



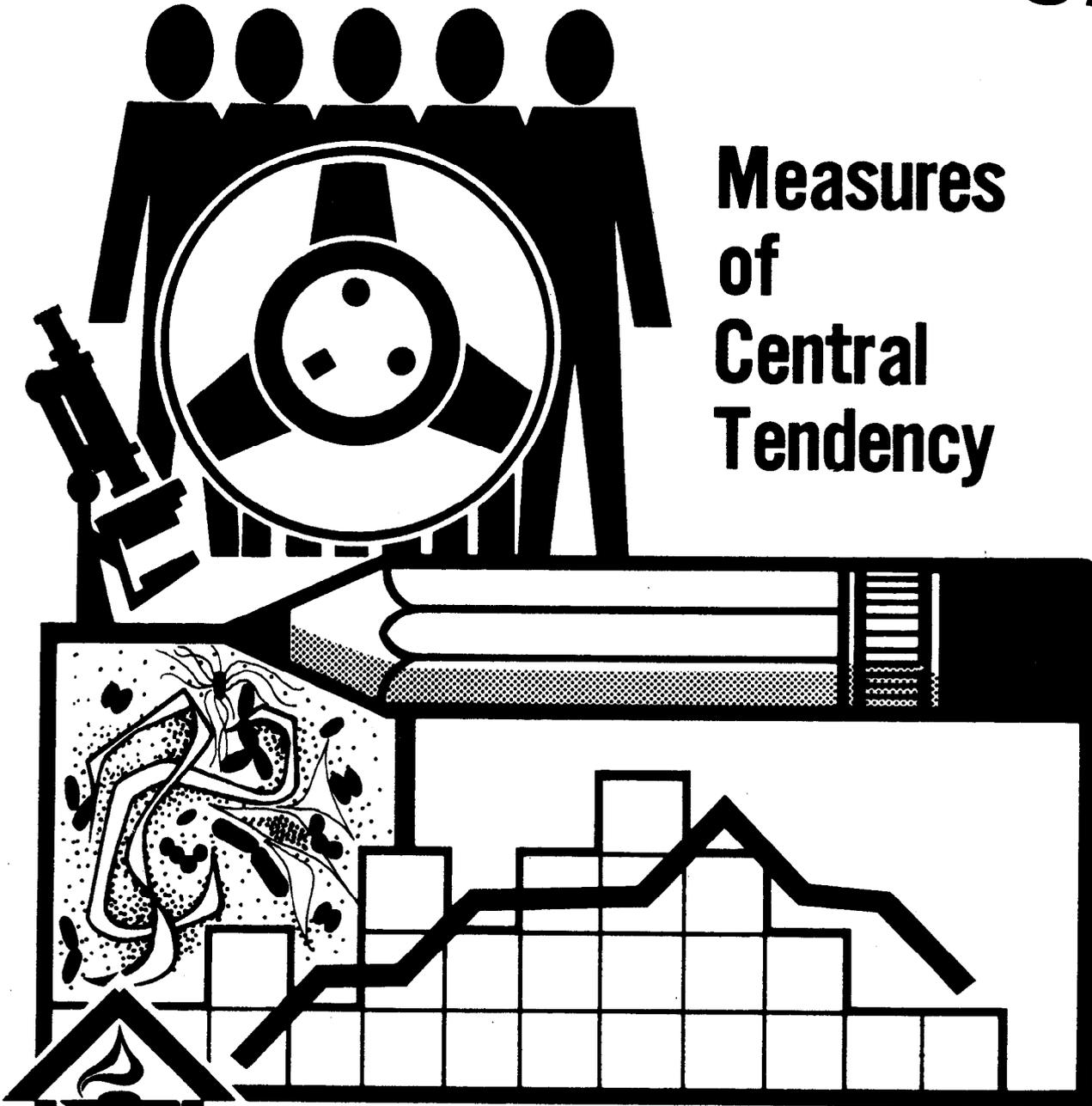
LESSON

2

SELF-STUDY COURSE 3030-G

Principles of Epidemiology

Measures of Central Tendency



U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

SELF-STUDY

PUBLIC HEALTH SERVICE
Centers for Disease Control
Training and Laboratory Program Office
Division of Training
Atlanta, Georgia 30333

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PRINCIPLES OF EPIDEMIOLOGY

Self-Study Course 3030-G

LESSON 2: MEASURES OF CENTRAL TENDENCY

I: LESSON CONSISTS OF:

Part I: 33 multiple choice questions

II: PRIMARY REFERENCE:

Manual 2 - "Measures of Central Tendency"

NOTE: This manual is provided by CDC and should be included when you receive this lesson.

