Essentials of Statistics 4th edition Healey Test Bank

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Chapter 2
BASIC DESCRIPTIVE STATISTICS
Percentages, ratios & rates, tables, charts & graphs

New to This Edition

- Reorganized chapter and moved Frequency Distributions to the front
- Deleted old Tables 2.1, 2.5, 2.6. 2.7, 2.8, 2.9, 2.10, 2.19, section on "Frequency Distributions for I-R Variables: An Example," and old Figures 2.2, 2.3, 2.4, 2.5, 2.6, and 2.7
- Added new Tables 2.1, 2.2, 2.3, 2.4, 2.7, 2.8 and new Figures 2.2, 2.3, 2.4 (voter turnout)
- Moved section on "guidelines on the use of percentages and proportions" to a boxed insert
- Updated "Statistics in Everyday Life: Traffic Fatalities," Table 2.14 "Income in the US,""Statistics in Everyday Life: Marriage and Divorce," Table on "Projected Population Growth," "Statistics in Everyday Life: Marriage and Divorce," and Problem 2.4
- Divided "Becoming a Critical Consumer" box into three, smaller boxes
    - "Lying with Statistics" New example
    - "Tricks with Graphs" New example
    - "Statistics in the Professional Literature" New example
- Changed Figure 2.1 to religion
- Changed Problem 2.2

Learning Objectives. By the end of this chapter, students will be able to

1. Explain how descriptive statistics can make data understandable.
2. Construct and analyze frequency distributions for variables at each of the three levels of measurement.
3. Compute and interpret percentages, proportions, ratios, rates, and percentage change.
4. Analyze bar and pie charts, histograms, and line graphs.
5. Use SPSS to generate frequency distributions and analyze the output.

Chapter Summary

This chapter covers relatively simple descriptive devices: frequency distributions, percentages and proportions, ratios, rates, percent change, pie and bar charts, histograms, and line charts. The emphasis is on frequency distributions and the construction and interpretation of these tables for variables measured at each of the three different levels. Instructors may want to supplement this material with additional examples of each technique and/or graphs and charts, especially those created by software such as Microsoft Excel.

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The underlying 'theme' of this chapter is the need to present results clearly; to communicate results accurately and concisely but without losing too much detail. The problems used in the section are intended to contrast the anarchy of raw, unorganized data with the clarity and simplicity of frequency distributions and various graphs.

Multiple Choice Questions

1. The purpose of univariate descriptive statistics is to
   a. summarize relationships between many variables
   b. display the essential meaning of variables measured at the interval-ratio level
   c. combine nominal and ordinal variables
   d. summarize a single variable

   Answer: d Page: 24

2. Frequency distributions may be compiled for variables measured at which level?
   a. nominal
   b. ordinal
   c. interval-ratio
   d. all of the above

   Answer: d Page: 25

3. To calculate a proportion, the number of cases in any category (f) is divided by
   a. the total number of categories (k)
   b. the number of cases in all categories (N)
   c. the cases in that category (f)
   d. the number of cases in adjacent categories (k-1)

   Answer: b Page: 28

4. Which of the following is an impossible value for a percentage?
   a. 0.0%
   b. 47.458923%
   c. 110.00%
   d. 0.05%

   Answer: c Page: 26

5. Forty of every two hundred students attend all of their classes. What percentage of the student body is this?
   a. 5%
   b. 50%
   c. 2%
   d. 20%

   Answer: d Page: 26

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6. Twenty-three of the 50 states rejected a proposed constitutional amendment to make the house fly the National Insect. What percentage is this?
    a. 23%
    b. 25%
    c. 46%
    d. 54%

    Answer: c Page: 26

7. To be converted to a percentage, the proportion must be multiplied by
    a. 10
    b. 100
    c. 1000
    d. any of the above

    Answer: b Page: 28

8. The sum of the proportions for all categories of a variable will be
    a. 100.00
    b. 10.00
    c. 1.00
    d. 0.10

    Answer: c Page: 27

9. When working with a very small number of cases, it is usually preferable to report
    a. percentages
    b. proportions
    c. fractions
    d. actual frequencies

    Answer: d Page: 29

10. The class intervals below represent ages of young adult respondents. Which set of intervals is both exhaustive and mutually exclusive?
    a. 18-19
       19-20
       20-21
    b. 18-19
       20-21
       22-23
    c. 18-20
       22-24
       26-28
    d. 18-19
       21-22
       24-25

    Answer: b Page: 32

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11. The midpoints of intervals for frequency distributions constructed with interval-ratio variables are found by
    a. adding the upper and lower class limits for each interval and then dividing by 2.
    b. multiplying the upper and lower class limits for each interval
    c. dividing the range by 10
    d. None of the above. Class intervals for interval-ratio variables do not have midpoints.

