Data Literacy: The Composition Effect

Lesson Author

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Standards and Benchmarks (see page 16)

Lesson Description

This lesson is part of the Data Literacy series, which was created to help university and secondary school librarians and other faculty members teach students how to reliably identify, interpret, and communicate data.

The lesson focuses on the composition effect. Students evaluate unemployment data from different racial and ethnic groups to determine how accurately the national rate of unemployment describes the labor market experiences of different groups of workers. Through a guided discussion and review of data, students learn how to identify the composition effect and why it is important to take it into account when describing a diverse group with a single statistic. They also identify the Bureau of Labor Statistics as the source of the data used in the lesson and discuss the methodology used to create a statistic from data. As an assessment, they use various data series in FRED® to identify the presence of the composition effect in other economic statistics.

Data Literacy Concepts

Editing and transforming data

Evaluating the credibility of data and data sources

Economic Concepts

Population adjustments

Unemployment rate

Mathematics Concepts

Composition effect and its relationship to means and averages

Population rates

Objectives

Students will be able to

- explain how unemployment numbers for the United States are determined;

- explain how the unemployment rate is calculated;

- identify problems that exist when using a statistic to describe a diverse population;

- explain the composition effect;

- identify factors/information needed to disaggregate data; and

- use FRED® to find data and determine the unemployment rate for population groups.

Grade Level

High School, College

Compelling Question

When using statistics to describe a group of persons, how do we derive meaning from a statistic that describes a diverse group?

Time Required

30-40 minutes

Materials

- PowerPoint Slides 1-5

- Visual 1, an outline of the PowerPoint slides, one copy for the teacher

- Handouts 1-2, one copy of each for each student

- Handouts 1-2 Answer Keys, one copy of each for the teacher

- Laptop, phone, or tablet for each student

- Access to the following for the teacher and students: FRED®, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/

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 at https://fredhelp.stlouisfed.org/.

- Go to https://www.bls.gov/cps/ to learn about the Current Population Survey (CPS) used by the Bureau of Labor Statistics (BLS) to calculate labor market statistics such as the unemployment rate.

- Go to https://www.bls.gov/cps/lfcharacteristics.htm#unemp to review the definition of the unemployment rate.

- Go to https://www.bls.gov/cps/demographics.htm to learn about the 13 demographic characteristics of the national labor force available from the CPS.

- Go to https://www.bls.gov/cps/demographics.htm#race to learn about the four racial and ethnic classification of workers used by the BLS.

- Follow the instructions for any of the groups in Handout 1 to use FRED® to calculate the unemployment rate using data from the CPS. URLs to the final versions of the graphs are provided.

Procedure

1. Tell the class that today's topic will cover the unemployment rate. Ask a student to define unemployment. (*Accept plausible answers.*)

2. Explain that in the United States, the Bureau of Labor Statistics (BLS) is the federal agency in charge of measuring unemployment. Alternatively, show the following video: https://www.bls.gov/video/?video=SNNCG6m-gYM.

3. Display Slide 1. Discuss the following:

   - Who does the BLS classify as unemployed? (*Answers will vary.*)

   - Does this include someone who does not have a job? (*Most students should agree.*)

   - Does this include someone who has actively looked for work in the prior four weeks? (*Fewer students are likely to agree.*)

   - Does this include someone who is currently available for work? (*Fewer students are likely to agree.*)

   - Does this include someone waiting to be recalled to a job from which they had been temporarily laid off? (*Fewer students are likely to agree.*)

   - Does this include someone receiving benefits from the Unemployment Insurance (UI) program? (*Fewer students are likely to agree.*)

4. Display Slide 2 or navigate to https://www.bls.gov/cps/lfcharacteristics.htm#unemp. Explain that to be considered unemployed, a person must be 16 years of age or older and out of a job, have actively looked for work in the prior four weeks, and be currently available to work. People temporarily laid off are also considered unemployed. Note that receiving benefits from the UI program has no bearing on whether a person is classified as unemployed.

5. Ask a student to define the unemployment rate. (*Answers will vary.*)

6. Display Slide 3 or navigate to https://www.bls.gov/cps/lfcharacteristics.htm#unemp. Or, show the following video: https://www.bls.gov/video/?video=BPCbBP7wJ6c. Define the **unemployment rate** as the number of unemployed as a percent of the labor force. The labor force is the sum of the number of persons employed and the number of persons unemployed.

