









Testing many hypotheses..

Prob(reject $H_0 \mid H_0$ true) = 0.05 = α

Suppose test n H_0^i with independent test statistics

Prob(at least one will reject an H_0^i | H_0^i true) = 1 - Prob(reject none) $= 1 - (1 - \alpha)^n$ ≈

$$1-(1-n\alpha)=n\alpha$$

So a simple method is to multiply the observed significance level by the number of tests

Can use α/n as a significance level [Bonferroni]

i.e. could have used 0.05/20 = 0.0025 for jelly beans

Problem whenever only the most extreme events are reported

Higgs Boson: adjustment for 'look elsewhere effect' when calculating P-value

How can we tell if an apparent 'cluster' could just be chance?





Plane crashes

- 3 major plane crashes in 8 days in July 2014
- Expect one every 40 days by chance
- Can calculate that 1/1000 chance of at least 3 in between July 16th and July 24th 2014 [observed p-value]
- But we have picked the most extreme p-value over a period
- Using '*scan statistics'* we can calculate the chance of 3 crashes in *any* 8 day window in 10 years
- 60%





