USE OF STATISTICS?

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HOW TO SELECT AN APPROPRIATE METHODOLOGY?

THE NATURE OF PROBLEM BEING INVESTIGATED

- QUALITATIVE
- QUANTITATIVE
- MIXED
- CRITICAL OR ACTION ORIENTED

STATISTICS TO BE USED:

- CATEGORICAL DATA;
- CHI-SQUARE TO DETERMINE RELATIONSHIP
- FISHER'S TEST TO COMPARE TWO UNPAIRED GROUPS
- WILCOXON TEST TO COMPARE ONE GROUP TO A HYPOTHETICAL VALUE
- SPEARMAN TEST – ASSOCIATION BETWEEN VARIABLES

CONTINUOUS DATA:

- T –TEST FOR ONE OR TWO GROUPS
- ANOVA TO COMPARE THREE OR MORE GROUPS
- PEARSON TEST TO COMPARE ASSOCIATION BETWEEN VARIABLES

HOW TO DRAW CONCLUSION FROM DATA?

- GRAPHICAL PRESENTATION- BAR, PIE, LINE CHART, SCATTER PLOT, FLOW CHART
- USE OF STATISTICAL ANALYSES
- CRITICALLY ANALYZING DATA & RESULTS

HYPOTHESIS

- **McGUIGAN, 69 – "HYPOTHESIS AS A TESTABLE STATEMENT OF POTENTIAL RELATIONSHIP BETWEEN TWO OR MORE VARIABLES."**

- **CHAPLIN, 75 – "HYPOTHESIS IS AN ASSUMPTION WHICH SERVES AS A TENTATIVE EXPLANATION."**

- **REBER, 87 – "HYPOTHESIS IS ANY STATEMENT, PROPOSITION OR ASSUMPTION THAT SERVES AS A TENTATIVE EXPLANATION OF CERTAIN FACTS."**

FUNCTION OF HYPOTHESIS

- **HYPOTHESIS MAKES THE RESEARCH MEANINGFUL**
- **HYPOTHESIS MAKES THE STUDY SPECIFIC**
- **HYPOTHESIS MAKES THE RESEARCH FOCUSSED**
- **HYPOTHESIS PROVIDES A DIRECTION FOR THE RESEARCH**
- **HYPOTHESIS PROVIDES A STARTING POINT**
- **HYPOTHESIS DELIMITS THE AREA OF RESEARCH**

TYPES OF HYPOTHESIS:

- **NULL**
- **DIRECTIONAL**

GOOD HYPOTHESIS

- **SHOULD BE SCIENTIFIC**
- **SHOULD BE A POSITIVE STATEMENT**
- **SHOULD BE RELATED TO THE PROBLEM**
- **MUST BE TESTABLE**
- **MUST BE LIABLE TO ACCEPTANCE OR REJECTION**

- **SHOULD BE QUANTIFIABLE –QUANTITATIVE RELATIONSHIP BET. VARIABLES**

- **SHOULD BE RELATED TO SOME THEORY**

- **SHOULD BE CAPABLE OF MAKING PREDICTIONS**

TYPES OF DESIGN

- **SINGLE GROUP DESIGN OR (WITHIN SUBJECTS DESIGN)**
- **BETWEEN SUBJECT DESIGN (TWO OR MULTIPLE GROUP DESIGN; MATCHED GROUP DESIGN**
- **FACTORIAL DESIGN**

STATISTICS

- **Statistics is the study of the collection, organization, analysis, and interpretation of data.**

- **A set of procedures and rules for reducing large masses of data into manageable proportions allowing us to draw conclusions from those data.**

- **It is extremely important to know what statistics to use before collecting data. Otherwise data might be un-interpretable.**

- **Without the use of statistics, it would be very difficult to make decisions based on the data collected.**

TYPES OF MEASUREMENTS:

- **Nominal** – Categorized or labeled data (red, green, blue, male, female)
- **Ordinal** – Rank order, (1st,2nd,3rd,etc.)
- **Ratio** – indicates order as well as magnitude.
- **Interval scale** - does not include zero.

TYPES OF STATISTICS

- **DESCRIPTIVE** - USED TO ORGANISE AND DESCRIBE A SAMPLE

- **INFERENTIAL** – USED TO EXTRAPOLATE FROM A SAMPLE TO A LARGER POPULATION

INFERENTIAL:

- CAN YOUR EXPERIMENT MAKE A STATEMENT ABOUT THE GENERAL POPULATION?

- **TWO TYPES:**

- **PARAMETRIC**

- INTERVAL OR RATIO MEASUREMENTS
- CONTINUOUS VARIABLES
- USUALLY ASSUMES THAT DATA IS NORMALLY DISTRIBUTED

NON-PARAMETRIC

- ORDINAL OR NOMINAL MEASUREMENTS
- DISCREET VARIABLES
- MAKES NO ASSUMPTION ABOUT HOW DATA IS DISTRIBUTED

INFERENTIAL STATISTICS – ERROR

- **TYPE I – FALSE POSITIVE, A**
- **TYPE II – FALSE NEGATIVE, B**

- **INFERENTIAL STATISTICS – POWER**

THE ABILITY TO DETECT A DIFFERENCE BETWEEN TWO DIFFERENT HYPOTHESES POWER DEPENDS ON:

- *SAMPLE SIZE*
- *STANDARD DEVIATION*
- *SIZE OF THE DIFFERENCE YOU WANT TO DETECT*

EFFECT SIZE

- DETECTABLE DIFFERENCE IN MEANS / STANDARD DEVIATION
- DIMENSIONLESS
- ~ 0.2 – SMALL (LOW POWER)
- 0.5 – medium
- ~ 0.8 – large (powerful test)

INFERENTIAL STATISTICS – T-TEST

- ARE THE MEANS OF TWO GROUPS DIFFERENT?

- GROUPS ASSUMED TO BE NORMALLY DISTRIBUTED AND OF SIMILAR SIZE.

ANOVA

COMPARES THE MEANS OF 3 OR MORE GROUPS

FOUR BASIC ASSUMPTIONS

- 1. NORMALITY OF DISTRIBUTION
- 2. HOMOGENEITY OF VARIANCE
- 3. RANDOM SAMPLING

Post-Hoc Test

CHI-SQUARE TEST

ASSUMPTIONS:

- OBSERVATIONS ARE INDEPENDENT
- CATEGORIES DO NOT OVERLAP
- MOST EXPECTED COUNTS > 5 AND NONE < 1
- SENSITIVE TO THE NUMBER OF OBSERVATIONS

MULTIVARIATE ANALYSIS OF VARIANCE

MANOVA allows you to look at differences between variables as well as group differences.

- **ASSUMPTIONS ARE THE SAME AS ANOVA**
- **ADDITIONAL CONDITION OF MULTIVARIATE NORMALITY**
- **ASSUMES EQUAL COVARIANCE MATRICES (STANDARD DEVIATIONS BETWEEN VARIABLES SHOULD BE SIMILAR).**

NON-PARAMETRIC STATISTICS

- MAKES NO ASSUMPTIONS ABOUT THE POPULATION FROM WHICH THE SAMPLES ARE SELECTED.
- USED FOR THE ANALYSIS OF DISCRET DATA SETS.
- AND ALSO USED WHEN DATA DOES NOT MEET THE ASSUMPTIONS FOR A PARAMETRIC ANALYSIS (SMALL DATA).

Thank You