7. Ask a student how the BLS calculates both the number of unemployed persons and the unemployment rate for the nation. (*Answers will vary but may include the use of a survey.*)

8. Explain that the BLS conducts the monthly Current Population Survey (CPS) to find the information needed to calculate both the number of unemployed and the unemployment rate for the nation. The following video from the Pew Research Center can be used to supplement the discussion: https://youtu.be/sonXfzE1hvo. Discuss the following:

    •   Each month, highly trained and experienced Census Bureau employees contact 60,000 eligible sample households and ask about household members' labor force activities and status.

    •   These are live interviews conducted either in person or over the phone.

    •   Each person is classified according to his or her activities during the reference week.

    •   Survey responses are "weighted," or adjusted to independent population estimates from the Census Bureau.

    •   The weighting takes into account different personal characteristics so that these characteristics are reflected in the proper population proportions in the final estimates.

9. Ask a student what questions the BLS is likely to ask persons taking the CPS to learn important details about their employment situation. (*Answers will vary but may include education, age, gender, marital status, veteran status, race, and ethnicity.*)

10. Ask a student why it is important for the BLS to collect this information. (*Answers will vary but may mention the fact that the employment situation of a survey respondent can be related to their education, age, gender, and so on. For example, workers with only a high school education are less likely to be employed than are workers with a college education.*)

11. Explain that these personal characteristics are used to create an accurate estimate of the national unemployment rate but that they are also important to describe the labor market experiences of different population groups within the nation.

12. Display Slide 4 or navigate to https://www.bls.gov/cps/demographics.htm. Explain that the BLS records 13 different demographic characteristics about the people it interviews. The BLS compares how common these characteristics are among the interviewees with how common they are in the U.S. population as a whole to calculate the relative weights of each group. Remind students that the CPS only collects answers from a relatively small number of people (60,000 households) but that it attempts to describe a whole country (328 million people).

13. Display Slide 5 or navigate to https://www.bls.gov/cps/demographics.htm. Explain that the size of each racial and ethnic group, relative to the total U.S. population, is a proportion, or a percentage. The relative size of each group determines its weight in the calculation of the national unemployment figures. Help the students interpret the information in the graphs on the slide by asking the following questions:

    • How many racial and ethnic categories does the U.S. Census identify? (*8*)

    • How many racial and ethnic categories does the CPS identify? (*4*)

    • Which racial and ethnic categories are not present in the CPS? (*American Indian and Alaska Native alone; Native Hawaiian and Other Pacific Islander alone; Two or More races; White alone, not Hispanic or Latino*)

    • Can the Hispanics or Latinos group be of different races? (*Yes. This is an ethnic group, not a racial group.*)

    • Rank the eight racial and ethnic categories identified in the U.S. Census by relative size from largest to smallest. (*White alone; White alone, not Hispanic or Latino; Hispanic or Latino; Black or African American alone; Asian alone; Two or More races; American Indian and Alaska Native alone; Native Hawaiian and Other Pacific Islander alone*)

    • Rank the four racial and ethnic categories identified in the CPS by relative size from largest to smallest. (*White; Hispanic or Latino; Black or African American; Asian*)

    • Why doesn't the CPS calculate labor market statistics for American Indian and Alaska Native alone; Native Hawaiian and Other Pacific Islander alone; and Two or More races? (*The number of survey respondents in those racial categories was determined to be too small to develop employment and unemployment estimates of sufficient reliability for monthly publication. See https://www.bls.gov/cps/rvcps03.pdf [p.5].*)

14. Explain that there are many different population proportions across racial and ethnic groups. This results in a marked composition effect, meaning that looking at the big picture sometimes masks what is going on with the individual parts. In the case of the unemployment rate, the national or overall unemployment rate represents the big picture. The individual parts are the unemployment rates for different ethnicities and races. The overall unemployment rate does not reflect well the different labor market experiences of individual racial and ethnic groups.

15. Tell the students that they are going to calculate the unemployment rate for different racial and ethnic groups and for the nation as a whole.

16. Divide the class into five small groups for the remainder of the lesson. Assign students to Group 1, Group 2, and so on. Do not organize the student groups by racial or ethnic origin. Groups with diverse skill sets are preferred. If short on time, randomly assign students to groups. Distribute *Handout 1: Instructions for Groups 1-5* to each student. Allow time for students to work.

