

## PART IV

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# **ANALYZING STUDY RESULTS**



## CHAPTER 12

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### THE MAIN TECHNIQUES FOR ANALYZING SURVEYS AND THEIR ADVANTAGES AND DISADVANTAGES

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Four of the main techniques used to analyze surveys are frequencies, crosstabs, means, and graphs, which have the following advantages and disadvantages.

#### Frequencies

Frequencies involve counting the number of instances for each of the categories of each variable and finding the percentages for each category based on the number of people in the survey or the number answering a question. Frequencies can be used for individual or multiple variables and for both descriptive and evaluative research.

For example, in looking at gender, one might look at the percentage of the sample that are males and females; in looking at age, one might look at the percentage of people in each age group. Another example of using frequencies is determining the percentage of people choosing a particular action in a forced choice question.

The advantages of using frequencies is that this is a simple way to provide an overview of responses to a questionnaire. Also, the frequencies for the categories can be combined to create a cumulative percentage for variables when the categories can be grouped together, such as age groups or the amount someone has spent on something.

A disadvantage of using frequencies is that if there are multiple choices for different categories, the percentages will add to more than 100%, making it difficult to compare responses across samples. Another disadvantage is that responses to multiple questions will result in multiple frequency, percentage, and cumulative percentage charts, which can be unwieldy for presenting the data. Also, using frequencies doesn't work well when there are numerous categories for ordinal or Likert-type variables.

## Crosstabs

Crosstabs involve conducting a cross-tabulation of two or more variables to look at the relationship between those variables, an approach commonly used in explanatory and evaluative research. For example, one might do a cross-tabulation between a demographic variable, like age or gender, to see if different groups differ in their response to a question, such as if an activity appeals more to younger or older age groups or to men or women.

The choice of which total to use in percentaging a row or column depends on the data, based on which comparison one makes, such as if one compares the demographic breakdown for a particular activity or compares the activity preferences for members of a demographic group.

Besides doing a two-way cross-tabulation, one can use a three way cross-tabulation or create even more cross-tabulations, if the sample size is large enough. For example, one can look at the sex and age breakdown for different activities.

The advantage of using crosstabs is that one can compare differences between different groups, and the results can be used in explaining these differences. Crosstabs can also be used to compare how different user and customer groups respond in evaluative research.

The disadvantage of crosstabs is that this method can lead to creating a very large number of tables when there are multiple responses, due to the many ways the variables can be cross-tabulated with each other. Also, not all the crosstabs may be meaningful, although it may not

be clear which ones are meaningful until one has done the crosstabs. Another disadvantage is the number of items that can be cross-tabulated is limited if there is a small sample size.

## Means

Using means involves finding the mean or average for certain types of variables in all types of research – descriptive, explanatory, and evaluative. However, means can only be obtained for scales or ordinal data. It is not meaningful to find means for numerical codes for nominal variables.

The advantage of using a mean is that it can provide a single statistic, which can be used in comparing different responses, rather than looking at a frequency table, which shows the percentage of responses for different categories in ranking or rating something.

Using a mean can be problematic, however, if it has resulted from averaging widely different responses, such as when a large percentage of respondents strongly agree or strongly disagree with something. This result indicates a bimodal distribution, but using the average of the two disparate results would make it appear that the respondents have a neutral response, rather than a widely divergent one, since these differences are averaged together.

A mean is also a disadvantage when there are a few extreme cases, such as when a few people with a very high income skew the whole distribution, so the average income is much higher for everyone. In such cases, a median might be a more accurate statistic, since it more accurately reflects the middle point of the data.

## Graphs

Graphs are a way to present the results of an analysis in graphic form, such as a bar graph, stacked bar graph, pie chart, line graph, or scatterplot. The bar graph, also called a histogram, is one of the most common methods of presenting data in social research. It shows the number or percent of cases on one axis of the graph and the category being measured on the other.

If two variables are cross-tabulated with each other, these results can be shown on a stacked bar graph, in which one variable is shown in one color or pattern and the other variable is shown in another, so together they make up a total stack for each of the categories into which the variable is divided. An additional variable might be shown by two side by side stacks, such as for a study conducted in two cities or in two different years.

The advantage of using a graph is that it shows visually the count or percentage differences in the results for different variables, rather than just presenting the count or percentages in a table.