SUPPLEMENTARY REFERENCES:

Daniel, W.W. *Biostatistics: A Foundation for Analysis in the Health Sciences*. 1974. 448 pp. John Wiley & Sons, Inc.

Ipsen, J., and Feigl, P. *Bancroft's Introduction to Biostatistics*. 1970. 223 pp. Harper and Row.

Remington, R.D., and Schork, M.A. *Statistics with Applications to Biological and Health Sciences*. 1970. 418 pp. Prentice - Hall, Inc.

III: TOPICS AND READING ASSIGNMENTS:

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B. Individual Data: Calculation of the Mean, Median, and Mode	2- 4
C. Grouped Data: Calculation of the Mean, Median, and Mode	4-11
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NOTE: The glossary is an important part of this lesson. Some of the test questions are based on the definitions used in the reference.

PRINCIPLES OF EPIDEMIOLOGY

Lesson 2

Objectives

Upon successful completion of Lesson 2, the student should be able to correctly:

- Identify, differentiate between, and recognize the characteristics of the measures of central tendency (mean, median, mode) and recognize their utility in epidemiological analysis.
- Identify statistical terms used in reference to and in conjunction with central tendency measures (biased, normal distribution, random, skewed, a set, class interval frequency distribution, simple frequency distribution).
- Given sets of data, demonstrate competency in calculating measures of central tendency for individual data, for a simple frequency distribution, and for a class interval frequency distribution.

PRINCIPLES OF EPIDEMIOLOGY

Self-Study Course 3030-G

LESSON 2: MEASURES OF CENTRAL TENDENCY

Part I: Multiple Choice

1. Which of the following measures of central tendency is most commonly used for statistical analysis?
 - A. The mean
 - B. The median
 - C. The mode
 - D. All of the above

2. The formula $\bar{X} = \frac{\sum x_i}{n}$ is used for calculating the mean of:
 - A. Values in a simple frequency distribution.
 - B. A set of individual values not in a frequency distribution.
 - C. A set of data grouped into class intervals.
 - D. None of the above.

3. In the formula $\bar{X} = \frac{\sum x_i}{n}$ (for calculating the mean), " x_i " represents:
 - A. The arithmetic mean.
 - B. The total number of individual values in a set.
 - C. The sum of the individual values in a set.
 - D. Each individual value in a set.

4. The "middle" value or mid-point in a set of values is:
 - A. The mean.
 - B. The median.
 - C. The mode.
 - D. All of the above.

5. The individual value that occurs most frequently in a particular set is defined as:
 - A. The mean.
 - B. The median.
 - C. The mode.
 - D. The mid-range.

6. Measures of central tendency are commonly used for:
- Identification of probable periods of exposure of cases in an outbreak of a known disease.
 - Identification of the incubation period of an illness when the cases were exposed at a known time.
 - Characterization of cases in an outbreak.
 - All of the above.
7. If a set of data is skewed (that is, it contains a few extreme values) then the measure of central tendency that is most representative of the individual values in the set usually is:
- The mean.
 - The median.
 - The mode.
 - None of the above.
8. The measure of central tendency that would be the most affected by the presence of a few extreme values in a set is:
- The mean.
 - The median.
 - The mode.
 - None of the above.
9. The formula $\bar{X} = \frac{\sum f_1 x_1}{n}$ is used to calculate:
- The median of grouped data.
 - The mode of grouped data.
 - The mean of a set of individual values.
 - The mean of a simple frequency distribution.
10. With a redefinition of x_1 , the formula $\bar{X} = \frac{\sum f_1 x_1}{n}$ is also used to calculate:
- The mean of a set of individual values.
 - The median of a simple frequency distribution.
 - The mean of data in a class interval frequency distribution.
 - The range of a set of grouped data.

11. The formula in question 10 is used only if it can be assumed that:
- There are no extreme values in the data to which the formula is applied.
 - The individual values in any given interval are at, or evenly distributed about, the mid-point of that interval.
 - The distribution is unimodal.
 - The data are grouped into equal class intervals.
12. Calculation of the median of grouped interval data is based on the assumption that:
- Each value in an interval is at the mid-point of the interval.
 - The class intervals are equal sized.
 - Values within a class interval are spaced equally throughout the interval.
 - There are an even number of values.
13. Events whose occurrence is influenced in some way are termed:
- Biased.
 - Normal.
 - Random.
 - Skewed.
14. Which of the following groups of class intervals are acceptable methods of showing class intervals?
- 0-4.9, 5-9.9, 10-14.9, 15-19.9, 20-49.9, 50-79.9, 80+
 - 0-5, 5-10, 10-15, 15-20, 21+
 - 0-1, 2-3, 4-5, 6-7, 8+
 - "A" and "C" are correct
15. A set of data that has a single peak centered on the mean, and in which the individual values are symmetrically distributed around the mean, would be:
- Biased.
 - Normal.
 - Random.
 - Skewed.