17. Invite students from different groups to share their answers. Discuss the following:

- Check with Group 1: What is the last reported value of the national unemployment rate? (*Answer will vary over time.*)

- Check with Groups 2-5: What is the last reported value of the unemployment rate for each racial and ethnic group? (*Answers will vary. At the time of this writing, the unemployment rates ranked from highest to lowest are ordered as follows: Black or African American; Hispanic or Latino; White; Asian.*)

- Which racial or ethnic group's unemployment rate is currently the most similar in value to the national unemployment rate? (*Answer will vary over time. At the time of this writing, it is the unemployment rate for Whites.*)

- Which racial or ethnic group's unemployment rate is currently the most dissimilar in value to the national unemployment rate? (*Answer will vary over time. At the time of this writing, it is the unemployment rate for Blacks or African Americans.*)

- Display the graph from https://fred.stlouisfed.org/graph/?g=rPO8 and discuss the following:

  ○ When were data on racial and ethnic groups first reported in the CPS? (*1972*)

  ○ When were data on Asians first reported in the CPS? (*2000*)

  ○ If the CPS were to report data on American Indians and Alaska Natives alone and on Native Hawaiians and Other Pacific Islanders alone, where would you expect their unemployment rates to be relative to the existing racial and ethnic groups? Why? (*Answers will vary. Considering the different degrees of educational attainment reported by the National Center for Education Statistics [https://nces.ed.gov/programs/raceindicators/indicator_RFA.asp], one could speculate that American Indians and Alaska Natives would have higher unemployment rates than Blacks or African Americans and that Native Hawaiians and Other Pacific Islanders would have unemployment rates similar to Asians.*)

  ○ If the CPS were to report data on persons of Two or More races, where would you expect their unemployment rates to be relative to the existing racial and ethnic groups? Why? (*Answers will vary. From the same source cited above, one could speculate that persons of Two or More races would have similar unemployment rates to Whites.*)

Closure

18. Review the key points of the lesson by discussing the following:

- Unemployment numbers for the United States are determined by the Bureau of Labor Statistic's Current Population Survey (CPS).

- The unemployment rate is calculated by dividing the number of unemployed persons by the sum of the number of persons employed and unemployed.

- When using a single statistic to describe a diverse population, the composition effect is problematic, meaning that looking at the big picture sometimes masks what is going on with the individual parts.

- Population characteristics such as age, gender, marital status, race, or ethnic group are needed to disaggregate data.

- Use FRED® to find data and determine the unemployment rate for population groups.

Assessment

19. Distribute a copy of *Handout 2: The Composition Effect Assessment* to each student. Assign as homework or allow time for students to complete individually in class. For answers, see *Handout 2: The Composition Effect Assessment—Answer Key*.

Visual 1: Outline of PowerPoint Slides (page 1 of 2)

Slide 1: Who is counted as unemployed?

Who does the Bureau of Labor Statistics (BLS) classify as unemployed?

- Does this include someone who does not have a job?
- Does this include someone who has actively looked for work in the prior four weeks?
- Does this include someone who is currently available for work?
- Does this include someone waiting to be recalled to a job from which they had been temporarily laid off?
- Does this include someone receiving benefits from the Unemployment Insurance (UI) program?

Slide 2: Definition of an unemployed person

A person is considered unemployed if she or he

- is 16 years of age or older and does not have a job;
- has actively looked for work in the prior four weeks; and
- is currently available for work.
- Also, someone waiting to be recalled to a job from which they had been temporarily laid off is considered unemployed.
- Note that receiving benefits from the Unemployment Insurance (UI) program has no bearing on whether a person is classified as unemployed.

Slide 3: Definition of the unemployment rate

It is the number of persons unemployed as a percent of the labor force.

