**Chapter 2 – Organizing and Summarizing Data**

**OUTLINE**

* 1. Organizing Qualitative Data
  2. Organizing Quantitative Data: The Popular Displays
  3. Additional Displays of Quantitative Data
  4. Graphical Misrepresentations of Data

**Putting It Together**

Chapter 1 discussed how to identify the research objective and collect data. We learned that data can be obtained from either observational studies or designed experiments. When data are obtained, they are referred to as **raw data**.

The purpose of this chapter is to learn how to organize raw data into a meaningful form so that we can understand what the data are telling us. The first step in determining how to organize raw data is to determine whether the data is qualitative or quantitative.

**Section 2.1 Organizing Qualitative Data**

**Objectives**

1. Organize Qualitative Data in Tables
2. Construct Bar Graphs
3. Construct Pie Charts

***Objective 1: Organize Qualitative Data in Tables***

Objective 1, Page 1

1. What is used to list each category of data and the number of occurrences for each category of data?

Objective 1, Page 2

**Example 1 *Organizing Qualitative Data into a Frequency Distribution***

A physical therapist wants to determine types of rehabilitation required by her patients. To do so, she obtains a simple random sample of 30 of her patients and records the body part requiring rehabilitation. (See Table 1.) Construct a frequency distribution of location of injury.

**Table 1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Back | Back | Hand | Wrist | Back | Back |
| Groin | Elbow | Back | Back | Back | Groin |
| Shoulder | Shoulder | Hip | Knee | Hip | Shoulder |
| Neck | Knee | Knee | Shoulder | Shoulder | Neck |
| Back | Back | Back | Back | Knee | Back |

Data from Krystal Catton, student at Joliet Junior College

OBJECTIVE 1, PAGE 3

1. In any frequency distribution, it is a good idea to add up the frequency column. What should the total be equal to?

Objective 1, Page 6

1. Define the relative frequency of a category.
2. What is a relative frequency distribution?

Objective 1, Page 7

**Example 2 *Constructing a Relative Frequency Distribution of Qualitative Data***

Using the summarized data in Table 2, construct a relative frequency distribution.

**Table 2**

| **Body Part** | **Frequency** |
| --- | --- |
| Back | 12 |
| Hand | 2 |
| Wrist | 2 |
| Groin | 1 |
| Elbow | 1 |
| Shoulder | 4 |
| Hip | 2 |
| Knee | 5 |
| Neck | 1 |

Objective 1, Page 8

1. When working with a relative frequency distribution, what should the total of the relative frequencies be equal to? Why?

***Objective 2: Construct Bar Graphs***

Objective 2, Page 1

1. Explain how a bar graph is constructed. What do the heights of each rectangle represent?

Objective 2, Page 2

**Example 3 *Constructing a Frequency and Relative Frequency Bar Graph***

Use the data summarized in Table 3 to construct a frequency bar graph and relative frequency bar graph.

**Table 3**

| **Body Part** | **Frequency** | **Relative Frequency** |
| --- | --- | --- |
| Back | 12 | 0.4 |
| Hand | 2 | 0.0667 |
| Wrist | 2 | 0.0667 |
| Groin | 1 | 0.0333 |
| Elbow | 1 | 0.0333 |
| Shoulder | 4 | 0.1333 |
| Hip | 2 | 0.0667 |
| Knee | 5 | 0.1667 |
| Neck | 1 | 0.0333 |

Objective 2, Page 4

1. What is a Pareto chart?

Objective 2, Page 5

1. Explain why it is best to use relative frequencies when comparing data sets.

Objective 2, Page 6

**Example 4 *Comparing Two Data Sets***

The frequency data in Table 4 represent the educational attainment (level of education) in 1990 and 2016 of adults 25 years and older who are U.S. residents. The data are in thousands. So 39,344 represents 39,344,000.

**Table 4**

| **Educational Attainment** | **1990** | **2016** |
| --- | --- | --- |
| Not a high school graduate | 39,344 | 23,453 |
| High school diploma | 47,643 | 62,002 |
| Some college, no degree | 29,780 | 36,003 |
| Associate’s degree | 9792 | 21,657 |
| Bachelor’s degree | 20,833 | 44,778 |
| Graduate or professional degree | 11,478 | 27,122 |
| Totals | 158,870 | 215,015 |

1. Draw a side-by-side relative frequency bar graph of the data.

OBJECTIVE 2, PAGE 6 (CONTINUED)

1. The side-by-side relative frequency bar graph shows additional information that was not easy to identify from the frequency table in Table 4. Comment on the interesting features of the side-by-side relative frequency bar graph.

Objective 2, Page 8

1. Explain when it would be preferable to use horizontal bars rather than vertical bars when constructing a bar graph.

***Objective 3: Construct Pie Charts***

Objective 3, Page 1

1. What is a pie chart?

OBJECTIVE 3, PAGE 2

**Example 5 *Constructing a Pie Chart***

The frequency data presented in Table 6 represent the educational attainment of U.S. residents 25 years and older in 2016. The data are in thousands so 23,453 represents 23,453,000. Construct a pie chart of the data.

**Table.6**

| **Educational Attainment** | **2016** |
| --- | --- |
| Not a high school graduate | 23,453 |
| Some college, no degree | 36,003 |
| Associate's degree | 21,657 |
| Bachelor's degree | 44,778 |
| Graduate or professional degree | 27,122 |
| Totals | 215,015 |

Objective 3, Page 5

*Answer the following after watching the video.*

1. Which graph, a pie chart or a bar graph, is better at comparing one category to another category?
2. Which graph, a pie chart or a bar graph, is better at comparing one category to the whole?