Choosing a statistical test

Geographers are facing an increasing need to analyse data, particularly primary data they have collected themselves in the field, through statistical tests. For many geographers this represents a step outside their comfort zone and finding the right test for the right data can seem like an overwhelming task. Statistical tests however can be a valuable tool if used correctly and appropriately and can add new layers of meaning to data which otherwise may have been missed.

Before you start, it is important to have a grasp of the terminology used in statistical testing.

Individual	a single piece of data collected in the field.
Sample	a collection of individuals that require analysis
Sample size	the number of individual within the sample.
Data	units of information. These can be quantitative (numerical) or qualitative (word-based).
Data set	a collection of pieces of data, all with a common theme.
Variable	an aspect of the data that is changeable. This may change spatially or temporally for example.
Spread	the distribution of the data if it is cited from lowest to highest value.
Observed data	the data sampled from the field through primary collection.
Expected data	the data one might expect if variables were to have no impact.
Outliers	individuals that fall far outside the expected or observed spread of results

What type of data do you have?

It is important to firstly establish the type of data you have to analyse. The data you have should fit into one of the following fields:

Comprises of one set of data	Comprises of two (or more) sets of data
(which you wish to analyse in itself or against a norm or mean)	(which you are aiming to compare or find a relationship between)

Once you have found which of these fields apply, you are ready to choose an appropriate statistical test.

In addition to these considerations, you must also have an awareness of your sample size - some statistical tests will not be meaningful unless a certain sample size is used.

One set of data

Simpson's Diversity Index	This tests the level of diversity found within a sample. Whilst traditionally used in ecology studies, the same principle can apply to any geographical data which shows a range of different items within a study framework.
Lorenz Curves	Formulating a Lorenz Curve highlights the level of diversity there is in a single sample set compared to a norm (or expected result).
Standard Deviation	This tests the amount of variance there is between an observed set of data and the mean of that same data by showing the amount of 'spread' in the data set.
Interquartile Range	This is another test that shows the level of variability in a data set around a mean. This test however, focusses on the data closest to the mean and can be useful if a data set shows outliers within the spread or if outliers need to be identified.

One set of data continued

Nearest Neighbour Index	This tests how spatially spread out data is and works best when data has been mapped. The Index gives a score for the level of spatial diversity for one particular variable within a data set.
Location Quotient	This test measures how clustered data in an observed set is compared to an average for that designated region or area. It can therefore be used to show unique characteristics for a series of regions.

Two sets of data

Spearman's Rank Correlation Coefficient	This tests for any relationship between two sets of paired data, i.e. where in a single location, data is collected on two variables, before the method is repeated at multiple other locations. It works off the rank order of the data rather than the raw data itself. It shows the nature of the relationship as well as the strength of that relationship.
Pearson's Product Moment Correlation Coefficient	This test also works with paired data but works with raw data that shows a linear relationship. It also shows the nature of the relationship as well as the strength of that relationship.
Chi Squared Test	This test tries to find a relationship between data sets but a relationship based on categories of data rather than the raw data itself. Once the observed data is placed in categories (such as age brackets) it is compared with the expected data for those same categories.
Mann Whitney U Test	This tests the extent to which two sets of data are similar to each other. It tests a null hypothesis that states that there is no similarity between the two sets. This test can be used if there are fewer than twenty samples within each data set.
Student's T Test	This also tests the extent to which two sets of data are similar to each other. This test is only valid if there are more than twenty samples within each data set.

Further guides are available on each of the above statistical tests.

