Y5 Exploring our World 2 - Dollar Street investigation

NEW June 2024

Year level: 5

Statistical focus: Summary investigations; Comparison investigations; Data: planning and collecting

Approximate number of lessons: 5

Learning goals

Lesson 1 - Identifying our investigative focus

- Make a connection to the Social Studies big idea of people seeing the world differently depending on their values, traditions, and experiences. Diversity: looking between and within cultures.
- Students are introduced to the PPDAC statistical enquiry cycle for data investigations.
- Students decide on an investigative purpose to gather data from Dollar Street - what will they detect?
- Students make a conjecture about what they expect to find.

Lesson 2 - Planning to collect data from Dollar Street

- Students identify the variables that they want to collect for their investigative focus.
- This will include defining the variables and possible outcomes to consider.
- Students develop data collection questions.
- Students test out their data collection ideas to see that they will work. They update data collection tools.
- Students design a way to record the data they will collect.

Lesson 3 - Collecting data from Dollar Street

- Students are collecting data from photographs on Dollar Street.
- Students are recording data in an electronic spreadsheet..
- Students are checking data for errors.

Lesson 4 - Analysing our data from Dollar Street

- Students import their data into CODAP and create data visualisations for their data.
- Students make summary statements about the data, connecting it to the group that was investigated.

Lesson 5 - Communicating findings about Dollar Street

- Students are learning to choose the best descriptive statements to answer the investigative question.

- Students prepare their own evidence of undertaking a statistical enquiry to share with others.
- Students can reflect on their findings relative to initial conjectures they have made.

Resources

- Prior work to do **Introducing the Dollar Street website**
- Website: **Dollar Street**
- **Data Detective Poster 2023 - CensusAtSchool New Zealand**
- **Y5 Exploring our World 2 Google Slides**
- Electronic spreadsheet e.g., Excel, Google Sheets, **CODAP**
- **Dollar Street Investigation one-pager template**
- **One pager**

Lesson 1 - Identifying our investigative focus

- Make a connection to the Social Studies big idea of people seeing the world differently depending on their values, traditions, and experiences. Diversity: looking between and within cultures.
- Students are introduced to the PPDAC statistical enquiry cycle for data investigations.
- Students decide on an investigative purpose to gather data from Dollar Street - what will they detect?
- Students make a conjecture about what they expect to find.

Connecting to Social Studies

Connect to the Social Studies big idea of people seeing the world differently depending on their values, traditions, and experiences. Diversity: looking between and within cultures.

Connect [back] to the lesson on **Introducing the Dollar Street website**, which provides students with an opportunity to explore the Dollar Street website. As this activity uses Dollar Street as a source to collect data from, it is useful for students to have had an opportunity to find out about what is available.

In our last session we explored three families on Dollar Street. From our explorations we found out…
RECAP REFLECTIONS FROM **Introducing the Dollar Street website** to the class

Introduce the PPDAC cycle

Use the data detective poster to introduce the PPDAC cycle. See Slide 3 **Y5 Exploring our World 2 Google Slides**.

