BST02: Using R for Statistics in Medical Research

Part D: Statistics with R

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t-test: `t.test()`

One-sample t-test

- compares the mean of a sample with a fixed value μ

Two sample / independent samples t-test

- compares the difference between the means of two samples with a fixed value μ

Related samples t-test

- compares the mean of the difference between related observations with a fixed value μ (same as one-sample t-test)

Wilcoxon Test: `wilcox.test()`

Wilcoxon Signed Rank Test

- tests if one sample (or the differences between two paired samples) is/are symmetric about μ

Wilcoxon Rank Sum Test / Mann-Whitney test

- test for a location shift between the distributions of two independent samples

See also BBR Sections 7.2 & 7.3 (http://hbiostat.org/doc/bbr.pdf)

Kruskal-Wallis Rank Sum Test: `kruskal.test()`

- This is an extension of the Wilcoxon rank sum test for more than two groups
- Test for a difference in location of a continuous variable between multiple groups
- The Wilcoxon rank sum test is a special case of the Kruskal-Wallis rank sum test

Other tests for continuous data

- **Kolmogoriv-Smirnov Test:** `ks.test()`
  tests if two samples are drawn from the same continuous distribution
- **Shapiro-Wilk Normality Test:** `shapiro.test()`
- **Friedman Rank Sum Test:** `friedman.test()`
  non-parametric test for 2 or more related samples
- …

Tests for Categorical Data / Proportions

One-sample Proportion Test

- tests if the proportion in one sample is equal to a fixed value p
- `prop.test()` and `binom.test()`

Tests for Proportions in Multiple (independent) Groups

- tests if the proportion in several samples are equal
- `chisq.test()` and `fisher.test()` (when there are cells with 0)

See also BBR Sections 5.7 & 6 (http://hbiostat.org/doc/bbr.pdf)

Tests for Categorical Data / Proportions

Related Samples: McNemar Test

- Tests for symmetry in a 2×2 table
- `mcnemar.test()`

3-Dimensional Contingency Table

- χ^2 test for independence of two nominal variables in each stratum
- Cochrane-Mantel-Haenszel Test

Statistical Tests

Continuous Outcomes

- `t.test()`
- `wilcox.test()`
- `kruskal.test()`
- `ks.test()`
- `friedman.test()`
- `shapiro.test()`

Categorical Outcomes

- `prop.test()`
- `binom.test()`
- `chisq.test()`
- `fisher.test()`
- `mcnemar.test()`
- `mantelhaen.test()`

Pairwise tests

- `pairwise.prop.test()`
- `pairwise.t.test()`
- `pairwise.wilcox.test()`

Variance and Correlation

- `cor.test()`
- `bartlett.test()`
- `var.test()`

Regression

Regression Models

- `lm()`
- `glm()`

Regression Results

- `summary()`
- `coef()`, `confint()`
- `fitted()`, `residuals()`
- `AIC()`, `BIC()`
- `anova()`

Plots

- `plot()`
- `qqnorm()`, `qqline()`, `qqplot()`

Topic

- `ns()`, `bs()`, `I()`
- `p.adjust()`