    Answer: a Page: 33

12. Cumulative frequencies and cumulative percentages allow a researcher to
    a. be sure the column totals are correct
    b. tell at a glance how many cases fall above or below a given category
    c. show the accuracy of his or her findings
    d. all of the above

    Answer: b Page: 34

13. If 60 cases range in score from 4 to 84 and you want 10 intervals in a frequency distribution, approximately what will be the width of each interval?
    a. 4
    b. 8
    c. 12
    d. 60

    Answer: b Page: 37

14. When constructing frequency distributions for variables measured at the interval-ratio level, approximate interval size (or interval width) can be found by
    a. dividing sample size (N) by 10
    b. multiplying the number of categories by the lowest score
    c. dividing the range by the sample size (N)
    d. dividing the range (R) by the number of categories (k)

    Answer: d Page: 37

TABLE 1 AGES OF RESPONDENTS		
Class Intervals	Frequency	Percentages
18-23	5	
24-29	21	
30-40	10	
TOTAL	36	

15. A possible problem with Table 1 is that
    a. class intervals overlap
    b. class intervals are too large
    c. class intervals are unequal in size
    d. class intervals are exhaustive

    Answer: c Page: 37

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16. In Table 1, what percentage of cases is in the 18-23 age group?
    a. (5/36) x 100 = 13.51%
    b. (18/23) x 100 = 78.26%
    c. c. (36/ 5) x 100 = 7.4%
    d. (5/21) x 100 = 23.81%
    Answer: a Page: 26

17. In Table 1, what is the ratio of 30-40 year olds to 18-23 year olds?
    a. 0.24:1.00
    b. 4.20:1.00
    c. 2.00:1.00
    d. 1.00:1.00
    Answer: c Page: 41

18. In Table 1, what proportion of cases are 18-23?
    a. 0.05
    b. 0.36
    c. 0.78
    d. 0.13
    Answer: d Page: 27

19. If we added a cumulative percentage column to Table 1 and began our calculations with the 18-23 interval, the entry in the 30-40 interval would be
    a. 10%
    b. 33.3%
    c. 37%
    d. 100%
    Answer: d Page: 34

20. A frequency distribution should reflect a balance of
    a. detail and conciseness
    b. time and money
    c. questions and answers
    d. elegance and symmetry
    Answer: a Page: 37

21. As a very general rule, frequency distributions should have ___ categories.
    a. less than 5
    b. more than 20
    c. no more than 5
    d. about 10
    Answer: d Page: 37

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22. Open-ended intervals
    a. are always preferable to unequal intervals
    b. should never be used in actual research
    c. can be useful when there are a few very high or very low scores in a distribution
    d. should only be used with ordinal-level variables

    Answer: c Page: 35

23. A possible problem with open-ended or unequal intervals is that they
    a. do not permit the computation of midpoints
    b. are useful only for nominal-level variables
    c. can be used only with variables that have few scores
    d. cannot be used for interval-ratio level variables

    Answer: a Page: 35

24. In reading SPSS output for the Frequencies procedure, we usually ignore the 'Percent' column because it
    a. includes "missing" scores
    b. excludes scores labeled DK and NA
    c. is appropriate only for nominal-level variables
    d. is based on cumulative percentages

    Answer: a Page: 40

25. The ratio of men to women in a karate class is 3.3:1. If there are 100 women, how many men are there?
    a. 33
    b. 66
    c. 133
    d. 330

    Answer: d Page: 41

26. A class has 20 men and 10 women. The ratio of women to men is
    a. 2 to 1
    b. 1 to 2
    c. 20%
    d. .2

    Answer: b Page: 41

27. To find the ratio of smokers to non-smokers, you would
    a. divide the number of non-smokers by the number of smokers
    b. add them together and divide by the number of smokers
    c. divide the number of smokers by the number of non-smokers
    d. multiply the number of smokers by the total number of people

    Answer: c Page: 41

TABLE 2 POLITICAL PARTY MEMBERSHIP IN TWO COMMUNITIES		
PARTY:	COMMUNITY A	COMMUNITY B

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Republican	103	17
Democrats	135	21
Independent	17	15
Socialists	9	11
TOTALS:	264	64

28. In Table 2, what percentage of Community A are Republicans?
    a. (103/264) x 100 = 39.02
    b. (103/17) x 100 = 605.88
    c. (264/328) x 100 = 80.49
    d. (103/135) x 100 = 76.30
    Answer: a Page: 26

29. In Table 2, what is the ratio of Socialists to Democrats in Community B?
    a. 11:21
    b. 11:64
    c. 64:11
    d. 9:11
    Answer: a Page: 41

30. In Table 2, which is the correct fraction for determining the proportion of Independents in community B?
    a. 15/17
    b. 15/264
    c. 64/15
    d. 15/64
    Answer: d Page: 27

