



Data **LITERACY**

Data Literacy: Adjusting for Population

Lesson Authors

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Standards and Benchmarks (see page 22)

Description

The lesson focuses on adjusting measures by population size. Students evaluate volunteerism data for 2015 to determine which state's citizens are most likely to volunteer. Through a guided discussion and review of data, students learn how to convert absolute numbers into per capita measures by adjusting for population and why such adjustments are necessary to make valid comparisons among groups. They also discuss credibility of data sources and identify data sources used in the lesson. As an assessment, they use various data series in FRED® to find state-specific data, including per capita measures.

Economic and Statistical Concepts

Per capita: A quantity per person determined by dividing the total quantity by the total population.

Personal income: The money people get from wages, self-employment, dividends, interest, rents, and government benefits.

Volunteering: Performing unpaid volunteer activities through or for an organization.

Objectives

Students will be able to

- define volunteering and per capita measures;
 - recognize when population adjustments are required to make valid comparisons of data;
 - identify the information needed to make population adjustments to data;
 - assess the credibility of data sources; and
 - use FRED® to find state-specific data.
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Grade Level

Grades 7-10

Compelling Question

When comparing data across different populations, what adjustments (transformations) are useful to derive meaning from the data?

Time Required

30-40 minutes

Materials

- PowerPoint slides (which may be used instead of the visuals), with the information noted in the Preparation section added prior to use
 - Visuals 1 to 6, with the information noted in the Preparation section added to Visuals 5 and 6 prior to use
 - Handouts 1 to 4, one copy of each for each student, with the information noted in the Preparation section added to Handouts 3 and 4 before copying
 - Handout 3—Answer Key for the teacher, with the information noted in the Preparation section added prior to use (or use Slide 11)
 - Handout 4—Answer Key for the teacher
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Preparation

- Make sure you are comfortable navigating around FRED®, finding values for data series used in this lesson, and identifying data sources. A demonstration is located here: <https://fredhelp.stlouisfed.org/>
 - Go to <https://americorps.gov/about/our-impact/volunteering-civic-life> to find the most recent number of volunteers and number of volunteer hours for your state: You will have to scroll down and search the “State, City, and Demographic Findings.” Fill in the data as follows:
 - Visual 5 (or Slide 7): Your state’s name and number of volunteers
 - Visual 6 (or Slide 8): Your state’s name, number of volunteers, and number of volunteer hours
 - Handout 3 (or Slide 10), Handout 3—Answer Key (or Slide 11): Your state’s name, number of volunteers, and number of volunteer hours
 - Follow the steps on Handout 2 to use FRED® to fill in the population for your state on Handout 3—Answer Key (or Slide 11).
 - Use your state’s number of volunteers, volunteer hours, and population to calculate your state’s volunteerism rate (see the equation in Procedure Step #10) and volunteer hours per capita (see the equation in Procedure Step #12) to fill in on Handout 3—Answer Key (or Slide 11). Also fill in your state’s volunteerism rate and volunteer hours per capita on Handout 4 and Handout 4—Answer Key.
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- Follow the directions on Handout 4 to find your state’s median income, unemployment rate, and poverty rate to fill in on Handout 4—Answer Key.
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Procedures

