Hypothesis Testing

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Learning Module 8: Hypothesis Testing

Exhibit 2: Test Statistics and Their Distribution

What We Want to Test	Test Statistic	Probability Distribution of the Statistic	Degrees of Freedom
Test of a single mean	$t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}}$	t-distributed	$n - 1$
Test of the difference in means	$t = \frac{(\bar{X}_{d1} - \bar{X}_{d2}) - (\mu_{d1} - \mu_{d2})}{\sqrt{\frac{s_p^2}{n_{d1}} + \frac{s_p^2}{n_{d2}}}}$	t-distributed	$n_1 + n_2 - 2$
Test of the mean of differences	$t = \frac{\bar{d} - \mu_{d0}}{s_{\bar{d}}}$	t-distributed	$n - 1$
Test of a single variance	$\chi^2 = \frac{(n-1)s^2}{\sigma_0^2}$	Chi-square distributed	$n - 1$
Test of the difference in variances	$F = \frac{s^2_{\text{before}}}{s^2_{\text{after}}}$	F-distributed	$n_1 - 1$, $n_2 - 1$
Test of a correlation	$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$	t-Distributed	$n - 2$

What We Want to Test	Test Statistic	Probability Distribution of the Statistic	Degrees of Freedom
Test of independence (categorical data)	$\chi^2 = \sum_{i=1}^{m} \frac{(O_{ij}-E_{ij})^2}{E_{ij}}$	Chi-square distributed	$(r-1)(c-1)$

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## Exhibit 2: Test Statistics and Their Distribution

| What We Want to Test                          | Test Statistic
|-----------------------------------------------|-----------------------------------------------
| Test of a single mean | $t = \frac{\bar{X} - \mu_0}{s / \sqrt{n}}$ | $t$-distributed | $n -
| Test of the difference in means | $t = \frac{(\bar{X}_{d1} - \bar{X}_{d2}) - (\mu_{d1} - \
| Test of the mean of differences | $t = \frac{\bar{d} - \mu_{d0}}{s_{\bar{d}}}$ | $t$-distri
| Test of a single variance | $\chi^2 = \frac{(n - 1)s^2}{\sigma_0^2}$ | Chi-square distribut
| Test of the difference in variances | $F = \frac{s^2_{\text{before}}}{s^2_{\text{after}}}$
| Test of a correlation | $t = \frac{r \sqrt{n - 2}}{\sqrt{1 - r^2}}$ | $t$-Distributed | $n
| Test of independence (categorical data) | $\chi^2 = \sum_{i=1}^{m} \frac{(O_{ij} - E_{ij})
```