A disadvantage is that a graph can be misleading, depending on how it is drawn to show differences between groups. For example, if there is a great difference between groups, but the percentage categories on the side are shown close together, this might underplay the differences. Conversely, if there are only small differences, spacing the percentages far apart could make the differences seem greater than they are. It might also be hard to know the actual percentages unless they are written in or on top of the bars.

## Pie Charts

Pie charts are a type of graph which divide up the number, percentages of categories, or responses for a variable into the sections of a pie. The advantage of a pie chart is that it shows the relative size of the different responses when there is a meaningful total, such as 100%. However, a pie chart doesn't work well when there are multiple responses, so the total is greater than 100%.

# CHAPTER 13

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## THE MAJOR STATISTICAL CONCEPTS

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If you are going to do research in the leisure and social science field, the major statistical concepts are these:

### Probabilistic Statements

These are statements about a population which are drawn from the results of a sample; they can only be probable and not certain, because we can never know if a sample drawn from a population fully represents that population, since it is only a subset of that population. As a result, we can only estimate how probable it is that those statements really represent or are true of that population, using statistical measures to determine the probability.

The three types of probabilistic statements that can be made about a population based on a sample are descriptive, comparative, or relational statements.

- A descriptive statement is a general characterization of the results, such as stating that a certain percentage of a group engage in an activity.
- A comparative statement compares the results of one group to another, such as stating that a certain percentage of the members of one group participate in an activity while a different percentage of the members of another group participate in that activity.

- A relational statement refers to a relationship between being a member of one group and another group and having a certain characteristic or participating in a certain activity. For example, one might state that the members of one group are more likely to have a certain trait or participate in an activity compared to the members of another group.

## Normal Distribution

A normal distribution is the bell shape curve that results from drawing a repeated number of samples and plotting the results of each sampling, so that the population's percentage or average is in the middle of the distribution, while the sample's percentage or average is plotted on the curve and compared to the population's percentage or average. Then, depending on the size of the sample, a statement can be made about the probability that the statistic for the sample reflects the statistic for the population.

Commonly the 5% or 95% level is used in social and leisure research to indicate that something is significant at this confidence level, meaning that we are 95% sure that this sample statistic does reflect the statistic for the population, and there is a 5% chance that this result doesn't reflect the population's statistic. However, sometimes a higher significance level is used, showing an even greater confidence in the results, such as using a 1% or 99% level, if a very large sample is drawn in a study.

## Significance

This concept is the degree to which a difference or relationship observed in a research study is not likely to have occurred by chance. For example, the significance of a finding is assessed when two percentages or means from two groups are compared, such as if one compares males and females or members of different age groups on whether they participate in a certain activity. The greater the difference between these percentages or means, the more likely it is that these differences are significant and not just due to chance.

## Null Hypothesis

This is the hypothesis in a study which states that a difference or relationship is not significant, whereby the alternate hypothesis or a series of alternate hypotheses state that a difference or relationship is significant at the level of significance chosen for the study. To show there is a significant difference, a study is designed to disprove the null hypothesis of no significance in order to accept the alternative hypothesis that the research finding is significant at that level. If there is only a small difference between percentages or means, this indicates that the null hypothesis of no difference is probably correct at the study's level of significance.

## Independent and Dependent Variables

These are variables that are related to each other, in that the changes in the independent variable affect, influence, or cause changes in the dependent variable. For example, if income is positively related to participation in a sports activity, an increase in income will lead to greater participation in that activity; if income and participation are negatively related, an increase in income will lead to less participation in that activity.

## Correlation

This is a statistical approach of looking at the way in which two or more scale or ordinal variables relate to each other. If there is a systematic relationship between them, they are considered to be correlated. If they are positively correlated, the dependent variable will increase when the independent variable increases.

Conversely, if they are negatively correlated, the independent and dependent variables will increase or decrease in opposite directions. In other words, there is a negative correlation between the variables if the dependent variable increases when the independent variable decreases, or if the dependent variable decreases when the independent variable increases.

This relationship can be shown graphically on a scatterplot, in which a dot shows the relationship of two variables for each individual case or observation.

## CHAPTER 14

### THE MAJOR DATA ANALYSIS TECHNIQUES

The major data analysis techniques to use in social research are the following. Choose the appropriate one to use for your study.

