

## CHAPTER 2

### MEASUREMENT

#### Objectives

This chapter is intended to present the fundamentals of measurement in the social sciences as applied to public administration. The major objective is to acquaint students with the concepts of the validity and reliability of an indicator and to point out the distinctions in levels of measurement of variables and their implications for quantitative description and analysis.

#### Major Points

Measurement is the assignment of numbers or category labels (for example, 'disagree', 'neutral', 'agree', or 'female', 'male') to a phenomenon. In public and nonprofit management we have three levels of measurement--interval, ordinal, and nominal. The level of measurement determines what statistics can be calculated. The two key issues in measurement are reliability (the stability of scores, for example, if we measure a phenomenon twice, will we get the same value?) and validity (are we measuring what we think we are measuring?).

#### Difficult Points

Students sometimes have trouble interpreting nominal level variables. For example, if gender is coded as a dummy variable (1=male, 2=female), some students may think that since 2 is greater than 1, the values for females are substantively "larger" than those for males. Similar problems are encountered with the interpretation of ordinal level variables. Asking students to interpret examples of nominal and ordinal variables is helpful.

Students may also wonder how to choose the numbers to represent nominal or ordinal variables. You may want to emphasize that when coding a nominal and ordinal variables, there is no inherently "correct" numbering scheme. A nominal variable does not have to be coded as "0 or 1" or "1 or 2." These are simply easy to remember and logical starting points. Similarly, if students are coding an ordinal variable with 5 categories, there is no one "correct" set of numbers for the category labels. "Zero through 4," "1 through 5," or "10 through 14" would all be fine. The main point to get across is that each category needs to have a different number, but the initial numbers selected are the choice of the analyst.

Aside from difficulties with nominal and ordinal variables, this chapter is largely substantive, as opposed to statistical, in orientation and generally raises few difficulties for students. Distinguishing validity from reliability can be a problem. In sum, this chapter is one of the easiest in the text for students to understand.

#### Answers to Computational Problems

Given the nature and content of the chapter, it does not present many computational problems for students. Answers are provided only for problems 2.9 through 2.12.

2.9 A unique number should be selected to represent each category. Since there are 4 categories, numbering the categories 1 through 4 is logical, but other numbers are acceptable.

1=Friend  
2=Silver  
3=Gold  
4=Platinum

Interval version	Ordinal version	
\$25		1
\$150		2
\$75		1
\$450		3
\$100		2
\$750		4
\$90		1
\$175		2
\$250		3
\$50		1

2.10 Establish a coding scheme for each variable. Since the choice of numbers used to label each category is up to the student or instructor, the version presented here is just one of many possible variations.

Gender  
1=male  
2=female

Delivery of meals  
0=no  
1=yes

Assistance with transportation

1=Never  
2=Rarely  
3=Frequently

Since there is an inherent ranking, assistance with transportation is an ordinal level variable.

Apply the above numbers to the table. Ask the students to explain in words what the numbers for each client mean. Using the coding scheme above, the row of data for first client has values of 1, 1,1. Substantively, this means the first client is male, utilizes meal delivery, and never requires assistance with transportation.

You might even suggest that students write the appropriate numbers directly onto the table to help them remember what the numbers for each observation represent in words.

2.11 Translating the numbers into words yields the following results for each employee

Employee 1: female, full-time, and professional.  
2: male, full-time, general labor

- 3: female, part-time, administrative
- 4: male, full-time, administrative
- 5: female, part-time, professional
- 6: female, part-time, professional
- 7: male, part-time, general labor
- 8: female, full-time, general labor

2.12 Create a coding scheme for each variable

Received shot

- 1=yes
- 2=no

Took Sick leave

- 0=no
- 1=yes

Received Shot	Took Sick Leave
1	0
2	1
2	1
1	0
1	1
1	0
2	0
1	0
1	0
2	1

Examination Questions and Answers

2.1 Choose several concepts which can be measured at the three different levels of measurement. Provide operational definitions for measuring the concept at each level. Discuss the information gained as one moves up the hierarchy of measurement with respect to each of these concepts. How valid and reliable are the indicators you have developed? What are their relative strengths and limitations? If you are designing a quantitative study or evaluation, at what level of measurement would you attempt to operationalize the important concepts? Discuss.

Answer

Open-ended.

2.2 Select a concept of interest in public or nonprofit administration. Provide a substantive definition for the concept. Develop three measures of the concept which are both valid and reliable. Explain how you would establish that the measures are valid and reliable.

Answer

Open-ended.

2.3 A researcher is conducting a study of the philanthropic purposes achieved by nonprofit organizations in the city of Mercantile, PA. She has identified a random sample of nonprofit organizations in the city, and is preparing to collect data from them. As measures of the philanthropic purposes achieved by each nonprofit organization in the sample she plans to use: (1) the organization's statement of purpose in its charter or bylaws, and (2) the goals of the organization as stated in its mission or vision statement. Evaluate the researcher's proposed measures of the philanthropic purposes achieved by nonprofit organizations. Consider both the validity and the reliability of the measures. Develop additional measures that you think would offer improvement over the ones she plans to use. Explain why you think the new measures would be an improvement.

Answer

Open-ended.

