

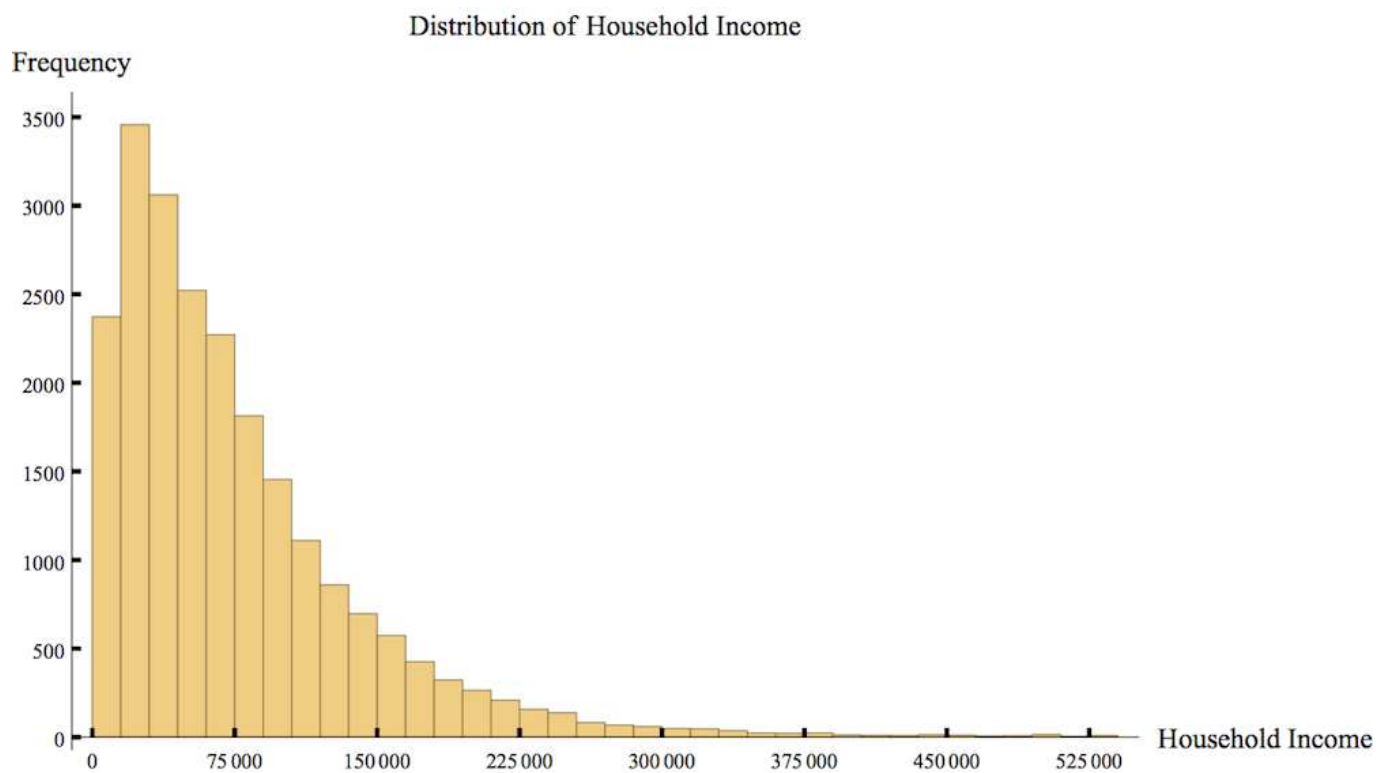


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1.2.2 Quiz: Reading Histograms