#### Chi-Square Test

This test, signified by the symbol  $\chi^2$ , shows the relationship between two nominal variables, which describe something, such as one's gender or age. This test is designed to show if the relationship is significant or not by rejecting the null hypothesis of no difference at a certain level of confidence – commonly 95%. The Chi-Square test involves examining the counts or percentages in the cells of a table and comparing the actual counts with the expected counts, which would occur if there was no significant difference. For example, if one conducts a study with an equal number of people of two different ethnic groups about their participation in two activities, one would expect the same number of members in each group in each activity if there is no difference. However, if one activity is more popular with one group and the other activity is more popular with the other, the percentage interested in each activity would be significantly different.

In short, a Chi-Square test is done by summing up the differences between the actual counts or percentages and the expected counts or percentage to get the squared values of the differences. The larger the total, the bigger the Chi-square value, and the more likely there is a significant difference.

## T-Test

This test involves comparing two means to determine if the differences between them are significant, based on rejecting the null hypothesis of no difference and accepting the alternative hypothesis that there is a difference. For example, a T-test might look at the average income of people participating in different activities, such as playing golf versus going bowling, to see if the income of the two groups differs, which might be expected, since golf is an expensive sport while bowling is a relatively inexpensive one.

The T-test can be conducted as a paired samples test or an independent samples test. In the paired samples test, the means of two variables for everyone in the sample are compared, such as the amount of time spent on the Internet versus the amount of time watching TV. By contrast, in the independent samples test, the means of two subgroups in the sample are compared in relation to a single variable, such as the amount of time teens and parents spend on the Internet, to see if there are any differences between them.

## One-Way Analysis of Variance or an ANOVA Test

This test compares more than two means in a single test, such as comparing the means for males and females for a number of activities, such as how much time each group spends eating out, using the Internet, watching TV, going shopping or participating in sports. The test examines whether the mean for each variable in the test is different or the same compared to the overall mean, and therefore either significant (so the null hypothesis is rejected and the alternate hypothesis is accepted) or there is no difference (thereby affirming the null hypothesis).

The one-way test not only considers the differences between the means for the overall population and for the different subgroups, but it examines the differences between the means, which is called the “variance.” This variance is determined by summing the differences between the individual means and the overall mean to get the results,

which are interpreted in this way. The higher the variance between groups, the more likely there is a significant difference between the groups, whereas the higher the variance within groups, the less likely there is a significant difference between the groups. The F score represents the analysis of these two difference measures of variance to show the ratio between the between groups and the within groups variance.

In conducting this analysis, one needs to take into consideration the number of groups and the size of the samples, which determine the degrees of freedom for that particular test. The result of these calculations produces an F score. The lower the F score, the more likely there is a significant difference between the means of the groups.

### Factorial Analysis of Variance

This is another ANOVA test, which is based on analyzing the means of more than a single variable, such as examining the relationship between participation in an activity and the participants' gender and age. The test involves cross-tabulating the means of different groups to determine if they are significant by comparing the means of the groups and the degree of spread between the groups. The degrees of freedom are taken into consideration along with the sum of the squares to produce a square of the means and then an F score. The lower the score, the greater the likelihood of a significant difference between the group means.

### Correlation Coefficient (usually designated by "r")

This test shows the degree of correlation between two variables. The coefficient ranges from 0 when there is no correlation to +1 if the correlation between two variables is perfect and positive or -1 if the correlation is perfect and negative. The numbers between 0 and +1 or -1 indicate the degree of positive or negative correlation between the variables. The size of r is determined by calculating the mean for each variable and examining how far each point of data is on the x and y axis from the mean in a positive or negative direction. Then, one multiplies

the two differences, and takes into consideration the size of the sample to determine how significant r is at a predetermined level of significance (usually the 95% or 5% level).

## Linear Regression

This approach is used when there is a sufficiently consistent correlation between two variables, so that a researcher can predict one variable by knowing the other. To this end, a researcher creates a model of the relationship by developing an equation that describes this relationship. This equation is generally stated as  $y = a + bx$ , in which "a" is a constant, and "b" refers to the slope of the line that best indicates the fit or correlation between the two variables being measured.

