

Spring 2017

**Problem 1** For this exercise, we will use a global poverty line of \$2/day (PPP).

Below are statistics on the number of persons living on less than \$2 a day in Malawi in 2010 from the World Bank's [PovcalNet database](#).

Malawi Population by Daily Income (PPP), 2010

Daily Income	Between 0 and 50 cents	Between 50 cents and 1 dollar	Between 1 and 1.5 dollars	Between 1.5 and 2 Dollars	Total Population of Country
Millions of Persons	1.25	4.25	3.5	2	15

Using that data answer the following questions.

1.1) What is the Poverty Headcount Ratio in percent?

$$H = \frac{1.25 + 4.25 + 3.5 + 2}{15} = \frac{11}{15} = 0.73 = 73\%$$

1.1) What is the average income for persons below the poverty line?

$$\begin{aligned} yq &= \frac{1.25 \times \left(\frac{.50 + 0}{2}\right) + 4.25 \times \left(\frac{1 + .50}{2}\right) + 3.5 \times \left(\frac{1 + 1.50}{2}\right) + 2 \times \left(\frac{2 + 1.50}{2}\right)}{1.25 + 4.25 + 3.5 + 2} \\ &= \frac{1.25 \times 0.25 + 4.25 \times 0.75 + 3.5 \times 1.25 + 2 \times 1.75}{11} \\ &= \frac{0.31 + 3.19 + 4.38 + 3.50}{11} = \frac{11.38}{11} = \$1.03 \end{aligned}$$

1.1) What is the Average Poverty Gap in percent?

$$APG = H \times \left(\frac{z - yq}{z}\right) = 0.73 \times \left(\frac{2 - 1.03}{2}\right) = 0.73 \times 0.48 = 0.36 = 36\%$$

*Note: when I compute solutions, I am not carrying over rounding errors. Your answers may differ slightly depending how you carry rounding errors.*

**Problem 2.** Below is data from the [US Census Bureau's Current Population Survey \(CPS\)](#) on household income and inequality in 2014. Income numbers are in USD.

**Table: Income and Inequality in the United States, 2014**

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
Income Range	Below 21,000	21,000–41,000	41,000–68,000	68,000–112,000	Above 112,000
Share of Aggregate Income (%)	3	8	14	23	52

Using the numbers in the income table answer the following questions.

Note: There are two common methods for computing the relative wealth of different quintiles. One is to compare the incomes of people exactly at the quintile cutoffs (the poorest household in the top quintile compared to the richest person in the bottom quintile), while another involves comparing the average income of all households in the top quintile compared to the average income of all households in the bottom quintile. Here we see how they compare.

**Question 2.1)** What is the 80/20 income ratio (income of the household in the 80<sup>th</sup> percentile relative to income of the household in the 20<sup>th</sup> percentile)?

$$80/20 \text{ Ratio} = \frac{112,000}{21,000} = 5.3$$

**Question 2.2)** What is the ratio of the average income of the top quintile relative to the average income of the bottom quintile? What do the differences in these numbers indicate?

Secret is to realize that we don't need to know the actual incomes. There are the same number of households in each quartile and therefore share of total income is enough.