16. A frequency distribution has a single peak, centered on the mean. Individual values are symmetrically distributed around the mean. We would describe the data as:
- A. Normally distributed.
 - B. Skewed to the left.
 - C. Skewed to the right.
 - D. All of the above.
17. Events which occur by chance alone are:
- A. Biased.
 - B. Normal.
 - C. Random.
 - D. Skewed.
18. A group of data containing values that are in some way related to each other is termed:
- A. Biased.
 - B. Normal.
 - C. Random.
 - D. A set.
19. A frequency distribution having a single mode in which the individual values are asymmetrically distributed about the mean would be:
- A. Biased.
 - B. Normal.
 - C. Random.
 - D. Skewed.

Use the following set of values (ages in months) to answer questions 20-23.

11, 3, 6, 6, 4, 6, 10, 11, 7, 8, 7

All calculations should be rounded off as described in the reference.

20. The mean age of the set is:
- A. 7.9 months.
 - B. 7.2 months.
 - C. 7.1 months.
 - D. 6.2 months.
21. The median age of the individuals in the above set can be readily identified in which of the following arrays?
- A. 11, 3, 6, 6, 4, 6, 10, 11, 7, 8, 7
 - B. 11, 11, 10, 8, 7, 7, 6, 6, 6, 4, 3
 - C. 3, 4, 6, 6, 6, 7, 7, 8, 10, 11, 11
 - D. "B" and "C"
22. The median age of the set is:
- A. 6.0 months.
 - B. 6.5 months.
 - C. 7.0 months.
 - D. 8.0 months.
23. The modal age of the set is:
- A. 6.0 months.
 - B. 6.5 months.
 - C. 7.0 months.
 - D. 7.5 months.
24. Of the three measures of central tendency, which is the only one that is always equal to a value that actually exists in the set?
- A. Mean, individual data
 - B. Mean, grouped data
 - C. Median, grouped data
 - D. Mode, ungrouped data

Use the following information to answer questions 25-27.

During the investigation of an outbreak of an illness it was found that the number of hours between time of exposure to a food item and appearance of the first symptoms of illness was:

Number of Hours	Number of Persons (f_i)
15-15.9	1
19-19.9	3
21-21.9	4
22-22.9	6
23-23.9	11
24-24.9	5
25-25.9	2
26-26.9	2
28-28.9	1
30-30.9	2

25. The calculated exact mean number of hours is:
- A. 22.5.
 - B. 23.5.
 - C. 24.5.
 - D. 26.5.
26. The mid-point of the interval containing the median number of hours is:
- A. 21.5.
 - B. 22.5.
 - C. 23.5.
 - D. 24.5.
27. The mid-point of the interval containing the modal number of hours is:
- A. 19.5.
 - B. 21.5.
 - C. 22.5.
 - D. 23.5.

Use the following information to answer questions 28-32.

Ages, in years, of cases of disease "A" reported to a state health department during a 12 month period:

Exact Ages of Cases

Age (In Years)	Number of Cases (f_i)
0- 9.9	0
10-19.9	4
20-29.9	16
30-39.9	14
40-49.9	17
50-59.9	3
60-69.9	0
70-79.9	0
TOTAL	54

28. The exact mean age of the cases is:
- A. 29.4 years.
 - B. 33.0 years.
 - C. 34.8 years.
 - D. 36.7 years.
29. The mid-point of the age group within which the median age of the set falls is:
- A. 35 years.
 - B. 44 years.
 - C. 45 years.
 - D. 55 years.
30. The modal class interval of the set is:
- A. 10-19.9 years.
 - B. 20-29.9 years.
 - C. 30-39.9 years.
 - D. 40-49.9 years.

31. The mid-point of the modal class interval in the set is:
- A. 34.5 years.
 - B. 35 years.
 - C. 45 years.
 - D. 54.5 years.
32. The median age of cases in the set is:
- A. 34.5 years.
 - B. 35 years.
 - C. 35.3 years.
 - D. 36.9 years.
33. Comparing a set of data presented both in simple frequency and in class-interval frequency distributions, which of the following statements is true?
- A. \bar{X} is more accurate when calculated from the class interval distribution.
 - B. No assumptions must be made regarding the class interval.
 - C. \bar{X} would usually be more accurate when calculated from the simple distribution.
 - D. The size of the class intervals is relatively unimportant.

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