Reference Table for Choosing the Right Statistical Test/Method:

Model/Test	Use when response/outcome variable is…	Use when the explanatory variable of interest is…	Basic Description
Two-sample t-test	Continuous (or at least Quantitative)	Categorical, comprised of two groups, and the two groups are *independent*	Tests whether there is a significant difference between the means of the two groups
Paired t-test	Continuous (or at least Quantitative)	Categorical, comprised of *paired* data, e.g. the same patients before and after an intervention	Tests whether the mean of differences in the outcome variable is significantly different between paired observations
One-way ANOVA	Continuous (or at least Quantitative)	Categorical, comprised of three or more groups, and the groups are *independent*	Tests whether there are any statistically significant differences between the group means
Simple Linear Regression	Continuous (or at least Quantitative)	Continuous (or at least Quantitative)	Tests whether there is a significant *linear* association between the continuous outcome and the continuous predictor variable, and estimates how changes in the predictor affects the outcome variable
Multiple Linear Regression	Continuous (or at least Quantitative)	Multiple continuous and/or categorical predictors	Tests whether there is a significant *linear* association between the outcome variable and each predictor variable, after adjusting for the effects of all other predictors (i.e. controls for *confounding*)
Chi-squared Test	Categorical (e.g. we are interested in the proportion in each category)	Categorical, with all observations being independent	Tests whether there is a significant association between

			the two categorical variables
Ordinary Logistic Regression	Categorical with binary outcomes (e.g. success/failure)	Usually continuous (or at least quantitative) but possible with categorical predictors	Tests whether the predictor variable has a statistically significant relationship with the outcome variable, and allows you to estimate the *odds* of the outcome occurring given the predictor variable
Linear Mixed Effects Model	Continuous, with *repeated measures* for each subject/patient	Multiple continuous and/or categorical predictors	Tests whether there is a statistically significant relationship between the outcome variable and each predictor variable, after allowing for correlation within subjects caused by repeated measures
Survival Analysis (e.g. Cox regression)	Time-to-event, e.g. number of days until occurrence of a specific event	Multiple continuous and/or categorical predictors	Tests whether there is a statistically significant association between the outcome and predictor variables in terms of *risk* of the event

Please note that some of these types of analyses (logistic regression, linear mixed effects modeling, survival analysis, etc.) can be quite complex and complicated to interpret, and we *strongly recommend* you come to us at the Rush Biostatistics Core for assistance in fitting and interpreting these models to ensure proper application of statistical methods, accurate interpretation of results, and valid conclusions.

Please note that for each of these tests/analyses, there are various assumptions that need to hold in order for these tests to be valid. For instance, for a two-sample t-test, we generally need the outcome variable to be normally distributed within each of the two groups. However, if the assumptions are severely violated, there are alternative *nonparametric* tests that may be used instead, that relaxes some of the assumptions (usually resulting in more valid inference but decreased *power*).

Here is a table of commonly used non-parametric alternatives to some of the tests/methods listed above. We strongly encourage investigators to consult the Rush Biostatistics Core when choosing between these methods.

Non-Parametric Alternatives to Common Statistical Tests/Methods

Non-Parametric Test	Use as an alternative to…	Use when…	Basic Description
Wilcoxon Rank-Sum Test (Mann-Whitney U)	Two-sample t-test	The outcome variable is not normally distributed within the groups (groups must still be *independent*)	Tests whether the distributions of the outcome differ between two independent groups
Wilcoxon Signed-Rank Test	Paired t-test	The differences between paired observations are not normally distributed	Tests whether the median of the differences between paired observations is zero
Kruskal-Wallis Test	One-way ANOVA	The outcome variable is not normally distributed, we have 3 or more *independent* groups	Tests for differences in the distribution of the outcome across multiple groups
Quantile Regression	Simple/Multiple Linear Regression	The residuals are non-normal, or the data is skewed or has large outliers	Models the relationship between predictors and the median (or other quantiles) of the outcome
Fisher's Exact Test	Chi-squared Test	Sample size is small and/or we have several cells with expected frequencies of <5	Tests for association between two categorical variables with small sample sizes