## Non-Linear Regression

This refers to the relationships between two variables which do not have a linear relationship, so that a single straight line can't express their relationship. Such a non-linear regression might occur if there is a curved relationship, such as when there is a gradual growth of interest in an activity, followed by a spurt of enthusiasm, and then a plateau of interest. Another example might be a bimodal distribution, such as when interest in an activity peaks twice a year or experiences an up and down growth of interest. Still another example of a non-linear regression is a cycle relationship, which might occur when a spike of interest follows the introduction of a new program several times a year, followed by a decline in interest until a new program is introduced again.

## Factor Analysis

This method involves determining what variables might occur in combination with one another, such as if people who like to snorkel dive also like to surf and water ski, suggesting that an underlying factor for an interest in both activities might be an interest in water sports. A factor analysis can be done by using a correlation matrix to group

the variables together and see which ones have the largest correlation with one another.

### Cluster Analysis

This method involves grouping individuals together, such as by combining several income categories related to a particular variable (i.e., participating in an activity). Then, one seeks to create a smaller number of groups, such as having a low, medium, or high income, that show a similar pattern of relationship to that variable. The analysis is done by combining the data points which are closest together into a cluster and repeating the process to combine previously formed clusters until there are only a few or even just two clusters. The result of this process is a dendrogram, which looks like a series of elimination rounds from quarter finalists to semifinalists to finalists in a competition, though in this case the repeated clustering selects the key meaningful divisions for a particular variable.

## **CHAPTER 15**

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### **THE EASIEST METHOD FOR SOCIAL RESEARCH**

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The easiest to use statistical method for social researchers, particularly if a quick analysis is needed to make a decision, is the Chi-Square test, since it looks at a cross-tabulation of frequencies to determine the relationship between two nominal variables. This method is most useful for general research findings. While accuracy is necessary, a high level of precision is not needed.

Another reason a Chi-square test would be especially useful is that questionnaires are often used to determine the number of people from different groups participating in different activities or their preferences for different services, products, or activities. For example, a recreation center manager might want to find out which activities are most popular among males and females to decide which activities to offer in an upcoming program, as well as how to best promote these activities to the most likely participants. To this end, the questionnaire might ask a sample of males and females which activities on a list they would prefer to participate in. A cross-tabulation would then show the count of the males and females selecting a particular activity, and the researcher could determine the percentage of males and females selecting each option. A Chi-square test would show if there were significant differences between the males and females in their preferences. If so, the recreation manager might target certain activities to males and others to females, or if there were no significant differences, the recreation manager might promote this as an activity for both.

However, while the Chi-square and other statistical tests might be used to determine the significance of any differences, commonly the managers of organizations in many fields, such as recreation and tourism, don't use statistical tests, even for a survey with scale and ordinal data, since much of the research in the field is descriptive.

The test has some weaknesses, however. It can only be used with two variables which are cross-tabulated with each other, so one can't look at the interaction between variables. For instance, if one wants to look at the relationship between age and gender on participating in a particular activity, one can't do so in a single test. One would have to look at the relationship between age and an activity in one table, and the relationship between gender and that activity in another. Likewise, if one wants to look at the relationship between participating in an activity, distance from the location, and gender, one can't use a single table. Instead, one would have to create different tables for each crosstab.

Another weakness is the Chi-square test can only be used with nominal data based on the count or percentage in different categories of a variable. It cannot be used with scale or ordinal data that has been combined to create a summary result, such as an average, mean, or a median, like the median income of individuals participating in different activities.

Another weakness of the Chi-square test is that it can be easier to make comparisons for multiple categories by using summary data, rather than breaking down the data by cell counts and percentages. For instance, to look at preferences for a number of different programs, it would be easier to look at a mean showing the preference for each program for each group in a single table, rather than having separate cross-tabs to show the preferences of males and females or of individuals with different backgrounds. It would then be easier to make a decision about how to offer the different activities, programs, or services based on this summary data rather than looking at numerous crosstabs with percentage or count breakdowns.

## References

- "The Impact of Participation in an Inclusive Adventure Education Trip on Group Dynamics" by Sue Sutherland and Sandra Stroot in the *Journal of Leisure Research*, 2010, Vol. 42, No. 1, pp. 153-176.
- "You don't want to hurt his feelings...": Family Leisure as a Context for Intergenerational Ambivalence," by Shannon Hebblewaite and Joan E. Norris in the *Journal of Leisure Research*, 2010, 42, No. 1, pp. 489-508.