- Unemployment rate = Number of persons unemployed / Labor force
- Labor force = Number of persons employed + Number of persons unemployed

### Slide 4: Labor force demographic characteristics available from the Current Population Survey (CPS)

Age	Race and Hispanic ethnicity
Certifications and licenses	School enrollment
Disability	Veterans
Educational attainment	Volunteering
Families and marital status	Women
Foreign-born workers	Youth
Older workers	

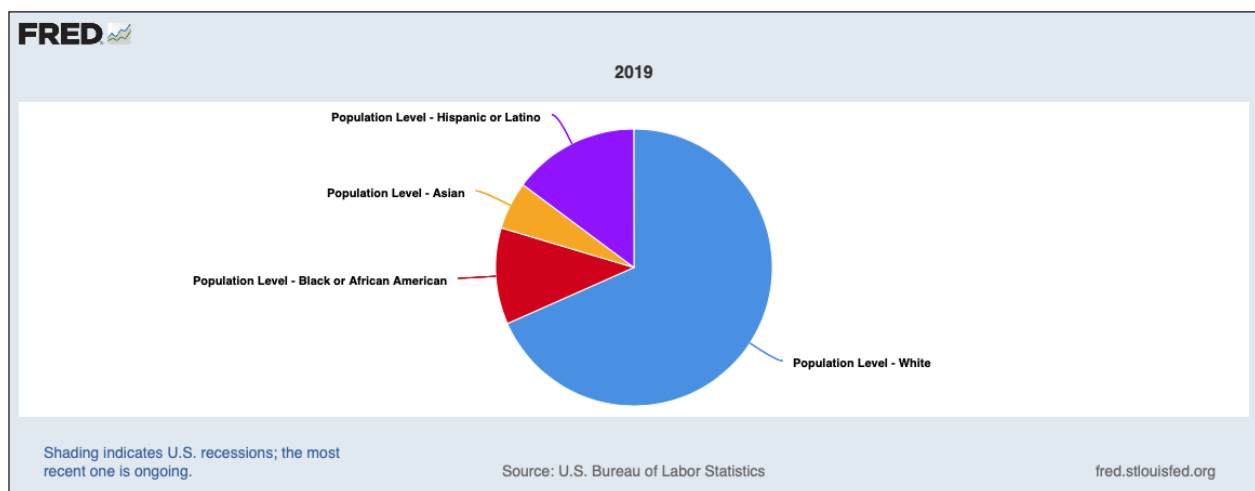**Visual 1: Outline of PowerPoint Slides (page 2 of 2)**

Slide 5: Population percentages from the U.S. Census (A) and labor force percentages from the Current Population Survey (CPS) (B)

A. Population Percentages from the U.S. Census

SOURCE: U.S. Census; https://www.census.gov/quickfacts/fact/table/US/PST045219.
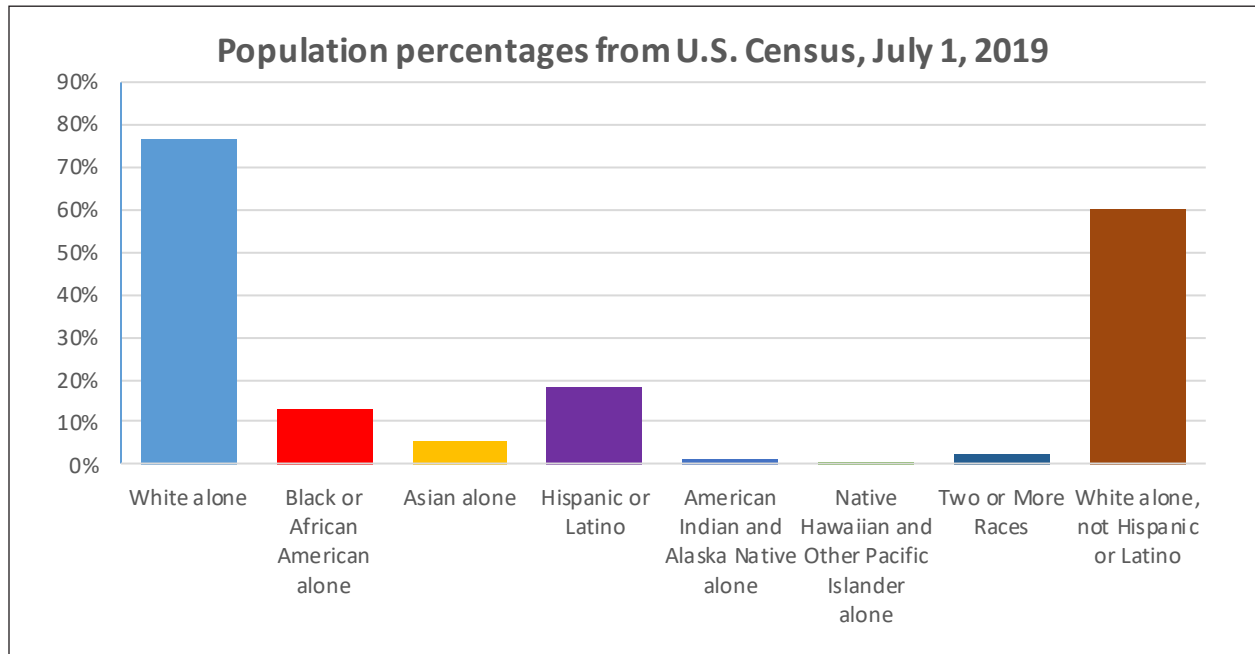
B. Labor Force Percentages from the Current Population Survey (CPS)