- Explain that for the investigation we will do into families on Dollar Street we will use the stages of the PPDAC cycle to help us.
- The first thing we will do is decide on a topic and pose investigative questions that we can explore using data.
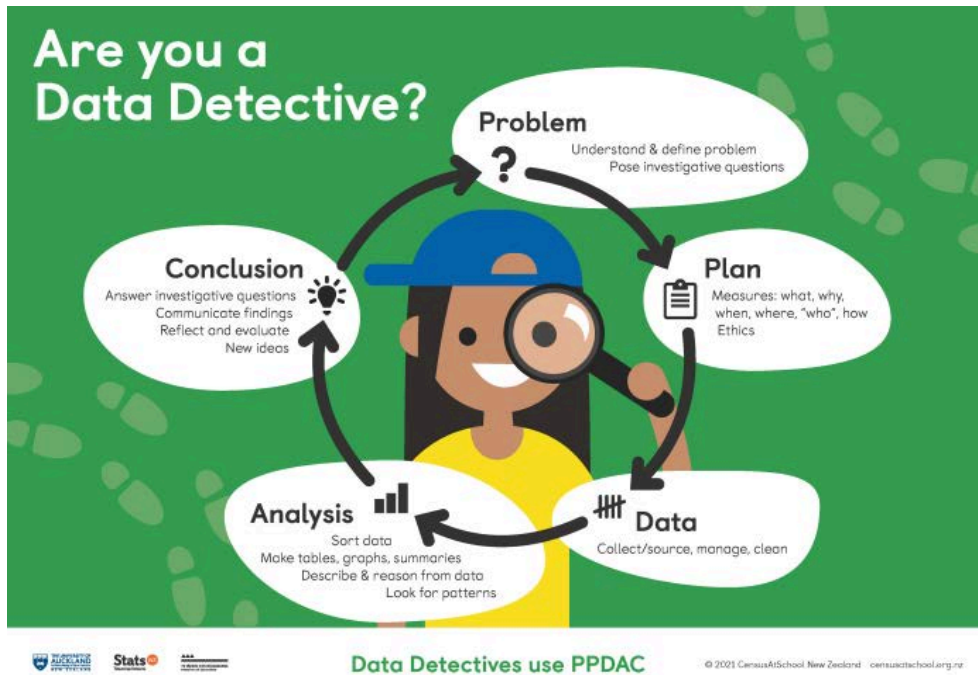
Figure 1. Data detective poster
https://new.censusatschool.org.nz/resource/data-detective-poster/

❓PROBLEM - Forming investigative questions

In this session students will start to dig more deeply into the data available on Dollar Street to detect how lives are different or the same using the families on Dollar Street.

- In groups, students brainstorm ideas that they would like to investigate using the families on Dollar Street.
- Use the wonderings from the previous session (**Introducing the Dollar Street website**) to help with ideas to explore.
- Students might want to focus on a country, an income level, different income levels, different countries.

Context analysis tool - brainstorming ideas to explore

Student exploration can be supported using the context analysis tool.

The headings provided are suggested starter headings, these can be added to and/or changed. To use the diagram firstly identify the broad area or topic of interest. Then add headings to the diagram that consider contributing factors for the area of interest. People and environment are given as two possible factors to explore and headings for additional contributing factors can be added in. Once these main headings are in place ideas can be brainstormed to add to the diagram. (Arnold, 2022, p. 44)
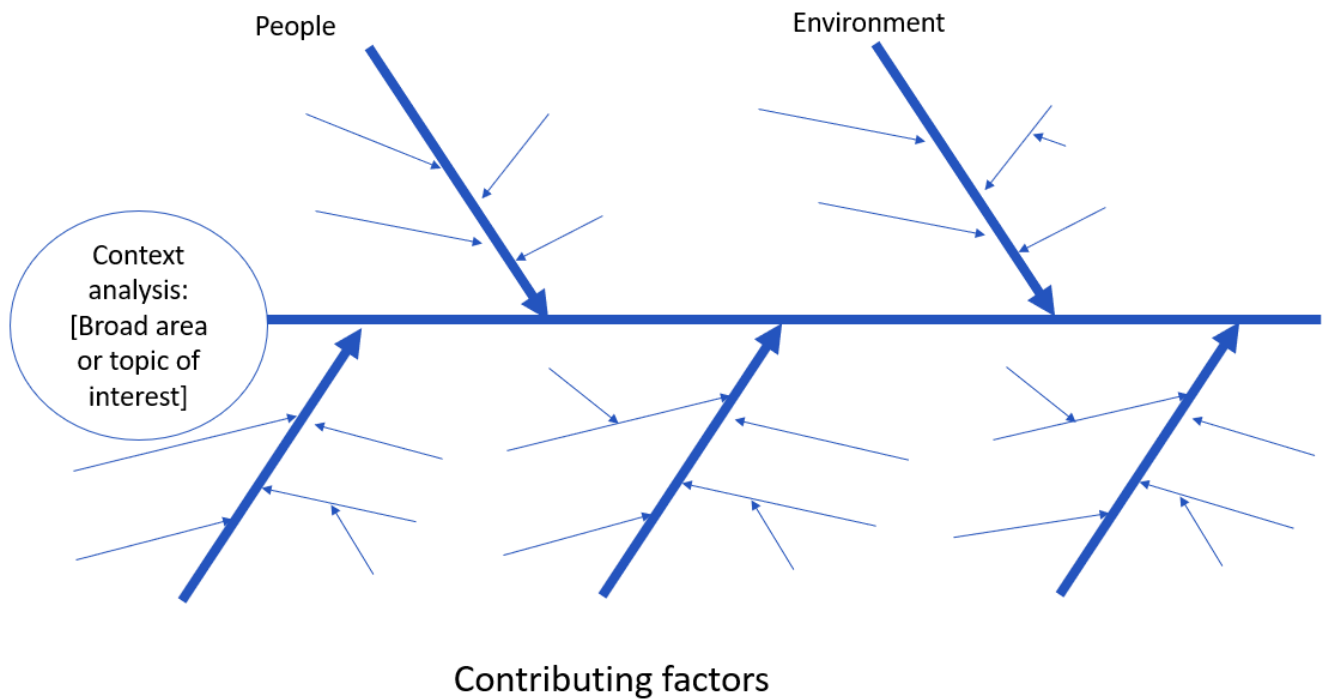
Figure 2. Context analysis tool (Arnold, 2022, p.44)
Reprinted with permission
Slide 4 **Y5 Exploring our World 2 Google Slides**