1. If using the PowerPoint slides, display Slide 1. Tell the class that today’s topic will cover **volunteering**. Ask a student to define volunteering. (Accept plausible answers.)
2. Display *Visual 1: Trends in Volunteering for 2017* (or Slide 2). Define volunteering as performing an activity, task, or service for another person or organization without being paid. Discuss the following:
 - Do any of you actively volunteer with an organization? (*Answers will vary.*)
 - Would anyone like to share your experience with volunteering? (*Answers will vary.*)
 - What are some factors that motivate people to volunteer? (*Answers will vary but may include that they enjoy or derive satisfaction from helping people.*)
3. From Visual 1 (or Slide 2), read the trends in volunteering for 2017 for various demographics of volunteers. To generate discussion (and not to elicit proven answers), discuss some of the following concerning volunteering in 2017:
 - In 2017, why do you think parents volunteered more often than nonparents? (*Answers will vary.*)
 - In 2017, why do you think Generation X (those born from 1965-1980, who were 37-52 years old in 2017) had the highest rate of volunteering? (*Answers will vary.*)
 - In 2017, why do you think veterans donated to charity at higher rates than civilians? (*Answers will vary.*)
 - In 2017, why do you think Americans most frequently volunteered their time to religious groups? (*Answers will vary.*)
4. Distribute a copy of *Handout 1: Data Sources* to each student (display Slide 3 if desired). Display *Visual 2: Data Source Questions, Part 1* (or Slide 4). Tell the students that one of the first steps in determining the credibility of data is assessing the reliability and the motives of the organization providing or collecting the data. Use the information and questions below to generate a discussion. Tell students they may refer to Handout 1 to assist with the discussion.
 - The source of the “Trends in Volunteering for 2017” we just reviewed (on Visual 1) is noted at the top of Handout 1. From what agency were the data obtained? (*The data were obtained from a November 13, 2018, press release from the Corporation for National and Community Service [CNCS], a federal agency. The press release used information from the “2018 Volunteering in America Report” released on the same day by the CNCS.*)
 - What motivation might this agency have for posting volunteer data? (*Answers will vary; there are many possible answers. The press release says this federal agency “engages millions of*

Americans in service through its AmeriCorps and Senior Corps programs and leads the nation's volunteering and service efforts." It seems reasonable that they use volunteer statistics to gauge their success and encourage more volunteerism from citizens.)

- Did the CNCS generate the volunteer data it reported on? If not, what agency generated this data? (*No, the data were produced by the U.S. Census Bureau.*)
 - How are the volunteer data collected? (*Answers will vary. The data are collected as a supplement to the Current Population Survey [CPS], which is a monthly survey of households conducted by the U.S. Census Bureau on behalf of the U.S. Bureau of Labor Statistics [BLS].*)
 - Explain that CPS data are collected either over the phone or in person by an interviewer. Other methods of collecting survey data include by mail or email or through the Internet.
5. Display *Visual 3: Data Source Questions, Part 2* (or Slide 5). Continue the discussion:
- Why does the U.S. Census Bureau survey U.S. households? (*Answers will vary; students may not know. The CPS collects data on the entire U.S. population, and some smaller subgroups, for studies that report on the well-being of citizens. These studies are used by government agencies and other organizations like the Corporation for National and Community Service.*) SOURCE: <https://www.census.gov/programs-surveys/cps/about/supplemental-surveys.html>.)
 - Does knowing that the data are collected and generated by the U.S. Census Bureau, and not the Corporation for National and Community Service, change your thoughts about the motives for generating these data? (*Answers will vary.*)
 - Explain that fostering volunteerism is not part of the mission of the U.S. Census Bureau. However, collecting accurate data regarding the U.S. population is part of its mission and has its roots in the Census mandated by the U.S. Constitution. So, people wouldn't likely have questions about the motives of the U.S. Census Bureau.
 - Of the methods used to collect survey data from U.S. households (phone, in person, mail, email, the Internet), which do you think is most reliable? Why? (*Answers will vary.*)
6. Display *Visual 4: Survey Errors* (or Slide 6). Explain that there are often errors associated with collecting survey data. Most errors fall in one of two categories:
- There is inaccurate or missing information: Respondents may not wish to share information with a stranger or may embellish information such as salary to avoid embarrassment in the eyes of the interviewer. Respondents may also not understand the question.
 - The sample does not represent the population: In some cases, the characteristics of a person willing to submit to a long survey may be different than the characteristics of a person who would avoid such surveys. Identifying groups of survey respondents who do not represent the population can cause errors in data collection.
 - Explain that data scientists continuously make advancements to minimize these errors.

7. Tell the students that they are going to evaluate volunteer data from 2015. (NOTE: At the time this lesson was written, 2015 was the last year for which there is the most complete information). Display *Visual 5: Volunteers for Select States, 2015* (or Slide 7). Explain that the data are provided by the Corporation for National and Community Service. (NOTE: The data are from the Current Population Survey September 2015 Volunteer Supplement from the BLS.)

