

SUMMARY

1. The three measures of central tendency presented in this chapter share a common purpose. Each reports some information about the most typical or representative value in a distribution. Appropriate use of these statistics permits the researcher to report important information about an entire distribution of scores in a single, easily understood number.
2. The mode reports the most common score and is used most appropriately with nominal-level variables.
3. The median (*Md*) reports the score that is the exact center of the distribution. It is most appropriately used with variables measured at the ordinal level and with interval-ratio variables when the distribution is skewed.

4. The mean, the most frequently used of the three measures, reports the most typical score. It is used most appropriately with variables measured at the interval-ratio level (except when the distribution is highly skewed).
5. The mean has a number of important mathematical characteristics. First, it is the point in a distribution of scores around which all other scores cancel out. Second, the mean is the point of minimized variation (this is the “least-squares” principle). Last, the mean is affected by every score in the distribution and is therefore pulled in the direction of extreme scores.

SUMMARY OF FORMULAS

FORMULA 3.1

Mean

$$\bar{X} = \frac{\sum(X_i)}{N}$$

GLOSSARY

Mean. The arithmetic average of the scores. $\bar{X}$ represents the mean of a sample, and μ , the mean of a population.

Measures of central tendency. Statistics that summarize a distribution of scores by reporting the most typical or representative value of the distribution.

Median (*Md*). The point in a distribution of scores above and below which exactly half of the cases fall.

Mode. The most common score in a distribution.

PROBLEMS

- 3.1 **SOC** A variety of information has been gathered from a sample of college freshmen and seniors, including
- Their region of birth;
 - The extent to which they support legalization of marijuana (measured on a scale on which 7 = strong support, 4 = neutral, and 1 = strong opposition);
 - The amount of money they spend each week out-of-pocket for food, drinks, and entertainment;
 - How many movies they watched in their dorm rooms last week;
 - Their opinion of cafeteria food (10 = excellent, 0 = very bad); and
 - Their religious affiliation.

Some results are presented here. Find the most appropriate measure of central tendency for each variable for freshmen and then for seniors. Report both the measure you selected and its value for each variable (e.g., “Mode = 3” or “Median = 3.5”). (HINT: Determine the level of measurement for each variable first. In general, this will tell you which measure of central tendency is appropriate. See the section “Choosing a Measure of Central Tendency” to review the relationship between measure of central tendency and level of measurement. Also, remember that the mode is the most common score, and especially remember to array scores from high to low before finding the median.)

FRESHMEN						
Student	Region of Birth	Legalization	Out-of- Pocket Expenses	Movies	Cafeteria Food	Religion
A	North	7	43	0	10	Protestant
B	North	4	49	14	7	Protestant
C	South	3	55	10	2	Catholic
D	Midwest	2	57	7	1	None
E	North	3	72	5	8	Protestant
F	North	5	58	1	6	Jew
G	South	1	62	0	10	Protestant
H	South	4	75	14	0	Other
I	Midwest	1	61	3	5	Other
J	West	2	53	4	6	Catholic

SENIORS						
Student	Region of Birth	Legalization	Out-of- Pocket Expenses	Movies	Cafeteria Food	Religion
K	North	7	75	0	1	None
L	Midwest	6	72	5	2	Protestant
M	North	7	70	11	8	Protestant
N	North	5	95	3	4	Catholic
O	South	1	72	4	3	Protestant
P	South	5	67	14	6	Protestant
Q	West	6	50	0	2	Catholic
R	West	7	59	7	9	None
S	North	3	55	5	4	None
T	West	5	95	3	7	Other
U	North	4	88	5	4	None

3.2 A variety of information has been collected for all district high schools. Find the most appropriate measure of central tendency for each variable, and summarize this information in a paragraph. (HINT: The

level of measurement of the variable will generally tell you which measure of central tendency is appropriate. Remember to organize the scores from high to low before finding the median.)

High School	Enrollment	Largest Racial/ Ethnic Group	% College Bound	Most Popular Sport	Condition of Physical Plant (10 = Excellent)
A	1400	White	25	Football	10
B	1223	White	77	Baseball	7
C	876	Black	52	Football	5
D	1567	Hispanic	29	Football	8
E	778	White	43	Basketball	4
F	1690	Black	35	Basketball	5
G	1250	White	66	Soccer	6
H	970	White	54	Football	9

- 3.3 **[PS]** You have been observing the local Democratic Party in a large city and have compiled some informa-

Respondent	Gender	Social Class	No. of Years in Party	Education	Marital Status	No. of Children
A	M	High	32	High school	Married	5
B	M	Middle	17	High school	Married	0
C	M	Working	32	High school	Single	0
D	M	Working	50	8th grade	Widowed	7
E	M	Working	25	4th grade	Married	4
F	M	Middle	25	High school	Divorced	3
G	F	High	12	College	Divorced	3
H	F	High	10	College	Separated	2
I	F	Middle	21	College	Married	1
J	F	Middle	33	College	Married	5
K	M	Working	37	High school	Single	0
L	F	Working	15	High school	Divorced	0
M	F	Working	31	8th grade	Widowed	1

- 3.4 **[PA]** The following table presents the annual person-hours of time lost due to traffic congestion for a group of cities for 2009. This statistic is a measure of traffic congestion.