SOURCE: U.S. Bureau of Labor Statistics via FRED®, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/graph/?g=rOGp.

Handout 1: Instructions for Groups 1-5 (page 1 of 2)

Instructions for Group 1

1. Go to https://fred.stlouisfed.org/.
2. Search for "Civilian Labor Force Level, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU01000000)."
3. Click on "Edit Graph" and select "Edit Line 1."
4. Select "Modify frequency: Annual."
5. Examine the graph and write down the answer to this question: What is the last reported value of the (national) civilian labor force level? _____
6. Customize the data by searching for "Unemployment Level, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU03000000)." Click on "Add."
7. Customize the data by typing the formula "b/a*100" and click on "Apply."
8. Examine the graph and write down the answer to this question: What is the last reported value of the (national) unemployment rate? _____

Instructions for Group 2

1. Go to https://fred.stlouisfed.org/.
2. Search for "Civilian Labor Force Level - White, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU01000003)."
3. Click on "Edit Graph" and select "Edit Line 1."
4. Select "Modify frequency: Annual."
5. Examine the graph and write down the answer to this question: What is the last reported value of the civilian labor force level - White? _____
6. Customize the data by searching for "Unemployment Level - White, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU03000003)." Click on "Add."
7. Customize the data by typing the formula "b/a*100" and click on "Apply."
8. Examine the graph and write down the answer to this question: What is the last reported value of the unemployment rate - White? _____

Instructions for Group 3

1. Go to https://fred.stlouisfed.org/.
2. Search for "Civilian Labor Force Level - Black or African American, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU01000006)."
3. Click on "Edit Graph" and select "Edit Line 1."
4. Select "Modify frequency: Annual."
5. Examine the graph and write down the answer to this question: What is the last reported value of the civilian labor force level - Black or African American? _____

(*continued*)

Handout 1: Instructions for Groups 1-5 (page 2 of 2)

6. Customize the data by searching for "Unemployment Level - Black or African American, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU03000006)." Click on "Add."

7. Customize the data by typing the formula "b/a*100" and click on "Apply."

8. Examine the graph and write down the answer to this question: What is the last reported value of the unemployment rate - Black or African American? _____

Instructions for Group 4

1. Go to https://fred.stlouisfed.org/.

2. Search for "Civilian Labor Force Level - Asian, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU01032183)."

3. Click on "Edit Graph" and select "Edit Line 1."

4. Select "Modify frequency: Annual."

5. Examine the graph and write down the answer to this question: What is the last reported value of the civilian labor force level - Asian? _____

6. Customize the data by searching for "Unemployment Level - Asian, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU03032183)." Click on "Add."

7. Customize the data by typing the formula "b/a*100" and click on "Apply."

8. Examine the graph and write down the answer to this question: What is the last reported value of the unemployment rate - Asian? _____

Instructions for Group 5

1. Go to https://fred.stlouisfed.org/.

2. Search for "Civilian Labor Force Level – Hispanic or Latino, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU01000009)."

3. Click on "Edit Graph" and select "Edit Line 1."

4. Select "Modify frequency: Annual."

5. Examine the graph and write down the answer to this question: What is the last reported value of the civilian labor force level - Hispanic or Latino? _____

6. Customize the data by searching for "Unemployment Level - Hispanic or Latino, Thousands of Persons, Monthly, Not Seasonally Adjusted (LNU03000009)." Click on "Add."

