# Hypothesis Tests in SPSS [HTS]: Answers

## **Two Independent Samples** – plotting the data and carrying out a two independent samples *t*-test for the *difference* between *two means*

**Example**: A random sample of 40 cellphones of the same make and model were chosen. Half of the cellphones were randomly selected to have a nickel-cadmium battery put in them and the rest had a nickel-metal hydride battery. The talk time (in minutes) before the batteries needed to be recharged was recorded. Carry out a two independent samples *t*-test for no difference in the means.

## Two Independent Samples *t*-test

**The correct null and alternative hypotheses for this test are:**

$H_0 : \mu_1 - \mu_2 = 0$
vs
$H_1 : \mu_1 - \mu_2 \neq 0$

## **Paired Data Comparisons** – finding the differences, plotting the data and carrying out a paired *t*-test for the *mean difference*

**Example**: A market research company is interested in which of two similar electric shavers, model A or model B, is preferred by consumers. 26 men who daily use an electric shaver, but not one of the models of interest are randomly selected to participate in the study. Half the men were randomly allocated to use model A one morning followed by model B the next morning whilst the order was reversed for the remaining men. After every shave, each man completed a questionnaire rating his satisfaction with the shaver. Satisfaction was measured as a score based on the answers to the questionnaire and is given in a range from 1 to 100. (Larger scores indicate greater satisfaction).

## Paired *t*-test

Carry out a paired data *t*-test for a mean difference of 0.

**The correct null and alternative hypotheses for this test are:**

$H_0 : \mu_{diff} = 0$
vs
$H_1 : \mu_{diff} \neq 0$

# **One Sample** – plotting the data and carrying out a one sample *t*-test for the *mean*

## One Sample *t*-test

**Example**: Of interest is whether the most recent road fatalities per capita per year for 26 countries has changed from the historical average of 15.5 per 100,000 inhabitants per year (for the same 26 countries in the mid-eighties). The data collected by the World Health Organization (WHO) is below. Carry out an appropriate one-sample *t*-test.

**The correct null and alternative hypotheses for this test are:**

$H_0 : \mu = 15.5$
vs
$H_1 : \mu \neq 15.5$

# **Three or more samples** – plotting the data and carrying out an *F*-test for one-way ANOVA for a *difference* between *three or more means*

**Example**: In 1989, 464 people were killed by a gun in the United States in a single week in May. These deaths have been grouped into four classes: **Accident**; **Homicide**; **Self defense**; and; **Suicide**. The age was also recorded for each person. Carry out a one-way ANOVA *F*-test for no difference in the groups' underlying means.

## *F*-test for one-way ANOVA

**The correct null and alternative hypotheses for this test are:**

$H_0 : \mu_1 = \mu_2 = \mu_3 = \mu_4$
(i.e. all of the $\mu$'s are the same)
vs
$H_1$ : at least one of the $\mu$'s is different from the rest