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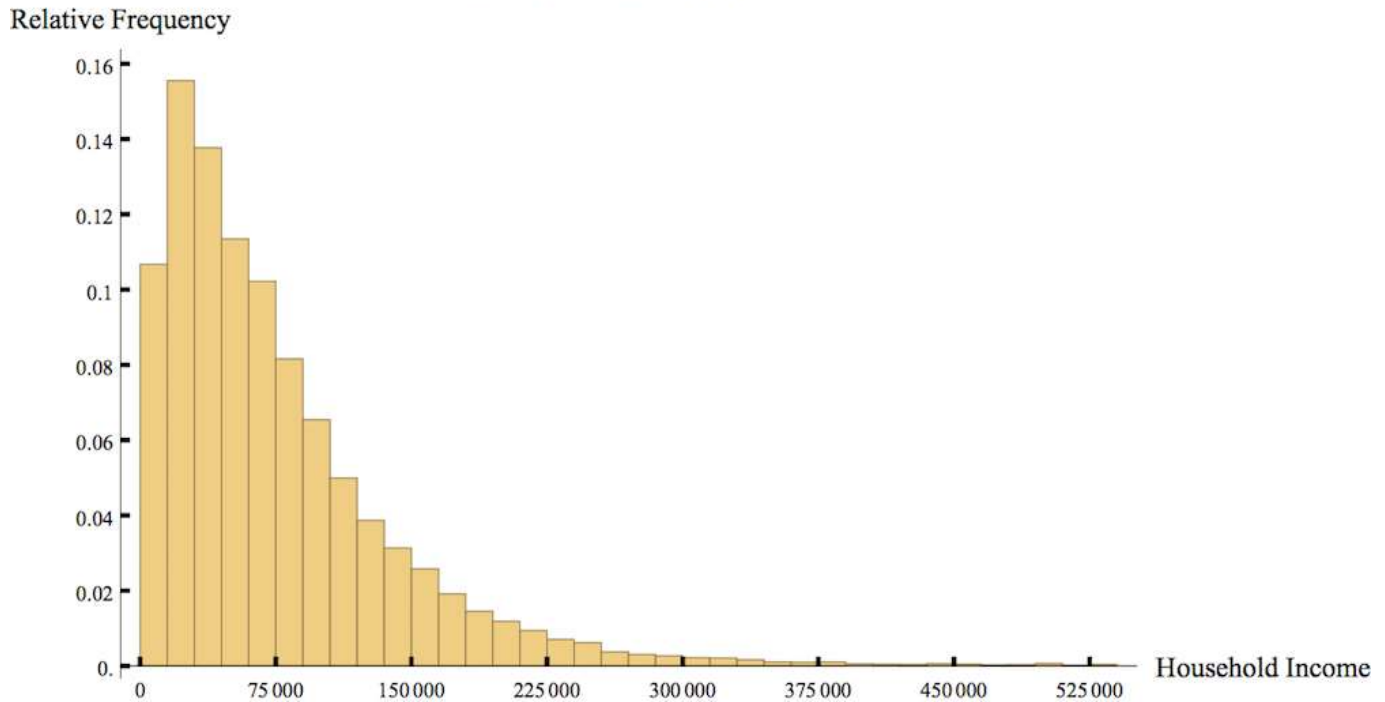
Use these two histograms above to answer the following questions. These histograms are from the same U.S. Census data set as the other histograms in this section.



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[Image Description](#)

Distribution of Household Income

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Question 1

1/1 point (graded)

Choose the best estimate for the number of households in the sample with income in range 75,000 to 90,000.

☐ 1100☐ 1500☒ 1800 ✓☐ 2300

Explanation

There are ten bins between \$0/year and \$150,000/year, so each bin has width \$15,000/year. The bar that starts at \$75,000/year (midway between \$0/year and \$150,000/year) and extends to \$90,000/year has frequency 1800.

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You have used 1 of 2 attempts

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Question 2

1/1 point (graded)

Choose the best estimate for the percent of households in the sample with income in range 75,000 to 90,000.

☐ 0.08%

☐ 0.1%

☒ 8% ✓

☐ 10%

☐ None of the above

Explanation

There are ten bins between \$0/year and \$150,000/year, so each bin has width \$15,000/year. The bar that starts at \$75,000/year (midway between \$0/year and \$150,000/year) and extends to \$90,000/year has a height corresponding to 0.08 or 8%.

