

## UNIT 3 SESSION 6: LINE GRAPHS

Age range: 8 - 12 years

<p><b>Outline</b> Learners will use line graphs to investigate how average income per person has changed over time in the UK and each of the four Young Lives countries (Ethiopia, India, Peru and Viet Nam). They will then construct line graphs to show how life expectancy has changed over time in each country. Finally, learners will interpret and discuss inequality data from these five countries.</p>		
<p><b>Learning objectives</b></p> <ul style="list-style-type: none"> <li>To interpret data represented in line graphs.</li> <li>To construct a line graph for a set of data.</li> <li>To know why a line graph is useful for certain types of data.</li> <li>To understand how well-being and inequality can be measured in different ways.</li> </ul>	<p><b>Learning outcomes</b></p> <ul style="list-style-type: none"> <li>Learners will interpret and answer questions about line graphs showing how average income per person and inequality have changed over time in the UK and the four Young Lives countries.</li> <li>Learners will construct a line graph to show how life expectancy has changed over time in the four countries.</li> <li>Learners will discuss differences in average income per person, inequality and life expectancy between and within countries.</li> </ul>	
<p><b>Key questions</b></p> <ul style="list-style-type: none"> <li>What does the data tell you?</li> <li>Why is a line graph suitable for this data?</li> <li>What has happened to “average income per person” over time?</li> <li>How do the different countries compare?</li> <li>What has happened to life expectancy over time?</li> <li>What do you think might be the reasons for these changes?</li> </ul>	<p><b>Resources</b></p> <ul style="list-style-type: none"> <li>Unit 3 Slideshow (Sessions 4 – 6): Slides 16 – 35</li> <li>Resource sheets:             <ol style="list-style-type: none"> <li><i>Average income per person</i></li> <li><i>Life expectancy - Table</i></li> <li><i>Inequality</i></li> </ol> </li> <li>Activity sheet 1: <i>Life expectancy - Line graph</i></li> </ul>	
<p><b>Curriculum links</b></p>		
<p><b>England</b> <i>Pupils should be taught to:</i> <b>Mathematics</b> <b>Statistics</b></p> <ul style="list-style-type: none"> <li>Interpret and construct bar charts, pictograms, tables, pie charts and line graphs and use these to solve problems.</li> </ul>	<p><b>Wales</b> <b>Handling Data</b></p> <ul style="list-style-type: none"> <li>Use and present data in a variety of ways including tables, pictograms, charts, bar charts, line graphs, diagrams, text and ICT.</li> <li>Collect, represent, analyse and interpret data.</li> </ul>	<p><b>Scotland</b> <b>Numeracy and Mathematics: Data and analysis</b></p> <ul style="list-style-type: none"> <li>Having discussed the variety of ways and range of media used to present data, I can interpret and draw conclusions from the information displayed, recognising that the presentation may be misleading.</li> </ul> <p style="text-align: right;">MNU 2-20a</p>
<p><b>Important teaching note</b> These are suggested activities and resources to <b>support</b> your teaching rather than guide it. Additional teaching input may be required to develop learners’ knowledge, skills and understanding of some of these concepts.</p>		

Note that you will find it useful to refer to the Background notes for teachers about inequality and the four Young Lives countries for this session.