Things that might be interesting to investigate - type of beds people sleep on, different pets around the world, type of toilet and sanitation, toys, number of medications, source of water, number of books, night lightsource, how people cook.

A blank context analysis tool template can be found in the **student resources section**.
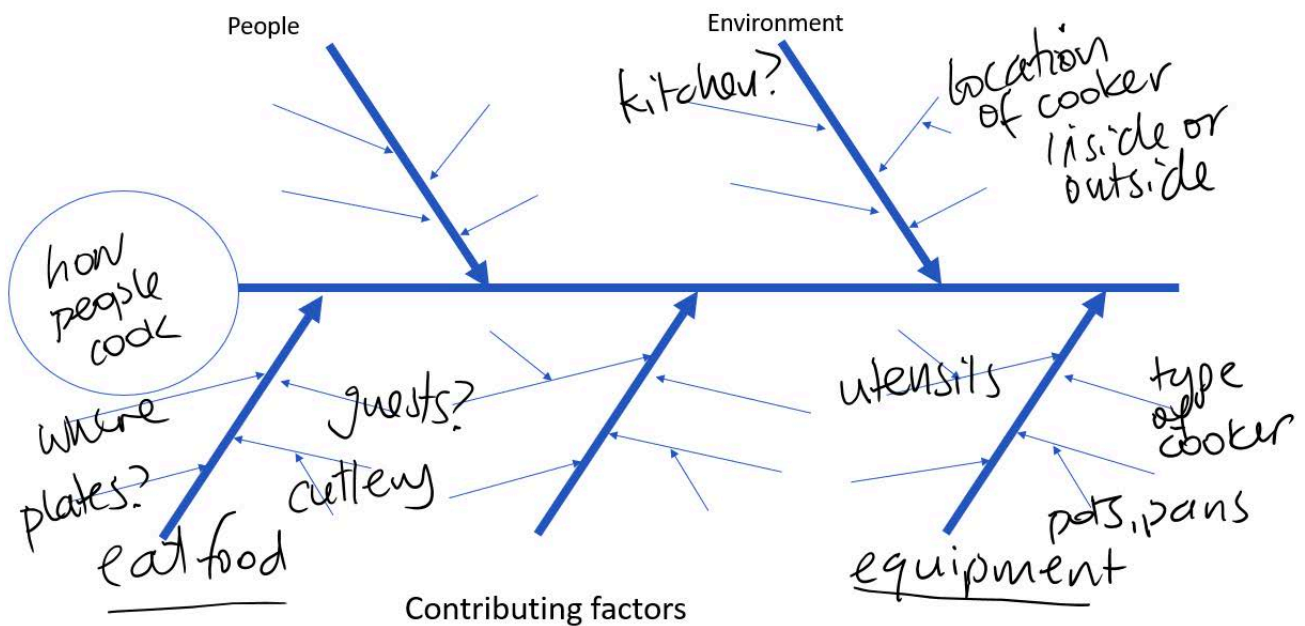
Figure 3. Context analysis for thinking about how people cook
Slide 5 **Y5 Exploring our World 2 Google Slides**

Investigative questions

From here with teacher support students can form some investigative questions as a class.
I wonder…(loosely form some investigative questions)

- What types of beds do people sleep on/in?
- What sort of pets do families have?
- How do the types of toys that children play with in Asia compare to the types of toys that children play with in Europe?
- Where do people serve guests their dinner?
- How do people cook their food around the world?
- Where do people eat their food?
- What sort of toilets are used around the world?
- How/where do people get their drinking water?
- Do families at lower income levels have more people in their family than families at higher income levels?

