.
The test statistic is a random variable which is defined in terms of numbers known BEFORE the sample is taken. Do not leave letters like μ_0 in the definition of the test statistic – substitute the numerical value if it is known (e.g. from H_0). The test statistic has a probability distribution which is determined by the null hypothesis H_0 and some implicit assumptions (such as the sample being random, or a normal probability distribution being a reasonable approximation for a large sample).

4. Determine the rejection region RR for the given α.
The RR is the set of numbers such that H_0 will be rejected if the value of the test statistic falls into the RR. So, values in the RR correspond to support of the alternate hypothesis. Here α is the level of significance, i.e. it is the probability of a Type I error. As α gets smaller, stronger evidence is required to reject H_0, and the RR likewise gets smaller. The probability that the test statistic output falls in the RR is computed under the assumption that H_0 is true.

5. Compute the value of the test statistic for the given data.

6. Conclude whether H_0 is retained or rejected at the α. Briefly state the practical consequence.

7. Compute the P-value for the given data and comment.
(Comment on whether the P-value provides particularly strong support for the decision made.)
The significance level α is decided before the hypothesis test is run. The P-value is the smallest number such that if α had been chosen equal to that number, then with the given data the null hypothesis would be rejected. So, for example if a Z-test is run at $\alpha = .05$ and has rejection region $Z \geq 1.64$, and the computed value of the Z statistic is $z = 3.0$, then the P-value is .0013; the test would have rejected H_0 even at the much more demanding $\alpha = .0013$, so the P-value provides strong support for the decision to reject H_0. On the other hand, if we computed $z = 1.9$, then the P-value would be .0287, close to the $\alpha = .05$ used. Here rejection of H_0 was a fairly close call, and the P-value doesn't give strong additional support.

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