31. In Table 2, which community has the higher proportion of Independents?
    a. Community A
    b. Community B
    c. Neither
    d. This proportion can't be determined from the information given.
    Answer: b Page: 27

32. In Table 2, what percentage of Democrats lives in community B?
    a. (21 / 64) x 100 = 32.8
    b. (21/328) x 100 = 6.4
    c. (21/156) x 100 = 13.5
    d. (64/264) x 100 = 24.2
    Answer: c Page: 26

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33. In Table 2, what is the ratio of Independents to Socialists in Community A?
    a. 15:11
    b. 17:9
    c. 9:17
    d. 17:264
    Answer: b Page: 41

34. The crude birth rate of a city that has 250 births in a year and a population of 7500 would be found by using which of the following?
    a. crude birth rate = (250/7500) x 1000
    b. crude birth rate = 7500/250
    c. crude birth rate = (1000/7500) x 250
    d. crude birth rate = (250/1000) x 7500
    Answer: a Page: 42

35. The homicide rate for a city is reported as 23.89. This means that
    a. for every homicide, there were 23.89 victims
    b. For every 100,000 people in the population there were 23.89 homicides
    c. The homicide rate is rising
    d. There was an average of 23.89 homicides each month
    Answer: b Page: 42

36. A city of 1567 people had 34 auto thefts last year. The auto theft rate for this city
    a. cannot be determined from the information given
    b. is falling
    c. is (34/1567) x 100,000
    d. is (100,000 x 1567)/34
    Answer: c Page: 42

37. City A (population = 1567 people) had 34 auto thefts last year. City B (population = 34,567) had 40 auto thefts in the same time period and City C (population = 156,980) had 70 auto thefts. Which city had the highest RATE of auto theft?
    a. City A
    b. City B
    c. City C
    d. More information is needed to answer this question.
    Answer: a Page: 42

38. A small town of 1,709 residents had one homicide in the past year. The homicide rate for this town
    a. cannot be determined from the information given
    b. is (1/1709) x 100,000
    c. is rising
    d. is (1709:1) x 1,000
    Answer: b Page: 42

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39. Proportions and percentages, ratios and rates are all ways of expressing
    a. concise distributions of a variable
    b. data without leaving out any details
    c. relative frequencies
    d. raw frequencies

Answer: c Page: 40

40. According to the text book, the rate of traffic fatalities in the United States
    a. fell between 1994 and 2011
    b. rose dramatically between 1994 and 2011
    c. rose between 1980 and 2000 and then fell
    d. fell between 1980 and 2000 and then rose

Answer: a Page: 45

41. A nation had a birth rate of 20 in 1990. The rate fell to 13 in 2010. What was the percentage change?
    a. $\left(\frac{20-13}{20}\right)\times 100 = 35\%$
    b. $\left(\frac{20-13}{13}\right)\times 100 = 54\%$
    c. $\left(\frac{13-20}{20}\right)\times 100 = -35\%$
    d. $\left(\frac{13-20}{13}\right)\times 100 = -54\%$

Answer: c Page: 43

42. A police department reports that the number of reported rapes in their jurisdiction increased by 100% over the past decade. This means that the number of reported rapes today is
    a. double the number 10 years ago
    b. actually about the same as 10 years ago
    c. equal to the number 10 years ago plus 50%
    d. triple the number 10 years ago

Answer: a Page: 43

43. Pie charts show the frequency distribution of
    a. one variable
    b. two variables
    c. three or more variables
    d. any of the above

Answer: a Page: 46

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44. For a single variable measured at the nominal level, an appropriate graph would be a
    a. pie chart
    b. histogram
    c. frequency polygon
    d. bivariate table

Answer: a Page: 46

45. Histograms and line charts or frequency polygons are used with data measured at the
    a. nominal level
    b. ordinal level
    c. interval-ratio level
    d. any level

Answer: c Page: 48-49

46. For a single variable at the interval-ratio level, an appropriate graph would be
    a. a pie chart
    b. a histogram
    c. a bivariate table
    d. none of the above. Graphs are never used for interval-ratio level variables

Answer: b Page: 48

47. A line chart or frequency polygon is based on
    a. the upper limits of each interval
    b. the lower limits of each interval
    c. the midpoint of each interval
    d. any limit which the researcher selects

Answer: c Page: 49

48. A researcher wants to visually display the U.S. divorce rate (an interval-ratio level variable) for the last 50 years. An appropriate format would be
    a. a line chart or histogram
    b. only a histogram would work in this situation
    c. a pie chart
    d. none of the above. Data in the form of rate should never be displayed in a chart or graph.

