# Chapter Ten

Relationships Between Two Variables: Cross-tabulation

**Summary**

• Bivariate analysis is a statistical technique designed to detect and describe the relationship between two variables. A relationship is said to exist when certain values of one variable tend to “go together” with certain values of the other variable.

• A bivariate table displays the distribution of one variable across the categories of another variable. It is obtained by classifying cases based on their joint scores for two variables.

• Percentaging bivariate tables are used to examine the relationship between two variables that have been organized in a bivariate table. The percentages are always calculated within each category of the independent variable.

• Bivariate tables are interpreted by comparing percentages across different categories of the independent variable. A relationship is said to exist if the percentage distributions vary across the categories of the independent variable.

• Variables measured at the ordinal or interval-ratio levels may be positively or negatively associated. With a positive association, higher values of one variable correspond to higher values of the other variable. When there is a negative association between variables, higher values of one variable correspond to lower values of the other variable.

• Elaboration is a technique designed to clarify bivariate associations. It involves the introduction of control variables to interpret the links between the independent and dependent variables.

• In a spurious relationship, both the independent and dependent variables are influenced by a causally prior control variable, and there is no causal link between them.

• In an intervening relationship, the control variable follows the independent variable but precedes the dependent variable in the causal sequence.

• In a conditional relationship, the bivariate relationship between the independent and dependent variables is different in each of the partial tables.

**Outline**

* Cross-Tabulation
  + A technique for analyzing the relationship between two nominal or ordinal variables that have been organized in a table
  + One of the most common techniques used in the analysis of relationships between two variables
  + It is a type of bivariate analysis
* Independent and Dependent Variables
* How to Construct a Bivariate Table
  + A bivariate table displays the distribution of one variable across the categories of another variable
  + Usually, the independent variable is the column variable and the dependent variable is the row variable
  + The intersection of a row and a column is called a cell
  + The column and row totals are the frequency distribution for each variable
  + Row and column totals are called marginals
* How to Compute Percentages in a Bivariate Table
  + Calculate percentages within each category of the independent variable
  + Compare the percentage point difference for different categories of the independent variable
* How to Deal With Ambiguous Relationships Between Variables
  + When it isn’t apparent which variable is independent or dependent one might compute both row and column percentages
  + Ultimately what guides the construction and interpretation of bivariate tables is the theoretical question posed by the researcher
* Reading the Research Literature
  + Place of death in America
  + Most bivariate tables presented in the professional literature are complex
* The Properties of a Bivariate Relationship
  + The existence of the relationship
    - A relationship is said to exist between two variables in a bivariate table if the percentage distributions vary across the different categories of the independent variable
  + The strength of the relationship
    - Examine the percentage difference across the different categories of the independent variable
  + The direction of the relationship
    - A positive bivariate relationship exists when the variables vary in the same direction
    - A negative relationship is a bivariate relationship between two variables measured at the ordinal level or higher in which the variables vary in opposite directions
* Elaboration
  + Elaboration is a process designed to further explore a bivariate relationship, involving the introduction of additional variables, called control variables
    - A control variable is an additional variable considered in a bivariate relationship
    - The variable is controlled for when we take into account its effect on the variables in the bivariate relationship
  + Elaboration allows us to test for nonspuriousness
  + Elaboration clarifies the causal sequence of bivariate relationships by introducing variables hypothesized to intervene between the independent and dependent variables
  + Elaboration specifies the different conditions under which the original bivariate relationship might hold
* Testing for Nonspuriousness
  + A spurious relationship is a relationship between two variables in which both the independent and dependent variables are influenced by a causally prior control variable, and there is no causal link between them
  + The relationship between two variables is said to be a direct causal relationship when it cannot be accounted for by other theoretically relevant variables
  + If the bivariate relationship between the two variables remains about the same after controlling for the effect of one or more causally prior and theoretically relevant variables, then the original bivariate relationship is said to be a direct (causal relationship) association. On the other hand, if the original bivariate relationship decreases considerably (or vanishes), then the bivariate relationship is said to be spurious
* An Intervening Relationship
  + Religious affiliation and attitudes toward abortion
  + An intervening variable is a control variable that follows an independent variable but precedes the dependent variable in a causal sequence
  + An intervening relationship is one between two variables in which a control variable intervenes between the independent and dependent variables
* Conditional Relationships
  + More on abortion
  + When a bivariate relationship differs for different conditions of the control variable, we say that it is a conditional relationship
  + Another way to describe a conditional relationship is to say that there is a statistical interaction between the control variable and the independent variable
* The Limitations of Elaboration
  + Elaboration is a procedure that helps us “untangle” bivariate relations
  + Theory provides significant guidance as to the relationships that we look for and the sorts of variables that should be introduced as controls
* Statistics in Practice
  + Support for the transition from high school