8. Divide the class into groups of two to three students for the remainder of the lesson. Instruct the groups to discuss the question on Visual 5 (or Slide 7): In which of the states listed were people most likely to volunteer their time in 2015? Students should develop a group answer, including an explanation of their reasoning. Allow time for students to work.

9. Invite students from different groups to share their answers and reasoning with the class. (Some groups will state that people in California are more likely to volunteer than those in any other state because California has the highest number of volunteers. Other groups may bring up the fact that states with more volunteers have larger populations. If students do not bring up this idea, use the questions below to guide them.) Discuss the following (if necessary):
 - Is a person in California more likely to volunteer than a person in Minnesota? (*Answers will vary. Some may say yes because California has the highest number of volunteers. Some may say no if they consider adjusting for the populations of the states. Some may say they are not sure and need more information.*)
 - What do you notice about the populations of states with many volunteers? (*They are much larger, and the high numbers of volunteers could be due to large populations.*)
 - How might you adjust the data to allow for better comparisons among states? (*Calculating a volunteerism rate that adjusts for population size will allow for comparisons among states. NOTE: The method for this calculation is provided in the next step.*)

10. Explain that if you use the population of the state to adjust the data, you can determine how likely people are to volunteer in that state. To do this, divide the number of volunteers by the population of the state to find the volunteerism rate. To illustrate, use the following calculation for California:

$$\text{Volunteerism rate} = \frac{\text{Volunteers}}{\text{Population}}$$

California

Population in thousands: 38,953.142

Population: 38,953.142 * 1,000 = 38,953,142

$$\text{Volunteerism rate} = \frac{7,041,413}{38,953,142} = 0.181 = 18.1\%$$

11. Display *Visual 6: Volunteers and Volunteer Hours for Select States, 2015* (or Slide 8). Discuss the following:
- Can you answer the questions on Slide 8 (In which of the states listed were people most likely to volunteer their time in 2015)? Why or why not? (*No, the populations of these states vary.*)
 - How might you adjust the data to allow you to make valid comparisons among states? (*Adjust for population*)
12. Define per capita as a per person average. Emphasize that a **per capita measure** is the same as an average-person or a mean-person measure. To illustrate how to calculate volunteer hours per capita, using the following example for California:

$$\text{Volunteer hours per capita} = \frac{\text{Volunteer hours}}{\text{Population}}$$

California

Volunteer hours in millions: 940.16

$$\text{Volunteer hours} = 940.16 * 1,000,000 = 940,160,000$$

$$\text{Volunteer hours per capita} = \frac{940,160,000}{38,953,142} = 24.1 \text{ hours per capita}$$

13. Explain that to calculate volunteer hours per capita for the other states, students need to know the populations of those states. Distribute a copy of *Handout 2: How to Use FRED® to Find State-Level Population Data* to each student (display Slide 9 if desired). Navigate to FRED and instruct the students to do the same on their devices (laptops, tablets, or smartphones). Guide them through the detailed steps in the handout to access state population data.
14. After working through Handout 2, point out that the map is color coded according to the legend. Discuss the following:
- Which colors of states have the largest populations? (The darker colors have the higher data values and therefore the largest populations. The dark-green states have the largest populations.)
 - Explain that this is a typical structure for these types of maps: Darker colors usually indicate higher data values.
 - Have the students click on California to view the pop-up of its population.
 - Point out the “Source” line. Explain that FRED does not generate these data but obtains them from the U.S. Census Bureau.
15. Distribute a copy of *Handout 3: Adjusted Volunteer Data for Select States, 2015* (display Slide 10 if desired). Instruct the groups to complete the following:

