MDM4U **CRITICAL ANALYSIS** **Date: _____**

Whenever you are presented with statistical information, it is useful to have a list of questions ready to help you judge the reliability of the statistics. This is not to suggest that there are problems with the data, but rather to help you gain confidence in questioning the reliability of the data.

The following are just some of the questions you should ask when presented with statistical information. Remember that if the source cannot provide you with answers or explanations, then you should question how sound the data really are.

- Who is the author (source) of the information?
- Is the source primary (i.e., the organization that collected the data) or secondary (an outside analyst or organization)?
- Does the primary source of information have a reason for misrepresenting the information?
- If the information is derived from a secondary source, is it possible that the data might have been altered for any reason?
- Is it necessary to find out the method of data collection, sampling technique or response rate to the survey?
- If the information is taken from a sample survey, do you think the sample size was adequate? What is the level of sampling error?
- Were the survey questions easy to understand?
- Do you understand the definitions of variables or topics discussed in the survey or census?
- Are the definitions consistent?

Common Mistakes Committed In Interpretation of Statistics

1. Bias: - Bias means prejudgment or preference of the investigator, which creeps in consciously and unconsciously in proving a particular point.
2. Generalization: - Some times on the basis of little data available one could jump to a conclusion, which leads to erroneous results.
3. Wrong conclusion: - The characteristics of a group if attached to an individual member of that group, may lead us to draw absurd conclusions.
4. Incomplete classification: - If we fail to give a complete classification, the influence of various factors may not be properly understood.
5. There may be a wrong use of percentages.
6. Technical mistakes may also occur.
7. An inconsistency in definition can even exist.
8. Wrong causal inferences may sometimes be drawn.
9. There may also be a misuse of correlation.

Distrust of Statistics

It is often said by people that, **"statistics can prove anything"**. **There are three types of lies - lies, damned lies and statistics**. A Paris banker said, **"Statistics is like a miniskirt, it covers up essentials but gives you the ideas."**

Thus by "distrust of statistics" we mean lack of confidence in statistical statements and methods. The following reasons account for such views about statistics.

1. Figures are convincing and, therefore people easily believe them.
2. They can be manipulated in such a manner as to establish foregone conclusions.
3. The wrong representation of even correct figures can mislead a reader. For example, Tam earned $ 4000 in 1990 - 1991 and Stev earned $ 5000. Reading this one would form the opinion that Stev is decidedly a better worker than Tam. However if we carefully examine the statement, we might reach a different conclusion as Stev's earning period is unknown to us. Thus while working with statistics one should not only avoid outright falsehoods but be alert to detect possible distortion of the truth.

Misleading Statistics

Graphs and charts frequently accompany articles in newspapers and magazines and are often used in advertising brochures. As consumers, we should examine these carefully because data displays and pseudo-statistics can be misleading.

In statistics, a misleading graph, also known as a distorted graph, is a graph which misrepresents data, constituting a misuse of statistics and with the result that an incorrect conclusion may be derived from it. Graphs may be misleading through being excessively complex or poorly constructed. Even when well-constructed to accurately display the characteristics of their data, graphs can be subject to different interpretation.

There are numerous ways in which a misleading graph may be constructed.

1. Excessive usage
   - use of graphs where they are not needed can lead to unnecessary confusion or interpretation
2. Biased labelling
3. Pie chart
   - Comparing pie charts of different sizes could be misleading as people cannot accurately read the comparative area of circles.
   - The usage of thin slices which are hard to discern may be difficult to interpret.
   - The usage of percentages as labels on a pie chart can be misleading when the sample size is small.
   - Making a pie chart 3D or adding a slant will make interpretation difficult due distorted effect of perspective.
   - Bar-charted pie graphs in which the height of the slices is varied may confuse the reader
4. Improper scaling
   - When using pictogram in bar graphs, they should not be scaled uniformly as this creates a perceptually misleading comparison
5. Truncated graph
6. Improper intervals/units