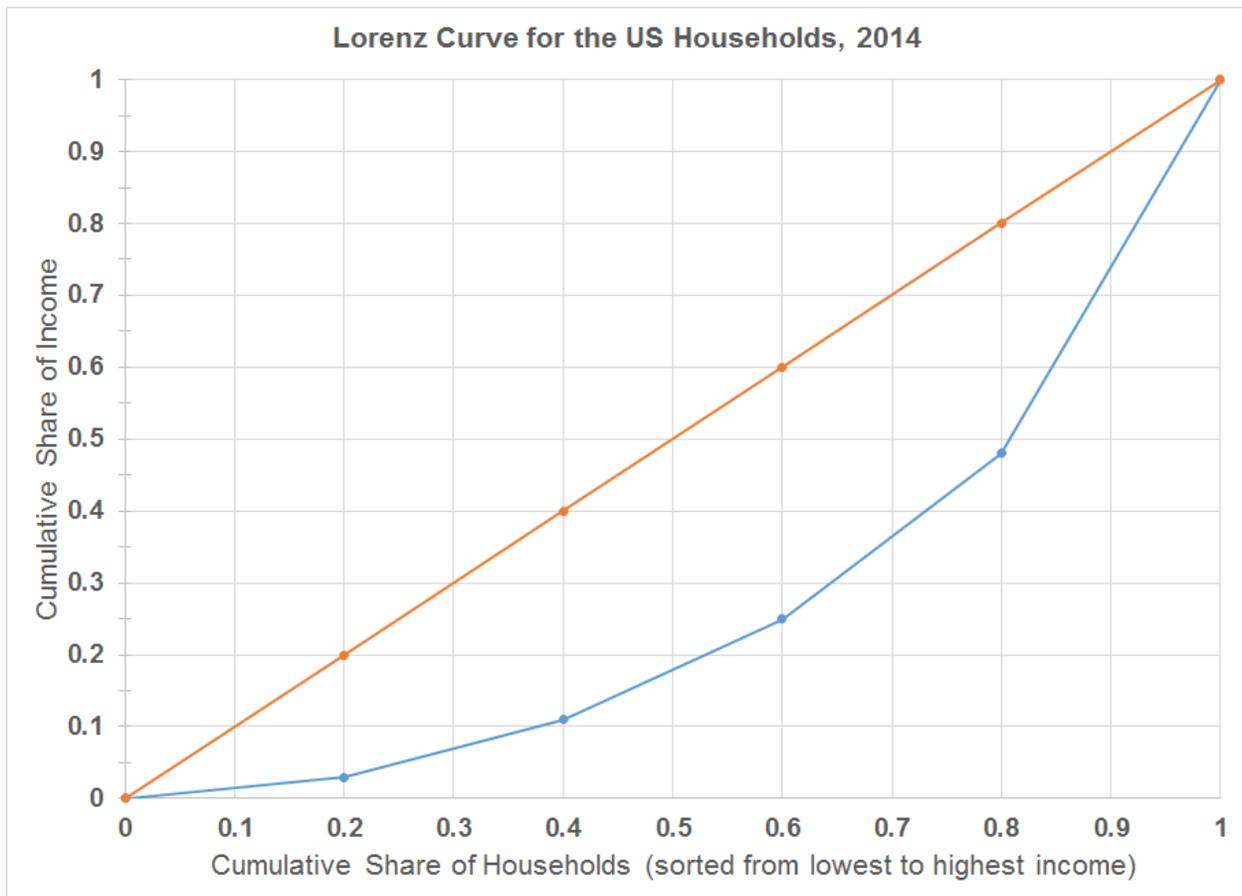
$$\frac{\text{Avg Income of Top Quintile}}{\text{Avg Income of Bottom Quintile}} = \frac{52\%}{3\%} = 17.3$$

Question 2.3)

Fill in the numbers for the following table

	First Quintile	Second Quintile	Third Quintile	Fourth Quintile	Fifth Quintile
<b>Cumulative</b> Share of Aggregate Income (as a fraction)	<b>0.03</b>	<b>0.11</b>	<b>0.25</b>	<b>0.48</b>	<b>1.00</b>
		= 0.08 + 0.03	= 0.14 + 0.11	= 0.23 + 0.25	= 0.52 + 0.48

Using those numbers, draw the Lorenz Curve for the United States.



The area under the Lorenz curve is approximately 0.274. What is the gini coefficient as a percentage?

(You can estimate it yourself by breaking the graph up into squares and triangles. Area of Square = Length  $\times$  Width, Area of Triangle =  $\frac{1}{2}$ (Length  $\times$  Width)] – although it isn't super accurate)

$$G = 1 - 2S = 0.452$$

$$\text{Gini} = (1 - 2 \times \text{Area under Lorenz Curve}) = 0.452$$