**Activity 6.1 (20 min)**

- Show slide 17 of the *Unit 3 Slideshow (Sessions 4 - 6)* and discuss some of the different ways in which people measure well-being. If you haven't done so already, you might like to revisit slides 4 to 13 in the *Unit 3 Slideshow (Sessions 1 – 3)* which show some of the indicators measured and used by organisations such as the World Bank.
- Show slide 18 and ask learners for ideas about how we can measure how rich or wealthy a country is. Use slide 19 to explain what average income per person means. Explain that an organisation called the World Bank (which lends money to different countries to support economic growth and development) calculates “average income per person” as a measure of how “wealthy” the country is. To calculate it they add up the total amount of money being made in the country over the year and then divide it by the number of people in the country. They do this calculation in US dollars so that they can compare all countries fairly. This is called GDP per capita. We can just call it “average income per person”.
- Show slide 20 and ask learners to rank the four Young Lives countries and the UK from lowest to highest according to what they think their “average income per person” would be. Discuss their reasons for the rankings that they have used. Slide 21 shows the correct order.
- Distribute copies of *Average income per person* (Resource sheet 1). This shows the data for the UK and the four Young Lives countries in a table and two line graphs. You may wish to support learners to convert some of the values for average income per person from US dollars to British pounds for comparison.
- The first line graph shows the data for all five countries; the second line graph shows the data for the four Young Lives countries only. The table and colour copies of the line graphs are provided on slides 22 to 24. Ask learners which they find easier to read and understand; the table or the line graphs. Encourage learners to give reasons for their answers. Discuss why a line graph is suitable for this data. Line graphs are useful for continuous data, such as measuring how a variable changes over a continuous period of time.
- Develop learners' understanding by asking them questions about the data, such as:
  - Which country was the wealthiest in terms of income per person in 2015?
  - Which was the second wealthiest in 2015?
  - Which country was the poorest in 2015?
  - In which countries is average income per person increasing/decreasing?
  - What happened to average income per person in the UK from 2005 to 2010?
  - What is the difference between average income per person in Ethiopia in 1985 and 2015?
  - What is the difference between average income per person in India and Peru in 2010?
- Learners could answer verbally or record their responses on individual whiteboards.
- If time allows, ask pairs of learners to devise their own questions and answers about the data.

**Activity 6.2 (30 min)**

- Ask learners what other indicators might be used to measure well-being. Distribute copies of *Life expectancy – Table* (Resource sheet 2). A copy of the table is provided on slide 25. Explain that this table shows how average life expectancy has changed over time in each of the four Young Lives countries and the UK.

**Life expectancy**

*Life expectancy at birth is the number of years a newborn infant would live if the prevailing patterns of mortality at the time of birth were to stay the same throughout his or her life.*

- Discuss what might be an alternative way of presenting the data. *Would a line graph be suitable for this data? Why or why not?*
- Ask learners to construct a line graph to show how life expectancy changes over time in one, three or all five of these countries. Learners could use the template provided in *Life expectancy - Line graph* (Activity sheet 1) or construct their own axes.
- Ask learners to devise their own questions about the data for others in the class to answer such as:
  - *What is the difference between life expectancy in Viet Nam in 1970 and 2015?*
  - *Which country had the highest life expectancy in 2015?*
  - *Which country had the lowest life expectancy in 2015?*
  - *Which country showed the greatest increase in life expectancy between 1970 and 2015?*
  - *Which country showed the smallest increase in life expectancy between 1970 and 2015?*

**Differentiation**

- *Make it easier: Construct a line graph to show life expectancy for one of the countries.*
- *Make it slightly harder: Construct a line graph to show life expectancy for three countries (including the UK).*
- *Make it harder: Construct a line graph to show life expectancy for all five countries.*

**Activity 6.3 (15 min)**

- Use slides 26 to 29 to explore what we mean by inequality and how it can exist both between and within countries. These slides are also provided in *Unit 1 Session 6* where learners consider what inequality means and use sharing to show equal and unequal distributions. Remind learners that inequality isn't just about how money is shared out between and within countries. It also affects the opportunities that people have.
- Ask learners to think again about the data for income per person and life expectancy. *Is there inequality between countries for these measures of well-being? Why are average income per person and life expectancy higher in some countries than in others?*
- Now discuss learners' ideas about whether or not there will be inequality within countries for these well-being indicators. *Do you think average income and life expectancy will be the*

*same for most people within a country? Why? In which countries do you think average income per person and life expectancy will vary the most? Why do you think this?*

- Show slide 30. Explain to learners that we can use the GINI index to measure inequality within a country. Countries are given a score between 0 and 1 to show how equal or unequal they are.
- Show slide 31. A score of 0 would mean that everyone in that country has the same income. In reality no country is like this. You might like to discuss whether it would be fair if everyone earned the same amount of money. If learners agree, you could ask them if they still think it would be fair if some people work for longer than others or have more senior positions of responsibility in the workplace and so on.
- Show slide 32. A score of 1.0 would mean that the country is completely unequal; one person has all the income and everyone else has none. Emphasise that no countries are this unequal. Show slide 33 and explain that all countries fall somewhere between 0 and 1.0. The lower the number, the more equal the country is.