7. Customize the data by typing the formula "b/a*100" and click on "Apply."

8. Examine the graph and write down the answer to this question: What is the last reported value of the unemployment rate - Hispanic or Latino? _____

Handout 2: The Composition Effect Assessment (page 1 of 2)

A. S&P/Case-Shiller National and 20-City Composite Home Price Index
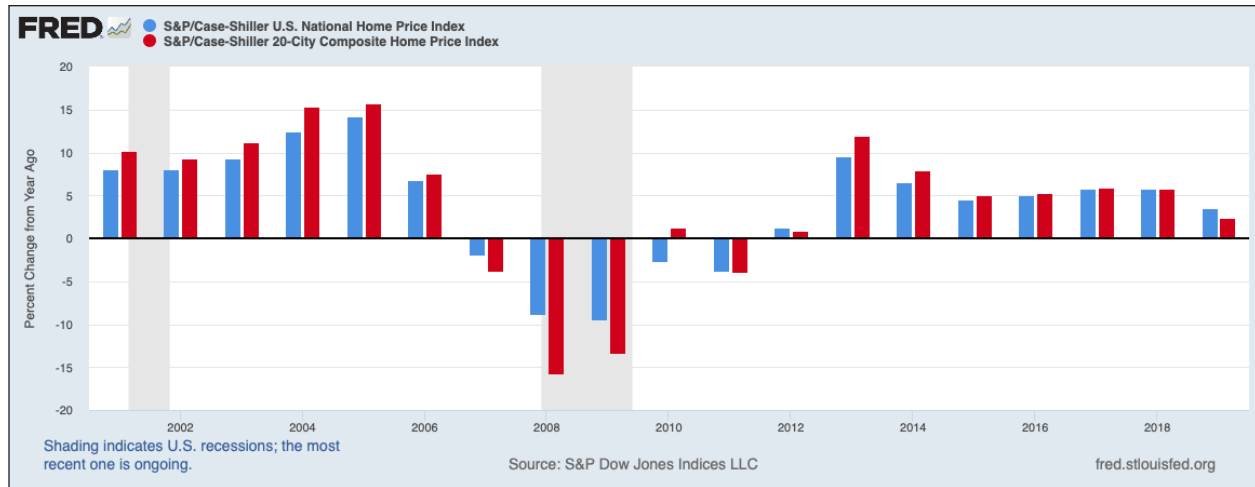
SOURCE: S&P Dow Jones Indices LLC via FRED®, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/graph/?g=rQ58.

Graph A shows the year-to-year growth rate of average home prices in the United States (blue bars) in its 20 largest metropolitan areas (red bars). The blue bars and red bars generally extend in the same direction, although by different magnitudes. Because these top 20 metropolitan areas are part of the United States, it's not surprising both sets of average prices move in the same direction.

But look what happened in 2010: Average home prices overall decreased while average home prices in the 20 largest metropolitan areas increased.

Write a short explanation of this phenomenon based on the composition effect of the S&P/Case-Shiller National Home Price Index.

Handout 2: The Composition Effect Assessment (page 2 of 2)

B. Labor Force Participation Rate of Veteran Men, Women, and Total
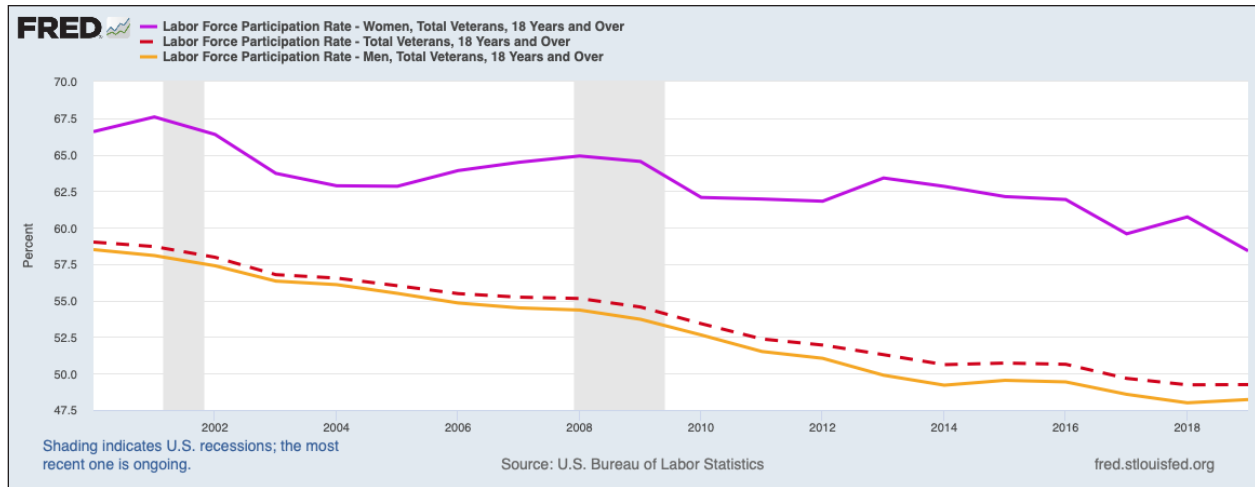
SOURCE: U.S. Bureau of Labor Statistics via FRED®, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/graph/?g=rQ5T.

