**Chi Square**

PARAMETRIC TEST: The test in which, the population constants like mean, std deviation, std error, correlation coefficient, proportion etc. and data tend to follow one assumed or established distribution such as normal, binomial, Poisson etc.

NON-PARAMETRIC TEST: the test in which no constant of a population is used. Data do not follow any specific distribution and no assumption are made in these tests. E.g., to classify good, better and best we just allocate arbitrary numbers or marks to each category.

IMPORTANT CHARACTERISTICS OF A CHI SQUARE TEST ¬ This test (as a non-parametric test) is based on frequencies and not on the parameters like mean and standard deviation. ¬ The test is used for testing the hypothesis and is not useful for estimation. ¬ This test can also be applied to a complex contingency table with several classes and as such is a very useful test in research work. ¬ This test is an important non-parametric test as no rigid assumptions are necessary regarding the type of population, no need of parameter values and relatively less mathematical details are involved.

CHI SQUARE DISTRIBUTION:

Chi-square distributions df based on number of cells not *n*



APPLICATIONS OF A CHI SQUARE TEST. This test can be used in

1) Goodness of fit of distributions 2) test of independence of attributes 3) test of homogeneity.

TEST OF GOODNESS OF FIT OF DISTRIBUTIONS: ¬ This test enables us to see how well the assumed theoretical distribution does (such as Binomial distribution, Poisson distribution or Normal distribution) fit to the observed data. And if null hypothesis is accepted, then it can be concluded that the given distribution follows theoretical distribution.

TEST OF INDEPENDENCE OF ATTRIBUTES ¬Test enables us to explain whether two attributes are associated. ¬For instance, we may be interested in knowing whether a new medicine is effective in controlling fever. When null hypothesis is rejected, it can be concluded that there is a significant association between two attributes.

 TEST OF HOMOGENEITY ¬ This test can also be used to test whether the occurrence of events follow uniformity or not e.g., the admission of patients in government hospital in all days of week is uniform or not can be tested with the help of chi square test. If the null hypothesis is accepted,it can be concluded that there is a uniformity in the occurrence of the events. (Uniformity in the admission of patients throughout the week)

 LIMITATIONS OF A CHI SQUARE TEST

 This test tells the presence or absence of an association between the events but doesn’t measure the strength of association. This test doesn’t indicate the cause and effect, it only tells the probability of occurrence of association by chance the test is to be applied only when the individual observations of sample are independent which means that the occurrence of one individual observation (event) has no effect upon the occurrence of any other observation (event) in the sample under consideration.

EXAMPLE WRITE UPS

A one-sample chi-square test was conducted to assess whether women become less depressed, remain unchanged, or become more depressed after giving birth. The results were found to be significant, *X*2(2, *n* = 60) = 12.70, *p* =.013. The proportion of women who were unchanged (55%) was greater than the hypothesized proportion (33%). While women who became less depressed (23%) and more depressed (22%) were approximately the same to the hypothesized proportion.

A follow-up test indicated that the proportion of women who became less depressed did not significantly differ from women who became more depressed, *X*2(1, n = 27) = 0.04, *p* = .158. Overall, these results suggest that women do not become more or less depressed after childbirth.

A chi-square test was conducted to assess whether cocaine addicts would relapse when treating addiction with Desipramine, Lithium, or a placebo drug. The results were found to be significant, X2(2, *n* = 72) = 10.5, p = .032. The proportion of addicts who did not relapse when treated with Desipramine (58%) was greater than the hypothesized proportion (33%). While the number of addicts who did not relapse when treated with Lithium (25%) and the placebo (17%) were approximately the same than the hypothesized proportion. The results suggest that there is a relationship between probability of a relapse and drug used to treat the addiction. It appears that Desipramine assists cocaine addicts to prevent relapse of drug abuse.