### **GINI Index**

*This is a measure of how equal or unequal a country is, derived from the distribution of income across the whole society. It was developed by the Italian statistician and sociologist, Corrado Gini. A score of 0 means that income is spread equally between everyone (all people earn the same amount of money); while a score of 1 means the opposite: one person has all the income and everyone else has none. Therefore, the GINI index can be seen as a measure of fairness, with a lower score meaning a fairer or more equal society and a higher score meaning a more unfair or unequal society. GINI indices can be calculated in different ways and therefore different sources may give slightly different numbers. Globally, inequality has been increasing over the last 20 years, both between countries and within countries.*

- Distribute copies of the *Inequality* table and line graph. Explain that both the table and line graphs only show selected data for every five years up until 2010. Copies of the table and line graph are provided on slide 34 to 35. The line graph shows the overall changes in inequality from 1980 to 2010. *How has inequality changed over time in each country?* Ask learners to write a sentence or two to describe the data for each country, for example in the UK, inequality has increased from 1980 to 2010.
- According to this data, in which country has inequality risen the most over this time period? Discuss whether learners are surprised by the correct answer (UK). *What do you think the reasons for this increase might be?*

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## Average income per person

## Resource sheet 1

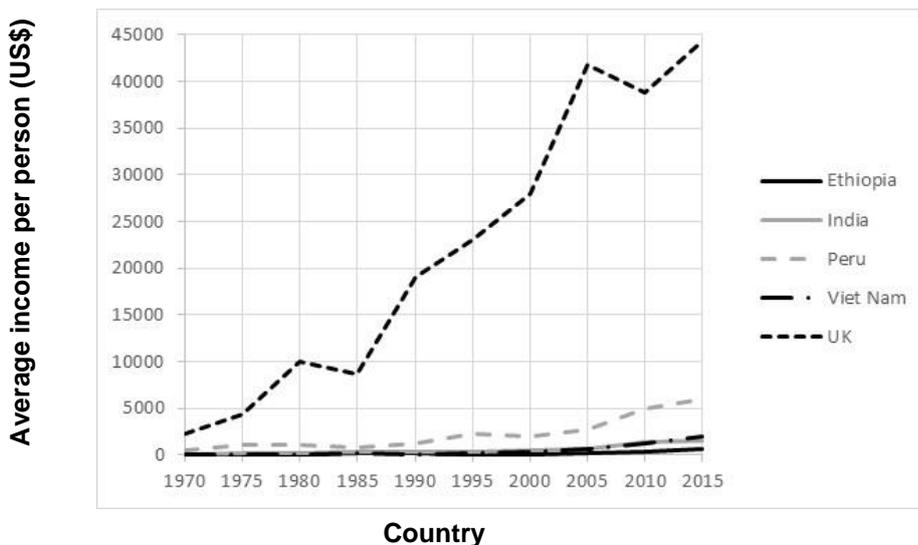
### Table

Data in US\$ and rounded to the nearest whole number.