Answer: a Page: 48-49

49. According to information presented in the text, the US divorce rate
    a. has generally fallen since the early 1980s
    b. has been rising steadily since the 1950s
    c. has been basically unchangedsince the 1970s
    d. rose until the 1990s and then began to fall sharply

Answer: a Page: 50

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50. According to the report discussed in the text, about what percentage of high school students have used cigarettes, alcohol, marijuana, or cocaine at least once?
    a. 100%
    b. 75%
    c. 25%
    d. 10%

Answer: b Page: 54

Problems and Essay Questions

1. You are the Dean of students at a college and the President has asked for some information about how the student body has changed over the years. You have collected the following information regarding the number of students in various categories for two different graduating classes:

CHARACTERISTICS OF TWO GRADUATING CLASSES		
	1990	2010
Total in class	345	687
Females	178	301
Married	48	117
Humanities Majors	115	258
Going to Graduate School	78	159
Attended Commencement	99	458
Finished in 4 years	269	325
Received financial aid	159	369

What will you say to the president when she asks:

a. What percentage of the graduating class was female in 1990?_____ 2010?_____
b. What percentage of the glass was going to graduate school in 2010? _____
   Has this percentage gone up or down since 1990 and by how much? (Hint: Compute the percentage change to measure the amount of change between the two times)_____
c. What proportion of the graduating class attended the commencement ceremony in 2010?_____
   Has this proportion gone up or down since 1990 and by how much? _____
d. What proportion of the class majored in the humanities in 1990?_____ 2010?_____
e. What percent of students received financial aid in 1990?_____ 2010?_____
f. Relatively speaking, how many student finished in just four years in 1990?_____ 2010? _____ How has this percentage changed between the two years?_____
g. What proportion of students were married in 1990? _____ 2010? _____
h. Write a paragraph describing the changes in the graduating classes of 1990 and 2010. What changes seem especially important? Why?

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Answers to Problem 1:

	1990	2010	
a.	51.59%	43.81%	
b.	22.61%	23.14%	The percentage going to graduate school has increased by 2.34%
c.	0.29	0.67	The proportion has increased by 132.30%
d.	0.33	0.38	
e.	46.09%	53.71%	
f.	77.97%	47.31%	The percentage finishing in 4 years has declined by 39.32%
g.	0.14	0.17	

Page: 26-28

2. Below are the scores of 25 students on a midterm test. Organize this information into a frequency distribution using a ten point grading scale for class intervals. Include columns for percentages and cumulative percentages. Write a brief description of the distribution.

35	45	65	75	87
80	69	71	53	90
99	95	70	82	73
93	67	61	57	74
72	77	71	81	83

TEST GRADES			
			Cumulative
Class Intervals	Frequency	Percentage	Percentage
59 or less			
60 – 69			
70 – 79			
80 – 89			
90 – 100			
TOTALS			

Answers to Problem 2:

TEST GRADES			
			Cumulative
Class Intervals	Frequency	Percentage	Percentage
59 or less	4	16	16
60 – 69	4	16	32
70 – 79	8	32	64
80 – 89	5	20	84

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90 – 100	4	16	100
TOTALS	25	100	

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3. The frequency distribution below displays the distribution of age for a sample drawn from a community. Finish the table by completing the columns for percentages, and cumulative percentages.

AGE			
			Cumulative
Class Intervals	Frequency	Percentage	Percentage
10 – 19	9		
20 – 29	17		
30 – 39	45		
40 – 49	56		
50 – 60	23		
60 – 69	10		
70 – 79	8		
TOTALS			

Answers to Problem 3:

AGE			
			Cumulative
Class Intervals	Frequency	Percentage	Percentage
10 – 19	9	5.36	5.36
20 – 29	17	10.12	15.48
30 – 39	45	26.79	42.27
40 – 49	56	33.33	75.60
50 – 60	23	13.69	89.29
60 – 69	10	5.95	95.24
70 – 79	8	4.76	100.00
TOTALS	168	100.00	

Page: 34-35

DETAILED SOLUTIONS TO SELECTED END OF CHAPTER PROBLEMS

2.2 a. % of nurses who are male:

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$$\% = \left(\frac{f}{N}\right) \times 100 = \left(\frac{62}{178}\right) \times 100 = (0.3483) \times 100 = 34.83\%$$

b. Proportion of orderlies who are female

$$p = \left(\frac{f}{N}\right) = \left(\frac{12}{163}\right) = 0.07$$

c. For doctors, what is the ratio of males to females?

$$Ratio = \left(\frac{f_1}{f_2}\right) = \left(\frac{83}{15}\right) = 5.53$$

There are 5.53 male doctors for every female doctor

2.3 Homicide rate:
Number of homicides = 13
Population = 211,732

$$\text{Homicide rate} = \frac{13}{211732} \times 100,000 = (0.0000614) \times 100,000 = 6.14$$

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