City	Annual Person-Hours Lost to Traffic Congestion
Baltimore	33
Boston	28
Buffalo	11
Chicago	44
Cleveland	13
Dallas	32
Detroit	23
Houston	37
Kansas City	14
Los Angeles	40
Miami	26
Minneapolis	27
New Orleans	20
New York	24
Philadelphia	26
Phoenix	23
Pittsburgh	23

(continued next column)

Respondent	Marital Status	Racial/Ethnic Group	Age	Attitude on Abortion
A	Single	White	18	10
B	Single	Hispanic	20	9

tion about a small sample of party regulars. Find the appropriate measure of central tendency for each variable.

(continued)

City	Annual Person-Hours Lost to Traffic Congestion
San Antonio	19
San Diego	23
San Francisco	30
Seattle	27
Washington, D.C.	41

Source: U.S. Bureau of the Census, 2012. *Statistical Abstract of the United States: 2012*, Table 1099. Available at <http://www.census.gov/prod/2011pubs/12statab/trans.pdf>

- Calculate the mean and median of this distribution.
- Compare the mean and median. Which is the higher value? Why?
- If you removed Chicago (the case with the highest score) from this distribution and recalculated, what would happen to the mean? To the median? Why?
- Report the mean and median as you would in a formal research report.

- 3.5 **[SOC]** Data have been gathered on four variables for 15 respondents (see the following table). Find and report the appropriate measure of central tendency for each variable. (On the "Attitude on Abortion" scale, a high score indicates strong opposition.)

(continued)

Respondent	Marital Status	Racial/Ethnic Group	Age	Attitude on Abortion
C	Widowed	White	21	8
D	Married	White	30	10
E	Married	Hispanic	25	7
F	Married	White	26	7
G	Divorced	Black	19	9
H	Widowed	White	29	6
I	Divorced	White	31	10
J	Married	Black	55	5
K	Widowed	Asian American	32	4
L	Married	Native American	28	3
M	Divorced	White	23	2
N	Married	White	24	1
O	Divorced	Black	32	9

- 3.6 **[SOC]** The following tables list the median family incomes for the 13 Canadian provinces and territories in 2000 and 2011 and for 13 states of the United States in 1999 and 2012. For the provinces and the states, compute the mean and median family income for each year and compare the two measures of central tendency. Which measure of central tendency is greater for each year? Are the distributions skewed? In which direction?

Median Income for Canadian Provinces and Territories, 2000 and 2011 (Canadian dollars)

Province or Territory	2000	2011
Newfoundland and Labrador	38,800	67,200
Prince Edward Island	44,200	66,500
Nova Scotia	44,500	66,300
New Brunswick	43,200	63,930
Quebec	47,700	68,170
Ontario	55,700	73,290
Manitoba	47,300	68,710
Saskatchewan	45,800	77,300
Alberta	55,200	89,930
British Columbia	49,100	69,150
Yukon	56,000	90,090
Northwest Territories	61,000	105,560
Nunavut	37,600	65,280

Mean =
Median =

Source: Statistics Canada. Retrieved from <http://www.statcan.gc.ca/tables-tableaux/sum-som/101/csl01/famil108a-eng.htm>

Median Income for Thirteen States, 1999 and 2012 (U.S. dollars)

State	1999	2012
Alabama	36,213	43,464
Alaska	51,509	63,348
Arkansas	29,762	39,018
California	43,744	57,020
Connecticut	50,798	64,247
Illinois	46,392	51,738
Kansas	37,476	50,003
Maryland	52,310	71,836
Michigan	46,238	50,015
New York	40,058	47,680
Ohio	39,617	44,375
South Dakota	35,962	49,415
Texas	38,978	51,926

Mean =
Median =

Sources: 1999: U.S. Bureau of the Census. *Statistical Abstract of the United States: 2001*, p. 436. Retrieved from <http://www.census.gov/prod/2002pubs/01statab/income.pdf>. 2012: U.S. Bureau of the Census. *American Community Survey, 2012*. Retrieved from <http://www.census.gov/hhes/www/income/data/statemedian/>

- 3.7 **[SOC]** Find the appropriate measure of central tendency for each variable displayed in problem 2.5. Report each statistic as you would in a formal research report.

- 3.8 **[SOC]** The accompanying table gives scores on four variables for 30 cases from the General Social Survey:
- "Age" is reported in years.

- “Happiness” consists of answers to the question “Taken all together, would you say that you are
 1. very happy
 2. pretty happy
 3. not too happy?”
- “Number of Partners” refers to sex partners over the past five years:
 - A score of 0 to 4 is the actual number of partners.
 - A score of 5 means 5–10 partners.
 - A score of 6 means 11–20 partners.
 - A score of 7 means 21–100 partners.
 - A score of 8 means more than 100 partners.
- “Religion” is self-identified religious affiliation (Protestant, Catholic, Jew, Other, or None).