Confirming topics and investigative questions to explore

Decide on one topic per group and form an investigative question
Summary investigative questions

- What income do families in South America have?
- What type of toilets are used in Asia?
- What pets do families in Europe have?

Comparison investigative questions

- How do the toilets of families in China compare with toilets of the families in India?
- How do how the families cook their meals compare across three income groups - lowest, middle, highest?

Comparison investigative question - higher than expected for year 5 students

- Do families with higher incomes tend to have more people in them than families with lower incomes (would need to define the groups higher income families and lower income families)?

Groups frame up their investigative question: e.g. How do people cook their meals compare across three income groups - lowest, middle, highest?

Groups think about what they expect to find out (make a conjecture) and write this down: We think that the higher income group will have an oven and an inside kitchen, the lower income group will most probably cook on a fire on the ground.

Gather in ideas ready for the next session.

Notes for teachers

Teacher background reading: **Pre-K–12 Guidelines for Assessment and Instruction in Statistics Education II (GAISE II)** pp 64-67

The aim is to have useful investigative topics set up so students are ready to plan for data collection in the next session.

Investigative questions

For more on investigative questions for teacher knowledge about what they are see:
- **What makes a good investigative question**
- **Posing summary investigative questions**
- Created by NZMaths **Planning a Statistical Investigation (L3)**

Investigative questions

In year 5, students should be generating broad ideas to investigate and then refining their ideas into an investigative question that can be answered with data. Investigative summary, simple comparison and time series questions are posed, where the entire data set can be collected or provided. The variables are categorical or whole numbers. Investigative questions are the questions **we ask of the data**.

Students are starting to pose their own investigative questions. The teacher is supporting this through questioning and modelling, working with the students to improve their investigative questions. Checking the variable of interest and the group of interest is key. Students are learning that the investigative question is the question **we ask of the data**. Data collection or survey questions are questions **we ask to get the data**.

Data collection or survey questions

Data collection or survey questions are the questions **we ask to collect the data** to answer the investigative question. For example, if our investigative question was "What ice cream flavours do the students in our class like?" a corresponding survey question might be "What is your favourite ice cream flavour?" As with the investigative question, survey question development is done by the students with teacher support to improve them so that suitable survey questions are developed.

If students get stuck

Here are some starter prompts below to get groups moving again if they don't know what to do.
- Get them to explore the topics and see if one or more of the topics would be of interest for their investigative question
- Look at some photographs to get a sense of the information they could gather from the photographs

References
Arnold. P. (2022). *Statistical Investigations Te Tūhuratanga Tauanga.* NZCER Press.
https://www.nzcer.org.nz/nzcerpress/statistical-investigations-te-tuhuratanga-tauanga

Lesson 2 - Planning to collect data from Dollar Street

- Students identify the variables that they want to collect for their investigative focus.
- This will include defining the variables and possible outcomes to consider.
- Students develop data collection questions.
- Students test out their data collection ideas to see that they will work. They update data collection tools.
- Students design a way to record the data they will collect.

📋 PLAN - what to measure and how to measure

The next step in the investigation is to develop some data collection questions that we ask (of the photographs) to get data to answer our investigative questions.

Working with the example investigative question: ***How do people cook their meals compare across three income groups - lowest, middle, highest?***

- Decide what information (variables) are needed to answer the investigative question, for example:
  - income
  - type of stove or cooking apparatus
  - pots and pans (Type?, Number?)
  - utensils for cooking?
  - electricity or not?
  - water source for cooking.

Pose data collection questions to ask for each family that is investigated. Some of the data collection questions will be the same across all topics for example:

- What is the family name?
- What country is the family from?
- What is the income per month?
- What is the income category (low, middle, high)?

Students explore some photographs about the topic they have chosen to see what information (variables) they might be able to collect.