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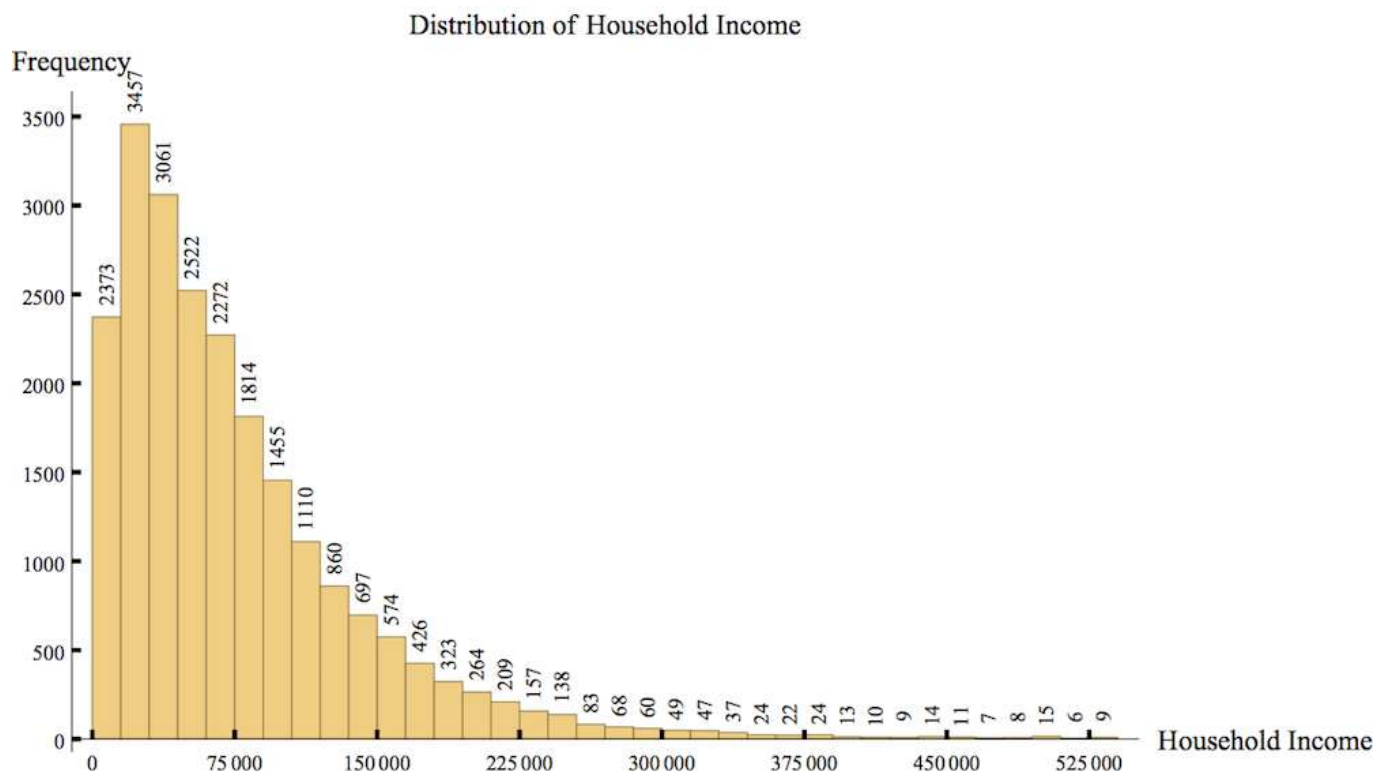
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Question 3

1/1 point (graded)

Here's the frequency histogram for the sample Nina presented, with 22,378 household incomes. Each bar is labeled with its exact height. Using this information, which of the following statements must be true?

Choose all that apply.



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Image Description

- ☒ The total number of households in the sample with income in the range \$60,000/year to \$90,000/year is 4,086. ✓
- ☐ The total number of households in the sample with income in the range \$75,000/year to \$82,500/year is 907.
- ☒ The percent of households in the sample with income less than \$30,000/year is 26.1%, rounded to the nearest tenth percent. ✓
- ☐ None of the above.

**Explanation**

The total number of households in the sample with income in the range \$60,000/year to \$90,000/year is 4,086. This is true because the number in the range \$60,000/year to \$75,000/year is 2272 while the number of households in the range \$75,000/year to \$90,000/year is 1814. The total number of households with income between \$60,000/year and \$90,000/year is $2272 + 1814 = 4086$.

Because the bin sizes are \$15,000/year, the histogram does not provide enough information to determine the exact number of households with income in the range \$75,000/year to \$82,500/year. (We could guess it is half of the number in the range \$75,000/year to \$90,000/year, which is 1814, but we can't say for sure.)

The number of households in the sample with income less than \$30,000/year is $3457 + 2373 = 5830$. This is $\frac{5830}{22378}$ or about 26.1% of the total number of households.

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You have used 1 of 2 attempts

 Answers are displayed within the problem

Question 4

1/1 point (graded)

In the relative frequency histogram, the height of the bar above the bin [15000,30000) is **3457/22,378 \approx 0.15**.

What can we say from this information? Choose the **two** best answers.

☒ We know that about 15% of households in the sample earning income in 2013 made somewhere between 15,000–30,000. ✓

☐ We know that about 15% of all U.S. households earning some income in 2013 made between \$15,000 and \$30,000 per year.

