

11-14 YEARS SESSION 4: Comparing the wealth of women in collective action groups

Subject: Mathematics

Age range: 11-14 years

Time: 1 hour

Outline

Learners explore the wealth of women who belong to collective action groups and the wealth of women who do not belong to groups using pie charts. Learners repeat this comparison using bar charts.

Learning objectives

- To develop data handling and presentation skills
- To understand some of the difficulties of data collection and sampling

Learning outcomes

- Learners will draw and interpret pie charts
- Learners will compare proportions represented in pie charts
- Learners will compare samples and proportions of data
- Learners will draw, interpret and compare bar charts

Key questions

- What does a pie chart represent?
- What impact does sample size have on results?
- How do the levels of education and wealth of women in collective action groups compare with those not in groups?
- What are the benefits of using a bar chart?

Resources

- Slideshow 4
- *Learner worksheet 4A: Constructing a Pie Chart*
- *Learner worksheet 4B: Grouped Ethiopia Education and Wealth Data*
- *Learner worksheet 4C: Ethiopia Education and Wealth Data*
- *Spreadsheet: Session 4*

Curriculum links

England

Pupils should be taught to:

- describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers)
- construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data
- describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts

Wales

Mathematics Key Stage 3

Using data skills: collect and record data, present and analyse data, interpret results

- construct and interpret graphs and diagrams (including pie charts) to represent discrete or continuous data
- interpret diagrams and graphs to compare sets of data
- use appropriate mathematical instruments and methods to construct accurate drawings

Numeracy Framework: Using data skills

Scotland

Numeracy and mathematics

I can display data in a clear way using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology. **MTH 2-21a / MTH 3-21a**



Starter (5 min)

True or False?

Have the True/False quiz on slide 3 in Slideshow 4 displayed for learners to complete. This quiz recaps some of the learning from previous sessions and introduces some of the data learners will be using in this session. Answers can be found on the following slides.

Activity 4.1 (10 min)

Construct a pie chart (A review of KS2 learning)

Show learners the pie chart on slide 10 Slideshow 4 which is a pictorial representation of the different wealth indices of women in collective action groups. Note that the higher their score on the wealth index, the wealthier they are. Point out that the wealth index shows relative wealth but that the wealthy women in this study are still considerably poorer than women in the UK.

Ask learners questions to check their interpretation of the pie chart, such as which wealth index is most common/least common. See slide 11 Slideshow 4 for ideas.

Explain that a pie chart is a useful way to represent data when you want to compare proportions of a whole (or percentages out of 100%) because it gives a clear visual image of one proportion compared to another. Therefore, in this case, it is a clear way to show the different wealth levels of women in collective action groups.

Give pairs of learners a copy of worksheet 4A with instructions of how to create a pie chart and explain that they are going to create a pie chart similar to the one shown on slide 10 of Slideshow 4 for themselves. They will be using the sample of the grouped wealth index for 50 women belonging to a group shown on worksheet 4B. Point out that the data has been grouped into categories of 0-19, 20-29 etc. for ease of use (refer back to Activity 3.2).

Support your learners to create the pie chart. How does their pie chart compare to that on slide 10 of Slideshow 4? Discuss what it shows using the questions on slide 11 of Slideshow 4.

If you have time and access to computers, you could ask learners to create the above pie charts using the Excel spreadsheet provided. Note that '0' denotes non-group members and '1' denotes collective group action members.

Differentiation

Make it harder:

Ask learners to create pie charts using one of the random samples of the wealth indices of 20 women belonging or not belonging to groups in worksheet 4C. How do these compare to the pie charts created using the random sample of 100? Which pie chart is a more accurate representation of the full set of 900 in the Ethiopian study? What was easier, using a small or larger random sample? In pairs, ask learners to consider the drawbacks of using a small sample size. Refer back to learning about sample size in session 2.

Activity 4.2 (20 min)

Pie chart or bar chart?

Show slide 12 of Slideshow 4 with pie charts of the wealth indices of both group and non-group members.

Ask learners if they think it is easy to use these pie charts to compare the wealth of group and non-group members. Draw out that in fact it is quite difficult to make this comparison because the data is quite similar for both group and non-group members. Ask if learners can think of a clearer visual way to compare the two data sets.