- For example if the topic is about cooking meals then the type of stove, or what is the stove will be something to collect information about.
- They should also think about other pieces of information to gather that would be related to the topic. For example
  - they might want to count the number of pots and pans in the photograph,
  - they might want to decide what is the "power" source, e.g., electricity, gas, wood/coal (if it is possible to tell).

Figure 4 shows some of the topics available from the drop down menu on the Families button.

- For the example given the topic "stoves" would be chosen.
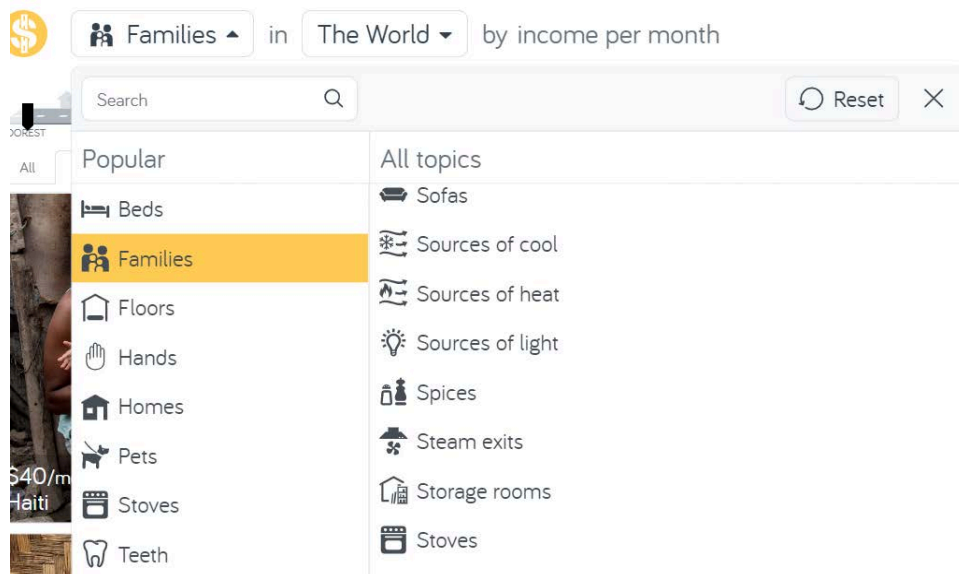
Figure 4. Drop down menu showing some of the topics available
Screenshot is from *Dollar Street* https://www.gapminder.org/dollar-street and is licensed under **CC BY 4.0**

Students develop data collection questions that are specific to the topic of interest. For the example:
- What is the "stove"? Choose from: (selection to be confirmed, maybe up to five categories e.g., fire pit, hot plates only, hot plates and separate oven, wood fired stove, combined in a stove or modern equivalent)
- How many pots and pans do they have (that were photographed)?
- What is the fuel source? (e.g., selection from wood, gas, coal, electricity, other)

Students test out their data collection questions on some photographs to check the data collection questions work, update data collection questions as needed.

📋PLAN - who to collect data from

Decide how many families to explore - it is not necessary for this to be a specific number as this investigation is only about the families they look at from Dollar Street.
- e.g., 10 at each income level for the example given

Decide what the income levels are
- e.g., lowest is less than $200 per month, middle is $200 to $1000 per month, highest is above $1000 per month OR lowest is less than $100 per month, middle is $300 to $800 per month, highest is above $4000 per month

📋PLAN & 卌DATA - how will the data be recorded?

Once students have confirmed their data collection questions they should plan on how they will record the data that they collect.
- An initial activity might be to get students to collect data from their test families recording it to help them with the planning.
- Get students to share how they have recorded their data and in small groups discuss the advantages and disadvantages of the different methods of recording the data.

- For example: a group may have decided to write the information about each family on a data card, another group may have recorded the information in a tally chart, yet another group may have set up a table to record the data.

Discuss what a case (a person, object, non-physical entity) is and how we record a case in a spreadsheet. Rows for cases, columns for variables.

Make a decision on how they will collect their data - this might be updated following the next lesson. It might be good for different groups to try different methods so they can compare and contrast the different methods of data collection.

Notes for teachers

In this session the aim is to have the groups of students set up to collect useful data in the next session. Encourage students to check their data collection questions by testing on a few families in Dollar Street.