☒ We can predict that about 15% of all U.S. households earning some income in 2013 made between \$15,000 and \$30,000/year. (This is only a prediction since the sample may not be exactly representative of the population.) ✓

☐ We can predict that about 15% of all U.S. households earning income in 2017 made somewhere between 15,000–30,000.

☐ None are valid.



Explanation

We know that 3457 out of the 22,378 households earned between \$15,000 and \$30,000 per year in 2013. This is about **15%** of all households in the sample.

If this is a representative sample of the population of the United States at the time, we can use this information to predict that about **15%** of all US households earning positive income earned between \$15,000/year and \$30,000/year in 2013.

Wages, prices, and demographics change over time. We should be wary of using data from 2013 to predict conditions in 2017.

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You have used 1 of 3 attempts

 Answers are displayed within the problem

Question 5

1/1 point (graded)

This question is to help you reflect on the differences and similarities between frequency and relative frequency histograms.

You may find it useful to look at the following interactive histograms in Desmos, which show the data from our small example with only 100 households.

Desmos Graph: Frequency Histogram- Small Sample (opens in a new window/tab)

Desmos Relative Frequency Histogram - Small Sample (opens in a new window/tab)

Choose all which are true.

- ☐ In the frequency histogram, the sum of the heights of the bars is 1.
- ☒ In the relative frequency histogram, the sum of the heights of the bars is 1. ✓
- ☐ In the frequency histogram, the sum of the heights of the bars is the total income of all households represented in the histogram.
- ☐ In the relative frequency histogram, the sum of the heights of the bars is the total income of all households represented in the histogram.
- ☒ If the bin size is the same for both, then the shape of the histogram is the same for both; only the scale on the vertical axis changes. ✓



Explanation

Frequency and relative frequency histograms each have strengths and weaknesses – otherwise we would study only one type of histogram! The shape of the histogram is the same for both, but the vertical axis of a frequency histogram is labeled with counting numbers while the vertical axis of a relative frequency histogram is labeled with percentages.

In the frequency histogram, the sum of the heights of the bars equals the total number of households in the sample. In the relative frequency histogram, the sum of the heights of the bars equals 100% or 1.

Note: In this sample, as bin size decreases we reach a point at which there is only one value in each bin. In the frequency histogram, these bars have height 1 while all other bars have height 0. In the relative frequency histogram, the height of each bar is $1/22378$. This doesn't happen in general - there can be multiple data points with the same value, in which case the bins have more than 1 value in them.

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You have used 2 of 3 attempts

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Question 6

1/1 point (graded)

Nina gave an example of a company with 11 employees, including a CEO. The median salary was 50,000 and the mean (average) salary was 136,364 (rounded to the nearest dollar).

She said we could figure out the total amount spent on salaries, knowing only this information.

Which of the following is a correct way to use this information to determine the total amount the company spends on salaries?

- ☐ Multiply the median by 11 to get the total spent on salaries. (The mean information is not needed to determine the answer.)
- ☒ Multiply the mean by 11 to get the total spent on salaries. (The median information is not needed to determine the answer.) ✓
- ☐ Take the average of the mean and median and multiply by 11.
- ☐ None of the above.

Explanation

The average is just the total value spent on salaries divided by the number of salaries. So to find the total spent on salaries we would multiply the average salary by 11.

The median salary would be the middle entry in a list of salaries sorted by size (or the average of the two middle entries if the number of entries is even). The median may reflect general trends in the population that are not well reported by the average. For example, median salaries tend to be lower than the average salary while median grades tend to be higher than the average grade.

However, because the median does not well represent outlying values (high salaries, low grades) it is not useful for calculating the total spent on salaries, without knowing other information.

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You have used 1 of 2 attempts

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Question 7: Think About It...

1/1 point (graded)

Which of the two values, mean or median, do you think is more representative of the household income data? Why?

median, since the data is skewed.



Thank you for your response.

Explanation

This is discussed in the next video. While the mean is useful to compute total amount (as in the previous example), the mean is affected by outliers (high salaries, very low salaries) so can be less representative of the whole population. The median is the middle entry in a list of data sorted by size (or the average of the two middle entries if the number of entries is even). The median may reflect general trends in the population that are not well reported by the mean. For example, median salaries tend to be lower than the average salary while median grades tend to be higher than the average grade. So we'd expected the median to be more representative here.

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You have used 1 of 2 attempts

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