- Fill in the remainder of the population column using FRED.
 - Fill in the remainder of the volunteer rate column using the appropriate calculation.
 - Fill in the remainder of the volunteer hours per capita column using the appropriate calculation.
16. Review the correct answers for the missing population, volunteer rate, and volunteer hours per capita columns using *Handout 3: Adjusted Volunteer Data for Select States, 2015— Answer Key* (or Slide 11).
17. Remind the students of the original question: In which of the states listed on Visual 5 (and now also Handout 3) were people more likely to volunteer their time in 2015? Ask students what their answers are now and why. (*Among the five states listed on Handout 3, Utah is the state with people most likely to volunteer based on volunteer hours per capita [57], while Minnesota and Utah have people most likely to volunteer based on volunteerism rates [28 percent]. Both answers would be acceptable unless your state has higher numbers for either measure, in which case your state would be the correct answer based on that measure.*)
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Closure

Review the purpose of the activity:

18. Review the key points of the lesson by discussing the following:
- Define volunteering. (*Volunteering is performing an activity, task, or service for another person or organization without being paid.*)
 - Define per capita. (*A per person average*)
 - New York has 27 congressmen or congresswomen in the U.S. House of Representatives, while Utah has 4 (based on the 2010 Census).
 - Can you conclude that citizens of New York and Utah have equal representation in the House of Representatives? Why or why not? (*No. New York has many more representatives but also has a much larger population. One cannot tell from this information which state's citizens have more representation on average.*)
 - What measure would allow you to determine which state's citizens (New York's or Utah's) have more representation? (*A representative per capita measure [which is calculated by taking the number of representatives for the state and dividing by the population of the state] would clarify representation. The state with the higher value would have more representation per person.*)
19. Distribute a copy of *Handout 4: Population Adjustments Assessment* to each student. Assign as homework or allow time for students to complete individually in class. For answers, see *Handout 4: Population Adjustments Assessment—Answer Key*.

Visual 1: Trends in Volunteering for 2017*

Volunteering: Performing an activity, task, or service for another person or organization without being paid.

From the Current Population Survey's "Civic Engagement and Volunteer Supplement" for 2017*

- Parents volunteered at rates nearly 48% higher than nonparents.
- Generation X (those born from 1965-1980) showed the highest rate of volunteerism.
- Veterans helped neighbors and donated to charity more than civilians.
- Americans most frequently volunteered their time to religious groups (32%).

SOURCE: Corporation for National and Community Service. "Volunteering in U.S. Hits Record High; Worth \$167 Billion." Press release, November 13, 2018; <https://www.americorps.gov/newsroom/press-releases/2018/volunteering-us-hits-record-high-worth-167-billion>, accessed March 2019.

Visual 2: Data Source Questions, Part 1

- From what agency were the data obtained?
- What motivation might this agency have for posting volunteer data?
- Did this agency generate the volunteer data it reported on?
If not, what agency generated this data?
- How are the volunteer data collected?

Visual 3: Data Source Questions, Part 2

- Why does the U.S. Census Bureau survey U.S. households?
- Does knowing that the data are collected and generated by the U.S. Census Bureau, and not the Corporation for National and Community Service, change your thoughts about the motives for generating these data?
- Of the methods used to collect survey data from U.S. households (phone, in person, mail, email, the Internet), which do you think is most reliable?

Visual 4: Survey Errors

- There is inaccurate or missing information.
- The sample does not represent the population.

Visual 5: Volunteers for Select States, 2015

In which of the states listed were people more likely to volunteer their time in 2015?

Develop an answer with your group, including an explanation of your reasoning.

State	Volunteers
California	7,041,413
Texas	4,652,679
New York	3,137,688
Minnesota	1,560,667
Utah	844,023
Your state:	
SOURCE: Corporation for National and Community Service (nationalservice.gov); BLS Current Population Survey September 2015 Volunteer Supplement.	

Visual 6: Volunteers and Volunteer Hours for Select States, 2015

In which of the states listed were people more likely to volunteer their time in 2015?

Develop an answer with your group, including an explanation of your reasoning.

State	Volunteers	Volunteer hours (millions)
California	7,041,413	940.16
Texas	4,652,679	566.19
New York	3,137,688	556.74
Minnesota	1,560,667	155.41
Utah	844,023	170.36
Your state:		

SOURCE: Corporation for National and Community Service (nationalservice.gov); BLS Current Population Survey September 2015 Volunteer Supplement.