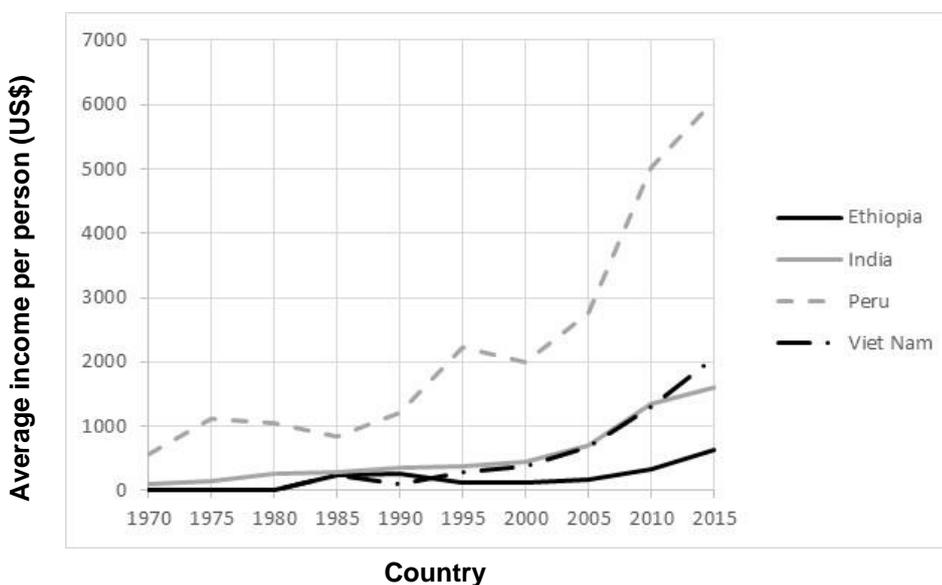
Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
Ethiopia	-	-	-	232	253	134	124	162	341	645
India	111	156	264	293	364	370	439	707	1,346	1,606
Peru	557	1,108	1,045	847	1,210	2,218	1,997	2,755	5,022	6,053
Viet Nam	-	-	-	231	95	276	388	684	1,310	2,065
UK	2,348	4,300	10,032	8,652	19,095	23,013	27,982	41,733	38,893	44,306

Data source: World Bank Open Data: [data.worldbank.org/](http://data.worldbank.org/)

### Line graphs



Data for the four Young Lives countries and the UK.



Data for the four Young Lives countries only.

## Resource sheet 2

### Life expectancy

### Table

Data rounded to the nearest whole number.

Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
Ethiopia	43	44	44	45	47	49	52	56	62	65
India	48	51	54	56	58	60	63	65	67	68
Peru	53	57	60	63	66	68	71	72	74	75
Viet Nam	60	61	68	69	71	72	73	74	75	76
UK	72	73	74	75	76	77	78	79	80	81

Data source: World Bank Open Data: [data.worldbank.org/](http://data.worldbank.org/)

### Life expectancy

### Table

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Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
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India	48	51	54	56	58	60	63	65	67	68
Peru	53	57	60	63	66	68	71	72	74	75
Viet Nam	60	61	68	69	71	72	73	74	75	76
UK	72	73	74	75	76	77	78	79	80	81

Data source: World Bank Open Data: [data.worldbank.org/](http://data.worldbank.org/)

### Life expectancy

### Table

Data rounded to the nearest whole number.