Show slide 13 Slideshow 4 and explain that a bar chart with two differently coloured bars for group and non-group members is a clearer way of comparing the two sets of data if there are only minimal differences in the data sets, as here. Explain that a histogram is similar to a bar chart, but a histogram shows the data in groups.

Point out that in order for the data to be compared, there must be the same number of women in each data set, in this case 50.

Ask learners to create their own bar charts in the same way to compare the wealth indices of group and non-group members using the random 20 samples. Compare these graphs with each other and with that on slide 13. Use the differences between the graphs to highlight the limitations of small samples (see session 2 for further details).

If you have time and access to computers, you could ask learners to create the above bar charts using the Excel spreadsheet provided. Note that '0' denotes non-group members and '1' denotes collective group action members.

Activity 4.3 (20 min)

Constructing and comparing bar and pie charts

Ask learners to use the 'Ethiopia 100 spreadsheet' to create other pie and bar charts to represent other data such as 'Years of Experience', choosing the most appropriate presentation for their purposes. Depending on the data set chosen, they will also need to decide whether to group the data first. Note that '0' denotes non-group members and '1' denotes collective group action members.

Plenary (5 min)

Select learners to share their pie and bar charts with the rest of the class and ask them to explain what they found out about women in and out of collective action groups. For example, in this sample, women non-group members tended to have more years of experience.

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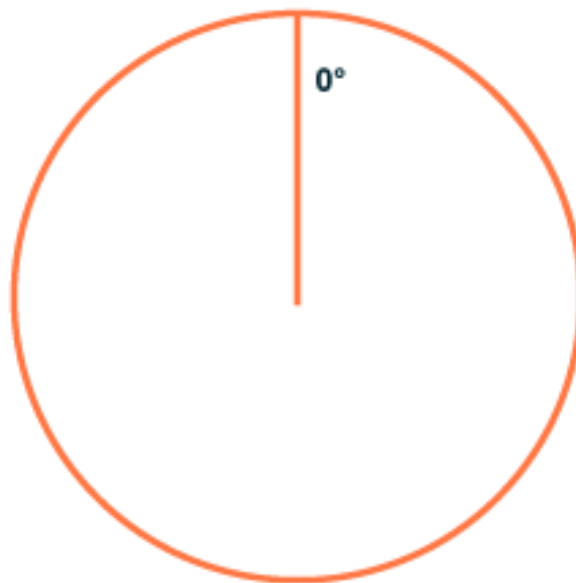
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Constructing a Pie Chart

1. You will need a pencil, a ruler and a protractor to construct your pie chart.
2. To draw a pie chart, each part of the data is represented as a proportion of 360, because there are 360 degrees in a circle.
3. You need to know the total amount of data collected. Add up the total number of women who were surveyed.
4. You then need to know how many are represented in each part of the data – for example, three women might have one year of education.
5. Divide the part of the data by the total amount.
6. You then multiply this answer by 360. This answer tells you how many degrees your segment of pie chart needs to be.
7. Before you draw the pie chart, remember to check that the angles which you have calculated add up to 360 degrees.
8. Colour or label each section and create a key to show what they represent.
9. Give your pie chart a title. What does it show?



Ethiopia Education and Wealth Data

Grouped data for 50 women who belong to a WCA group

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

Years of Education	Wealth Index	Wealth Index Group
0	12.19	0-19
0	12.80	0-19
0	19.67	0-19
0	20.24	20-29
0	23.52	20-29
0	23.54	20-29
0	24.27	20-29
0	24.75	20-29
0	24.94	20-29
0	25.02	20-29
4	26.40	20-29
0	26.69	20-29
8	27.12	20-29
0	28.02	20-29
0	28.12	20-29
0	28.36	20-29
4	29.29	20-29
0	31.01	30-39
10	31.07	30-39
0	31.35	30-39
7	33.64	30-39
0	34.83	30-39
0	35.11	30-39
0	35.61	30-39
0	36.63	30-39
0	37.00	30-39