Handout 1: Data Sources

Trends in Volunteering for 2017

SOURCE: AmeriCorps. "Volunteering in U.S. Hits Record High; Worth \$167 Billion." Press release, November 13, 2018; <https://www.americorps.gov/newsroom/press-releases/2018/volunteering-us-hits-record-high-worth-167-billion>, accessed December 2023.

The press release used information from the "2018 Volunteering in America Report" released on the same day by the CNCS.

Excerpts from the Press Release "Volunteering in U.S. Hits Record High; Worth \$167 Billion"

- The Corporation for National and Community Service is a federal agency that engages millions of Americans in service through its AmeriCorps and Senior Corps programs and leads the nation's volunteering and service efforts. For more information, visit [NationalService.gov](https://www.nationalservice.gov).
- Background on the ["2018 Volunteering in America Report"]: The data for this report were collected through a supplement to the Current Population Survey (CPS): the Civic Engagement and Volunteering Supplement. The CPS is a monthly survey of about 60,000 households (approximately 100,000 adults), conducted by the U.S. Census Bureau on behalf of the [U.S.] Bureau of Labor Statistics [BLS]. The selected supplements collect data on the volunteering, voting, and civic activities of adults age 16 and older. Volunteers are considered individuals who performed unpaid volunteer activities through or for an organization at any point during the 12-month period (from September 1st of the prior year through the survey week in September of the survey year).

Handout 2: How to Use FRED® to Find State-Level Population Data

1. On the FRED® website, <https://fred.stlouisfed.org/>, create a map by following the instructions below.
2. Search for “Resident Population in Georgia.”
3. Click on “View Map.”
4. Click on “Edit Map” and select “Data grouped by: Equal Interval.”
5. Select “Date: 2015-01-01.”
6. Hover over the map to view each state’s population.
7. To convert the population data from thousands to number of people, multiply by 1,000.

Handout 3: Adjusted Volunteer Data for Select States, 2015

State	Volunteers	Volunteer hours (millions)	Population (millions)
California	7,041,413	940.16	39.0
Texas	4,652,679	566.19	27.5
New York	3,137,688	556.74	19.7
Minnesota	1,560,667	155.41	
Utah	844,023	170.36	
Your state:			

State	Volunteerism rate	Volunteer hours per capita
California	18%	24
Texas	17%	21
New York	16%	28
Minnesota		
Utah		
Your state:		

Handout 3: Adjusted Volunteer Data for Select States, 2015—Answer Key

State	Volunteers	Volunteer hours (millions)	Population (millions)
California	7,041,413	940.16	39.0
Texas	4,652,679	566.19	27.5
New York	3,137,688	556.74	19.7
Minnesota	1,560,667	155.41	5.5
Utah	844,023	170.36	3.0
Your state:			

State	Volunteerism rate	Volunteer hours per capita
California	18%	24
Texas	17%	21
New York	16%	28
Minnesota	28%	28
Utah	28%	57
Your state:		

Handout 4: Population Adjustments Assessment (page 1 of 2)

1. Search FRED® (<https://fred.stlouisfed.org/>) for the following data series and fill in the columns in the table for the year 2015:
 - “Median Adjusted Gross Income in California”
 - “Unemployment Rate in California, Annual”
 - “Estimated Percent of People of All Ages In Poverty in California.”

Repeat the searches for the other five states listed in the table. Definitions of the variables are provided below the table.

State	Volunteer rate (%)	Volunteer hours per capita	Median income (\$)	Unemployment rate (%)	Poverty rate (%)
California	18%	24			
Texas	17%	21			
New York	16%	28			
Minnesota	28%	28			
Utah	28%	57			
Your state:					

- **Median income:** The middle income in society. If someone earns the median income, then there are the same number of people earning more as there are earning less than that person.
 - **Unemployment rate:** The percentage of the labor force that is willing and able to work, does not currently have a job, and is actively looking for employment.
 - **Poverty rate:** The percentage of people living in families with an income below the poverty line. The poverty line is an income level that varies by family size and composition.
2. Do you see any patterns in median income, the unemployment rate, and/or the poverty rate when compared with the high volunteer rates or volunteer hours per capita? If so, what are they?
 3. Which government agency generates the median income and poverty rate data? Is this agency a reliable data source? Why?