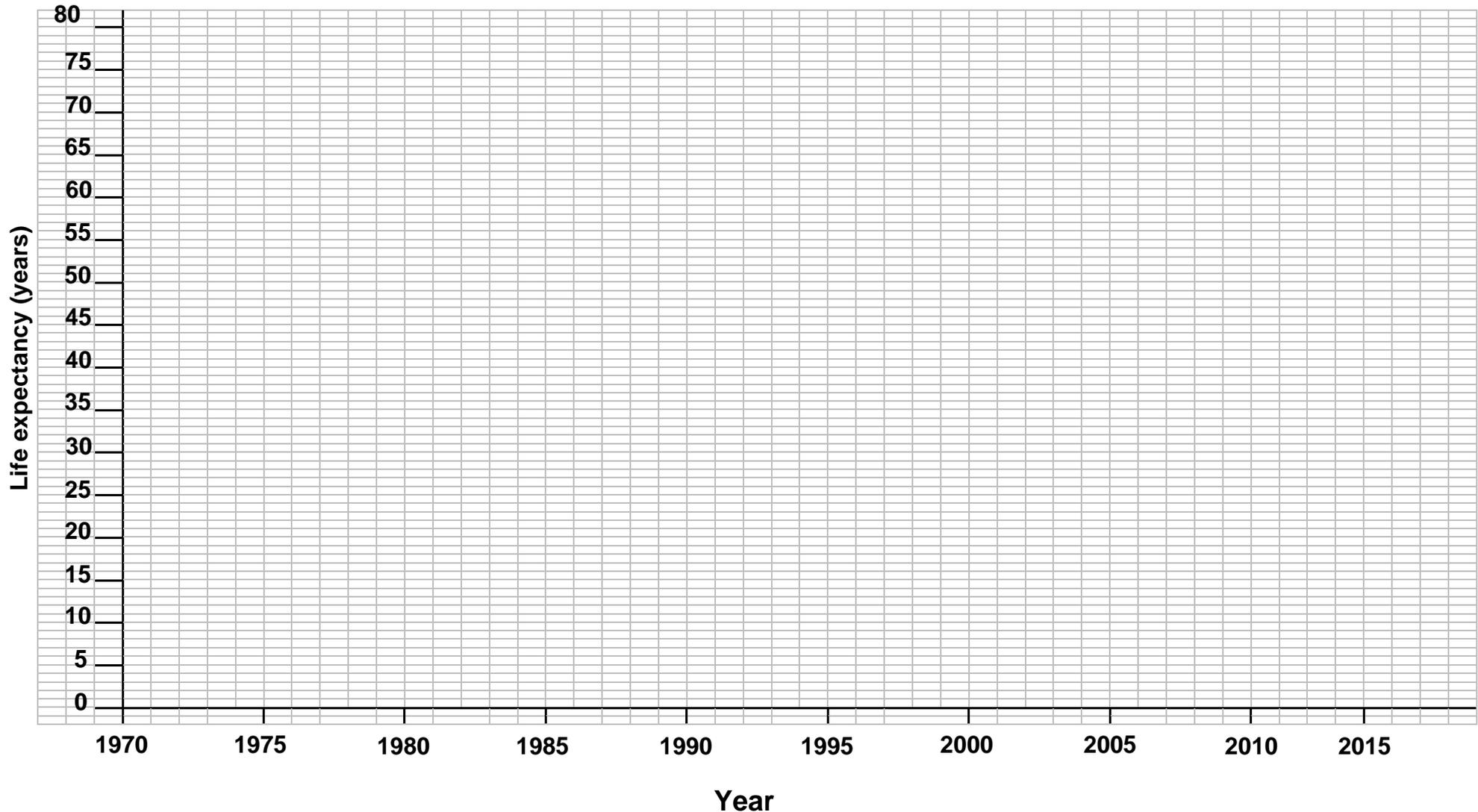
Country	1970	1975	1980	1985	1990	1995	2000	2005	2010	2015
Ethiopia	43	44	44	45	47	49	52	56	62	65
India	48	51	54	56	58	60	63	65	67	68
Peru	53	57	60	63	66	68	71	72	74	75
Viet Nam	60	61	68	69	71	72	73	74	75	76
UK	72	73	74	75	76	77	78	79	80	81

Data source: World Bank Open Data: [data.worldbank.org/](http://data.worldbank.org/)

## Life expectancy - Line graph

## Activity sheet 1

Use the blank axes below to draw a line graph to show how life expectancy has changed over time



## Inequality

## Resource sheet 3

### Table

This table shows how the GINI index has changed over time in the four Young Lives countries and the UK. This index measures how equal or unequal a country is. The index goes from 0 (completely equal) to 1 (completely unequal). The lower the number the more equal the country is.

Data rounded to 2 decimal places.

Country	1980	1985	1990	1995	2000	2005	2010
Ethiopia	*	0.36	0.41	0.45	0.33	0.29	0.33
India	0.47	0.48	0.47	0.51	0.48	0.50	0.50**
Peru	*	0.55	0.53	0.51	0.53	0.50	0.47
Viet Nam	*	*	*	0.41	0.42	0.41	0.42
UK	0.27	0.29	0.33	0.34	0.34	0.35	0.36

\*No data available

\*\*2009 figure used as 2010 data not available

**Data source:** Frederick Solt, 2013, "The Standardized World Income Inequality Database", Frederick Solt [Distributor] V10 [Version]: [hdl.handle.net/1902.1/11992](http://hdl.handle.net/1902.1/11992)

### Line graph