Data collection - recording the data

Method	Advantages	Disadvantages
Data cards	Easy to fill in and can be used to make physical graphs.	Students might not record the same information in the same place making it difficult to sort. Limited use beyond making a physical graph with the data cards.
Tally chart	Easy to fill in and data is sorted.	Can only record 1 or 2 variables at a time, which means other connections might not be made. Could have many other responses, and with no other data these can not be further classified. Can miss out people/photographs and not know which ones are done and which ones are missing.
Recording sheet	Good for keeping track of who has participated and who has not - but do consider privacy/ethics of responses if this was data collection from the class themselves rather than the families on Dollar Street. Response categories can be decided later on. The recording sheet could be an electronic spreadsheet e.g., excel, google sheets.	Data needs to be sorted for making a data display. Data would still need to be entered into an electronic spreadsheet for data visualisation.
Questionnaire	Data collected by an online questionnaire can be downloaded to use with statistical software. Potential for gathering confidential responses.	Need to be confident setting up a questionnaire online

Sometimes students need to "make mistakes" so they can see better about decisions that need to be made. That is, don't always show students how to do it. Let them explore to see what happens. Discuss and share things that went well and things that didn't go so well. How can the process be improved next time?

If students get stuck

Here are some starter prompts below to get groups moving again if they don't know what to do
- Have you had a look at all of the topics to see if there are other ones that could support your main topic - select one family and scroll through their photos to see what is available.
- Have you tested your data collection questions on some families from different parts of Dollar Street?
- Have a look at some photographs from the topic to get a sense of the data you could collect from the photographs.

A second example

Investigative Question: e.g. How do people's toilets compare between China and India?

Variables I will need to collect data:

Type of Toilet:
- Bare Earth/hole in ground/bush/long drop (Ground)
- Porcelain/Sit on/upright toilet (Up)
- Porcelain toilet on the floor (Floor)
- Other such as plastic bag, bucket, (Other)

Country
- China
- India

Income $ per month

Sort the data on Dollar Street to create the dataset. Depending on the filters used, students can make smaller datasets by being more specific of their country/continent/income.   Check how easy it is to categorise each picture and discuss any potential problems.

Some data can be tricky to categorise. This is good to discuss so that there is an agreed understanding of what goes in each category before the start.
- The toilet to the left in Figure 5 is an in the ground porcelain toilet but it is raised.
- The toilet would go into the Floor category since it is a porcelain toilet but still requires crouching over rather than sitting on.
- The picture to the right does not appear to have a toilet as it may have been photographed incorrectly so this will be recorded as a missing value, e.g., X.
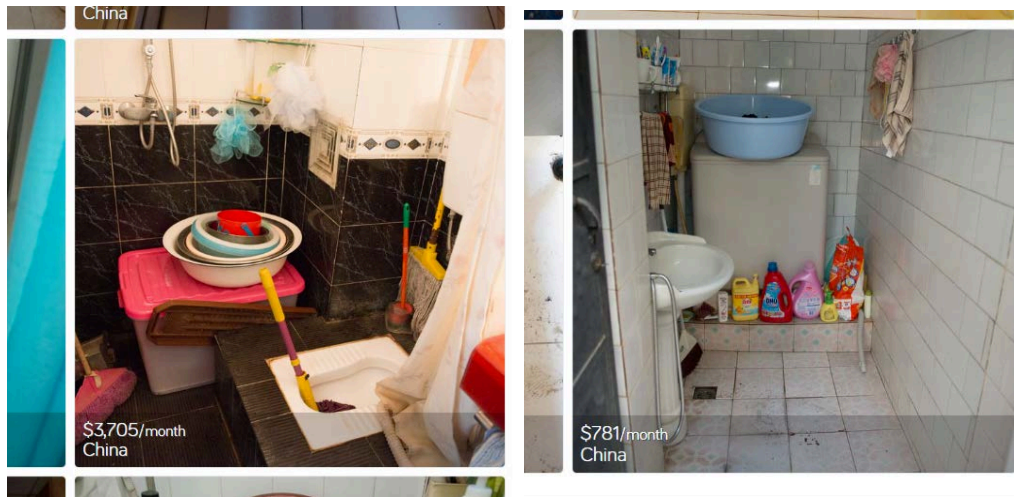
Figure 5. Examples of toilets from China

Screenshot is from *Dollar Street* https://www.gapminder.org/dollar-street and is licensed under **CC BY 4.0**, no changes have been made to the images

Lesson 3 - Collecting data from Dollar Street

- Students are collecting data from photographs on Dollar Street.
- Students are recording data in an electronic spreadsheet.
- Students are checking data for errors.