0	37.49	30-39
0	38.22	30-39
0	38.55	30-39
9	38.71	30-39
0	39.25	30-39
0	39.56	30-39
2	39.82	30-39
0	40.60	40-49
0	42.73	40-49
8	47.52	40-49
0	48.67	40-49
0	51.06	50-59
0	52.52	50-59
0	53.78	50-59
0	55.98	50-59
0	58.02	50-59
8	58.66	50-59
3	61.83	60-69
0	68.12	60-69
8		Unknown
0		Unknown
0		Unknown
8		Unknown
3		Unknown

Ethiopia Education and Wealth Data

Random Sample 1

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	46	0	37
0	67	0	29
0	41	0	46
0	21	0	47
0	21	0	58
0	34	9	39
2	25	0	27
0	33	2	40
0	31	9	30
0	17	0	42
0	49	0	42
0	59	0	37
5	38	0	45
0	36	0	14
0	29	10	17
0	49	0	49
0	26	0	49
0	29	0	40
0	39	0	26
0	44	0	55

Ethiopia Education and Wealth Data

Random Sample 2

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	25	0	
7	51	0	17
0	46	0	19
0	67	0	16
0	32	0	15
0	32	8	59
0		0	37
0	36	0	32
0	47	0	39
0	18	0	29
0	30	0	30
0	42	0	50
1	36	0	20
0	27	0	14
0	17	0	25
0	51	0	32
0	30	0	32
0	26	0	58
0	35	0	36
0	23	9	55

Ethiopia Education and Wealth Data

Random Sample 3

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	34	0	12
0	32	10	38
0	31	0	66
0	40	0	40
3	60	0	38
0	49	4	37
0	27	0	55
0	26	0	25
0	60	0	47
0	42	0	30
2	25	3	
0	57	0	34
0	37	8	27
8	38	0	32
0	33	0	14
0	51	6	
0	44	7	34
0	28	0	56
0	60	0	
0	34	0	51

Ethiopia Education and Wealth Data

Random Sample 4

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	34	8	
0	19	0	23
0	43	0	20
0	51	0	15
0	31	0	75
0	27	0	31
0	30	0	33
0	28	0	
0	38	0	26
2	55	0	50
0	34	0	31
0	29	0	49
0		0	41
0	38	0	37
0	35	0	
0	32	0	31
0	22	0	50
0	44	0	8
0	34	0	30
0	29	0	55

Ethiopia Education and Wealth Data

Random Sample 5

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	29	0	29
0	46	0	50
0	27	0	29
0	63	5	45
0	43	0	44
0	45	0	37
0	33	0	37
0	38	0	46
0	22	0	60
0	39	0	14
0	38	0	82
0	44	0	37
0	51	0	
0		7	39
0	34	0	29
6	33	12	55
0	21	0	25
0	30	0	25
0	29	0	38
0	50	0	22

Ethiopia Education and Wealth Data

Random Sample 6

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	53	0	35
0	50	0	32
0	41	0	40
0	49	0	23
0	39	0	34
0	63	7	34
0	36	7	28
0	17	9	55
0	26	0	39
0	11	0	44
0	38	0	30
0	36	0	
0	28	0	71
0	18	0	18
0	33	0	37
0	30	0	44
0	34	0	31
0	28	4	37
0	41	0	82
4	57	0	8

Ethiopia Education and Wealth Data

Random Sample 7

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	44	0	35
0	38	0	40
0	52	3	25
0	46	0	42
0	54	0	61
2	55	5	
0	41	5	39
0	24	0	35
1	36	0	15
8	38	0	34
0	38	8	24
0	42	0	26
0	31	0	55
0	42	0	51
0	34	0	52
0	34	0	34
0	39	0	
0	21	0	
0	45	0	54
0	25	0	22

Ethiopia Education and Wealth Data

Random Sample 8

Wealth Index = a measure of how wealthy the women are which includes how many farming animals they own and what their house is like, amongst other things.

These women DO NOT belong to a WCA group		These women DO belong to a WCA group	
Years of Education	Wealth Index	Years of Education	Wealth Index
0	11	0	60
0	40	0	48
5	38	0	12
0	38	0	54
0	43	0	31
0	33	0	45
0	25	7	56
0	30	0	43
0		0	27
0	42	0	35
0	19	0	29
0	27	0	47
0	33	0	65
0	64	0	
0	36	0	39
5	21	5	
0	45	0	32
0	37	6	61
0	21	0	25
0	29	0	35