

# What is significance?

- Suppose that a treatment and a placebo are allocated at random to a group of people. We measure the mean response to each treatment, and wish to know whether or not the observed difference between the means is real (not zero), or whether it could plausibly have arisen by chance. If the result of a significance test is  $p=0.05$ , we can make the following statement:

If there were actually no effect (if the true difference between means were zero) then the probability of observing a value for the difference equal to, or greater than, that actually observed would be  $p=0.05$ . In other words there is a 5% chance of seeing a difference at least as big as we have done, by chance alone.

# ASA Principles on $p$ -values

1.  $p$ -values can indicate how incompatible the data are with a specified statistical model.
2.  $p$ -values do not measure the probability that the studied hypothesis is true, or the probability that the data were produced by random chance alone.
3. Scientific conclusions and business or policy decisions should not be based only on whether a  $p$ -value passes a specific threshold.
4. Proper inference requires full reporting and transparency.
5. A  $p$ -value, or statistical significance, does not measure the size of an effect or the importance of a result.
6. By itself, a  $p$ -value does not provide a good measure of evidence regarding a model or hypothesis.