Graph B shows the labor force participation rate of men and women veterans of the U.S. Armed Forces. The men's rate is the solid orange line; the women's rate is the solid magenta line; and the average across both genders is the dashed red line. As with the labor force participation rate of the overall civilian population, the rates in this graph are decreasing.

Notice how different the labor force participation rates of veteran men and women are, particularly relative to the average across genders.

Write a short explanation of this phenomenon based on the composition effect of the average labor force participation rate of veterans across genders.

Handout 1: Instructions for Groups 1-5—Answer Key

Answers for Group 1

- *FRED® graph: https://fred.stlouisfed.org/graph/?g=rQb4.*
- *As of 2019, the reported value of the (national) civilian labor force level is 164 million persons.*
- *As of 2019, the reported value of the (national) unemployment rate is 3.67 percent.*

Answers for Group 2

- *FRED® graph: https://fred.stlouisfed.org/graph/?g=rQd0.*
- *As of 2019, the reported value of the civilian labor force level – White is 126.6 million persons.*
- *As of 2019, the reported value of the unemployment rate – White is 3.28 percent.*

Answers for Group 3

- *FRED® graph: https://fred.stlouisfed.org/graph/?g=rQex.*
- *As of 2019, the reported value of the civilian labor force level – Black or African American is 20.6 million persons.*
- *As of 2019, the reported value of the unemployment rate – Black or African American is 6.06 percent.*

Answers for Group 4

- *FRED® graph: https://fred.stlouisfed.org/graph/?g=rQfW.*
- *As of 2019, the reported value of the civilian labor force level – Asian is 10.46 million persons.*
- *As of 2019, the reported value of the unemployment rate – Asian is 2.67 percent.*

Answers for Group 5

- *FRED® graph: https://fred.stlouisfed.org/graph/?g=rQgd.*
- *As of 2019, the reported value of the civilian labor force level – Hispanic or Latino is 29.05 million persons.*
- *As of 2019, the reported value of the unemployment rate – Hispanic or Latino is 4.29 percent.*

Handout 2: The Composition Effect Assessment—Answer Key

Home prices:

In 2010, average home prices overall decreased, while average home prices in the 20 largest metropolitan areas increased because average home prices in smaller metropolitan areas and rural areas decreased more than average home prices in large metropolitan areas increased. In 2010, the change in overall home prices did not accurately represent the change in average home prices in the 20 largest metropolitan areas.

Labor force participation rate of veterans:

The labor force participation rates of veteran men and women are very different, particularly relative to the average across genders because the proportion of veteran men to veteran women is very high. In this case, the average across genders does not accurately represent the labor market experience of women veterans.

Standards and Benchmarks

Voluntary National Content Standards in Economics

Standard 19: Unemployment

- **Benchmarks: Grade 12**

  1. The unemployment rate is an imperfect measure of unemployment because, among other reasons, it does not: (1) include workers whose job prospects are so poor that they become discouraged from seeking jobs and leave the labor force, and (2) reflect part-time workers who are looking for full-time work.

  2. Unemployment rates differ for people of different ages, races, and sexes. This reflects differences in work experience, education, training, and skills, as well as discrimination.

ACRL Information Literacy Frame

- **Authority Is Constructed and Contextual**

- **Information Creation as a Process**

Common Core State Standards in Mathematics

High School: Number and Quantity

- **Reason quantitatively and use units to solve problems.**

  CCSS.MATH.CONTENT.HSN.Q.A.2: Define appropriate quantities for the purpose of descriptive modeling.

High School: Statistics & Probability

- **Make inferences and justify conclusions from sample surveys, experiments, and observational studies.**

  CCSS.MATH.CONTENT.HSS.IC.B.3: Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.