For each variable, find the appropriate measure of central tendency, and write a sentence reporting this statistical information as you would in a research report.

Respondent	Age	Happiness	Number of Partners	Religion
1	20	1	2	Protestant
2	32	1	1	Protestant
3	31	1	1	Catholic
4	34	2	5	Protestant
5	34	2	3	Protestant
6	31	3	0	Jew
7	35	1	4	None
8	42	1	3	Protestant
9	48	1	1	Catholic
10	27	2	1	None
11	41	1	1	Protestant
12	42	2	0	Other
13	29	1	8	None
14	28	1	1	Jew
15	47	2	1	Protestant
16	69	2	2	Catholic
17	44	1	4	Other
18	21	3	1	Protestant
19	33	2	1	None
20	56	1	2	Protestant
21	73	2	0	Catholic
22	31	1	1	Catholic
23	53	2	3	None
24	78	1	0	Protestant
25	47	2	3	Protestant
26	88	3	0	Catholic
27	43	1	2	Protestant
28	24	1	1	None
29	24	2	3	None
30	60	1	1	Protestant

- 3.9 **[SOC]** The college administration is considering a total ban on student automobiles. You have conducted a poll on this issue of 20 fellow students and 20 of the neighbors who live around the campus and have calculated scores for your respondents. On the scale you used, a high score indicates strong opposition to the proposed ban. The scores are presented here for both groups. Calculate an appropriate measure of central tendency and compare the two groups in a sentence or two.

Students		Neighbors	
10	11	0	7
10	9	1	6
10	8	0	0
10	11	1	3
9	8	7	4
10	11	11	0
9	7	0	0
5	1	1	10
5	2	10	9
0	10	10	0

- 3.10 **[SW]** As the head of a social services agency, you believe that your staff of 20 social workers is very much overworked compared with 10 years ago. The case loads for each worker are reported below for each of the two years in question. Has the average caseload increased? Which measure of central tendency is most appropriate to answer this question? Why?

2002		2012	
52	55	42	82
50	49	75	50
57	50	69	52
49	52	65	50
45	59	58	55
65	60	64	65
60	65	69	60
55	68	60	60
42	60	50	60
50	42	60	60

- 3.11 **[SOC]** The following table lists the approximate number of cars per 1000 population for 15 nations. Compute the mean and median for these data. Which is greater in value? Is there a positive skew in the data? How do you know?

Nation	Number of Motor Vehicles per 1000 Population (2009)
United States	786
Germany	588
Canada	608

(continued)

Nation	Number of Motor Vehicles per 1000 Population (2009)
Japan	588
Australia	703
Israel	330
Russia	271
Mexico	278
Tunisia	130
Bolivia	87
China	69
Niger	8
Kenya	25
Thailand	172
India	18
Mean =	
Median =	

Source: World Bank, 2014. Retrieved from <http://data.worldbank.org/indicator/IS.VEH.NVEH.P3>

- 3.12 **[SW]** Compute the median and mean for both the pretest and posttest for the test scores first presented in problem 2.6 and reproduced here. Interpret these statistics.

Case	Pretest	Posttest
A	8	12
B	7	13
C	10	12
D	15	19
E	10	8
F	10	17
G	3	12
H	10	11
I	5	7
J	15	12
K	13	20
L	4	5
M	10	15
N	8	11
O	12	20

- 3.13 **[SOC]** A sample of 25 freshmen at a major university completed a survey that measured their degree of racial prejudice (the higher the score, the greater the prejudice).

- a. Compute the median and mean scores for these data.

10	43	30	30	45
40	12	40	42	35
45	25	10	33	50
42	32	38	11	47
22	26	37	38	10

- b. These same 25 students completed the same survey during their senior year. Compute the median and mean for this second set of scores, and compare them to the earlier set. What happened?

10	45	35	27	50
35	10	50	40	30
40	10	10	37	10
40	15	30	20	43
23	25	30	40	10

- 3.14 **[SOC]** You have compiled the following information on each of the graduates voted “most likely to succeed” by a local high school for a 10-year period. For each variable, find the appropriate measure of central tendency.

Case	Present Income (\$)	Marital Status	Owns a Home?	Years of Education Post-High School
A	104,000	Divorced	Yes	8
B	68,000	Divorced	No	4
C	54,000	Married	Yes	4
D	45,000	Married	No	4
E	40,000	Single	No	4
F	85,000	Separated	Yes	8
G	30,000	Married	No	3
H	27,000	Married	No	1
I	93,000	Married	Yes	6
J	48,000	Single	Yes	4

- 3.15 **[SOC]** Professional athletes are threatening to strike because they claim that they are underpaid. The team owners have released a statement that says, in part, “The average salary for players was \$1.2 million last year.” The players counter by issuing their own statement that says, in part, “The typical player earned only \$753,000 last year.” Is either side necessarily