Notes on the Interpretation of Chi Square

* Generally speaking, Chi Square is designed to determine whether an observed set of frequencies (Fo's)[1] differ from an expected set(Fe's)[1], the latter taken to be either calculated from the data & of equal value, or derived from some other source (as in the goodness of fit test).

Ho [the **Null** Hypothesis] for Chi is that the Observed Frequencies (Fo's) = the Expected Frequencies (Fe's)

$\mathbf{H_{alt}}$ [the **ALT**ernate Hypothesis] for Chi, therefore, is usually that the Fo's do not equal the Fe's

* Chi Square may be said to be of the **goodness-of-fit type** in that it may be used to test whether a significant difference exists between an OBSERVED number of objects or responses, or a proportionate number, falling in each of several categories and the EXPECTED numbers.

* If a Chi Square were to be calculated on, say, the number of teenagers who are listening to one of four radio stations AND one station-- e.g., Station A--clearly has more listeners than the others AND the 1 x 4 Chi Square turns out to be statistically significant, THEN we can conclude that Station A is INDEED MORE POPULAR AND THAT THIS OUTCOME CAN BE EXPRESSED WITH A PARTICULAR AMOUNT OF STATISTICAL CERTAINTY WITH A PARTICULAR PROBABILITY OF BEING WRONG. Additionally, since this result IS STATISTICALLY SIGNIFICANT, our conclusion regarding Station A has attained what could be called a precise amount of statistical support and probabilistic certainty.

* Chi Square can also be used to analyze experimental data. If two groups of subjects were exposed to either EXPERIMENTAL TREATMENT A or EXPERIMENTAL TREATMENT B and then classified as either IMPROVED or NOT IMPROVED after the experience (a 2 x 2 Chi design) AND if the outcome lead us to Reject Ho, THEN we could examine our data to see which treatment was more effective AND then conclude that THAT INDEPENDENT VARIABLE--Treatment A or Treatment B--did indeed influence the results in the direction observed.

* Chi Square can also be considered to be a TEST OF INDEPENDENCE. Since the r x c tests whether or not the variables in the contingency table are independent, it can be used for testing the hypothesis of difference. Therefore, Chi Square can be applied to both experimental data, which is always aimed at the hypothesis of difference, and *post-facto* data, which sometimes tests for difference.

* When samples are DEPENDENT or when correlation is required from nominal data, SPECIAL ALTERNATE PROCEDURES APPLY.

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[1] Whether you refer to the frequencies observed as Fo or simply O and the frequencies expected as Fe or simply E is your personal choice. If you were to examine several statistics textbooks you would discover that both versions are used, i.e., the symbols are not standardized.

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