Handout 4: Population Adjustments Assessment (page 2 of 2)

- 4 Personal income is the money people living in each state and the District of Columbia get from wages, proprietors' income, dividends, interest, rents, and government benefits. These statistics help assess and compare the economic well-being of state residents. Search the FRED® website (<https://fred.stlouisfed.org/>) for "Per Capita Personal Income in California" to determine the total income in 2015 for that state. Repeat the search for the other five states listed in the table below.

State	GDP per capita (2015 \$)
California	
Texas	
New York	
Minnesota	
Utah	
Your state:	

Handout 4: Population Adjustments Assessment—Answer Key (page 1 of 2)

1. Search FRED® (<https://fred.stlouisfed.org/>) for the following data series and fill in the columns in the table for the year 2015:

- “Median Adjusted Gross Income in California”
- “Unemployment Rate in California, Annual”
- “Estimated Percent of People of All Ages In Poverty in California.”

Repeat the searches for the other five states listed in the table. Definitions of the variables are provided below the table.

State	Volunteer rate (%)	Volunteer hours per capita	Median income (\$)	Unemployment rate (%)	Poverty rate (%)
California	18%	24	\$40,998	6.20%	15.4%
Texas	17%	21	\$37,878	4.45%	15.9%
New York	16%	28	\$40,769	5.26%	15.5%
Minnesota	28%	28	\$47,540	3.68%	10.2%
Utah	28%	57	\$43,519	3.63%	11.2%
Your state:					

- **Median income:** The middle income in society. If someone earns the median income, then there are the same number of people earning more as there are earning less than that person.
- **Unemployment rate:** The percentage of the labor force that is willing and able to work, does not currently have a job, and is actively looking for employment.
- **Poverty rate:** The percentage of people living in families with an income below the poverty line. The poverty line is an income level that varies by family size and composition.

2. Do you see any patterns in median income, the unemployment rate, and/or the poverty rate when compared with the high volunteer rates or volunteer hours per capita? If so, what are they?
The two states with the highest volunteer rates and/or highest volunteer hours per capita also have the highest median incomes, the lowest unemployment rates, and the lowest poverty rates of the five states.

3. Which government agency generates the median income and poverty rate data? Is this agency a reliable data source? Why?
The U.S. Census Bureau, a government agency, collects this data. Their mission is to “serve as the nation’s leading provider of quality data about its people and economy.” Collecting accurate data regarding the U.S. population is part of its mission and has its roots in the Census mandated by the U.S. Constitution. So, people would likely consider this agency to be a reliable source of data.

Handout 4: Population Adjustments Assessment—Answer Key (page 2 of 2)

4. Personal income is the money people living in each state and the District of Columbia get from wages, proprietors' income, dividends, interest, rents, and government benefits. These statistics help assess and compare the economic well-being of state residents. Search the FRED® website (<https://fred.stlouisfed.org/>) for "Per Capita Personal Income in California" to determine the total income in 2015 for that state. Repeat the search for the other five states listed in the table below.

State	GDP per capita (2015 \$)
California	<i>\$53,817</i>
Texas	<i>\$46,760</i>
New York	<i>\$56,603</i>
Minnesota	<i>\$51,362</i>
Utah	<i>\$39,899</i>
Your state:	

Standards and Benchmarks

ACRL Information Literacy Frame

- Authority Is Constructed and Contextual
- Information Creation as a Process

Voluntary National Content Standards in Economics

Standard 4: Incentives

- **Benchmarks: Grade 12**

1. Acting as consumers, producers, workers, savers, investors, and citizens, people respond to incentives in order to allocate their scarce resources in ways that provide them the highest possible net benefits.
2. Decision-making in small and large firms, labor unions, educational institutions, and not-for-profit organizations has different goals and faces different rules and constraints. These goals, rules, and constraints influence the benefits and costs of those who work with or for those organizations, and, therefore, their behavior.

Standard: Per Capita

This concept is mentioned across various sections of the standards, mostly in relation to Real GDP and living standards.