MEASURING THE ASSOCIATION BETWEEN TWO INDEPENDENT RANDOM VARIABLES

Variable 1	Variable 2	Commonly reported association summary statistic	Name of test	Null and alternative hypotheses	Assumptions (or "when to use")
Continuous	***Continuous***	Pearson correlation coefficient (and possibly the corresponding CI)		H_0: $\rho = 0$ H_A: $\rho \neq 0$	Both variables are normally distributed (actually, the variables have a joint bivariate normal distribution)
		Spearman correlation coefficient (and possibly the corresponding CI)		H_0: $\rho_s = 0$ H_A: $\rho_s \neq 0$	No distributional assumptions – use if at least one variable is non-normal
Continuous	***Categorical*** – 2 levels	Mean and SD of continuous variable at each level of categorical variable	t-test	H_0: $\mu_1 = \mu_2$ H_A: $\mu_1 \neq \mu_2$	Continuous variable is normally distributed
		Median and IQR (or possibly Range) of continuous variable at each level of categorical variable	Wilcoxon rank-sum test (equivalent to Mann-Whitney U test)	H_0: $location_1 = location_2$ H_A: $location_1 \neq location_2$	No distributional assumptions – use if continuous variable is not normally distributed
Continuous	***Categorical*** – K levels ($K \geq 3$), nominal or ordinal	Mean and SD of continuous variable at each level of categorical variable	1-Way ANOVA	H_0: $\mu_1 = \mu_2 = \ldots = \mu_K$ H_A: at least one mean differs from the others	Continuous variable is normally distributed
		Median and IQR (or possibly Range) of continuous variable at each level of categorical variable	Kruskal-Wallis test	H_0: $location_1 = location_2 = \ldots location_K$ H_A: at least one location differs from the others	No distributional assumptions – use if continuous variable is not normally distributed

Categorical	***Categorical***	Frequencies and percents of one variable across levels of second variable	χ^2 – test	H_0: Variable 1 and Variable 2 are independent H_A: Variable 1 and Variable 2 are not independent (i.e. are associated with one another)	The *expected* cell counts (frequencies) must be at least 5
		Frequencies and percents of one variable across levels of second variable	Fisher's exact test	H_0: Variable 1 and Variable 2 are independent H_A: Variable 1 and Variable 2 are not independent (i.e. are associated with one another)	Use when any expected cell count is less than 5
Categorical – 2 level	***Categorical*** – K levels (K ≥ 3), ordinal	Frequencies and percents of K-level variable across each level of the dichotomous variable	Cochran-Armitage trend test	H_0: Variable 1 and Variable 2 are independent H_A: There is a linear trend in the probabilities $\pi_{1\|1}$, $\pi_{2\|1}$, …, $\pi_{K\|1}$ (and also, by symmetry, in $\pi_{1\|2}$, $\pi_{2\|2}$, …, $\pi_{K\|2}$)	Use to test for linear trend

MEASURING THE ASSOCIATION BETWEEN PAIRED ENDPOINTS

Variable	Commonly reported association summary statistic	Name of test	Null and alternative hypotheses	Assumptions (or "when to use")
Continuous	Average and standard deviation of differences	Paired t-test	H_0: $\mu_d = 0$ H_A: $\mu_d \neq 0$	Continuous variable is normally distributed
Continuous	Median and IQR (or possibly range) of differences	Wilcoxon signed-rank test	H_0: $\text{location}_d = 0$ H_A: $\text{location}_d \neq 0$	No distributional assumptions – use if continuous variable is not normally distributed
Categorical – 2 level	Frequency and percent that changed (depending on context, may want to report separately for select category pairings the frequency and percent that changed)	McNemar's test	H_0: $\pi_{\text{condition 1}} = \pi_{\text{condition 2}}$ H_A: $\pi_{\text{condition 1}} \neq \pi_{\text{condition 2}}$	See course text, Chapter 18
Categorical – K levels (K ≥ 3), nominal or ordinal	Frequency and percent that changed (depending on context, may want to report separately for select category pairings the frequency and percent that changed)	Stuart-Maxwell test	H_0: $\pi(i)_{\text{condition 1}} = \pi(i)_{\text{condition 2}}$ H_A: $\pi(i)_{\text{condition 1}} \neq \pi(i)_{\text{condition 2}}$ where $\pi(i)$ is the probability of category i, $i = 1, \ldots$ K.	See course text, Chapter 18