⿓DATA - Setting up to record our data

Refer the students back to the previous lesson where a plan was made about recording data. Check in to see if they have any other ideas. Explain that the plan is to use **CODAP** to make data visualisations of what they find out, so they should think about how they might record the data to use in **CODAP**.

NOTE: This and subsequent lessons assume students have seen CODAP before. If students are unfamiliar with CODAP see the activity **Using CODAP**. You may want to do this activity between Lesson 2 and Lesson 3.

Ask them to think back to how the data is stored in the **CODAP** tables and if they noticed that the variables (attributes) were in columns and an individual mammal or student (case) information was recorded in a row.

> *Typically raw data is stored in a table that has each case recorded by row and each variable recorded in columns. A row therefore has the values for all the variables for one case. A column has the values for each case for a single variable. Arnold (2022, p.179)*

Explain that they will use this same format when they record their data so that it can be easily uploaded into CODAP. See teachers notes for ideas on electronic recording. Share with students any prepared spreadsheets you have set up.

ⵌ DATA - Collecting data from Dollar Street photographs

Students collect their data from the photographs.

- They select their topic, countries or regions if required, and income level if required and filter the photographs.
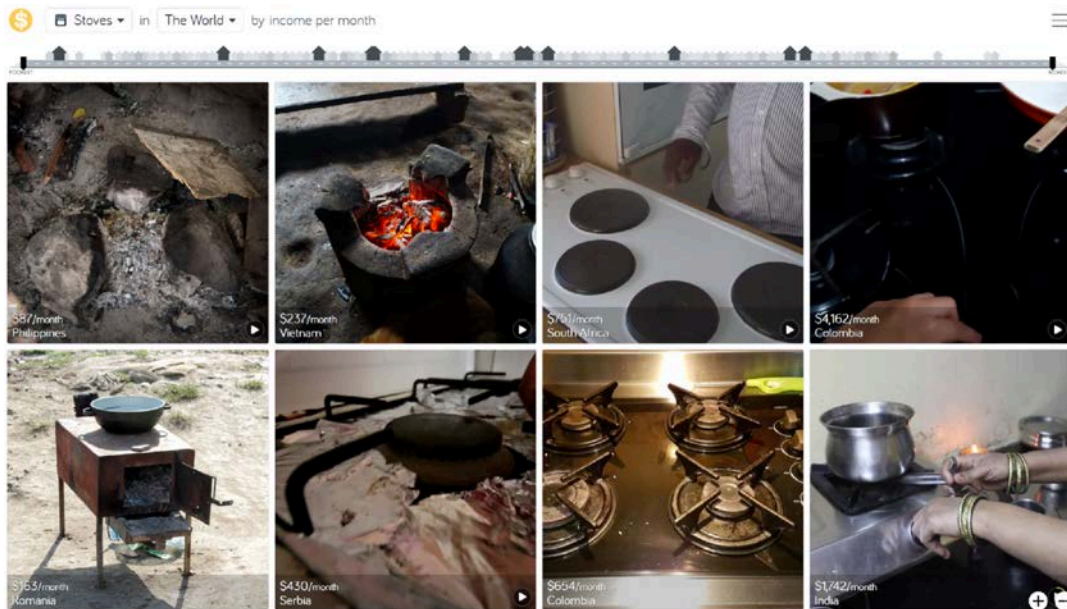

Figure 6. Showing filter by stoves for "The World"

Screenshot is from *Dollar Street* https://www.gapminder.org/dollar-street and is licensed under CC BY 4.0, no changes have been made to the images

- Students then open each of the photographs and record the answers to their data collection questions for the photographs. There are videos also about the families, students may need to use the videos and other photographs to collect all the information they want.

Figure 7. Stove photograph for the Castaneda family from Colombia

Screenshot is from *Dollar Street - Castaneda, Colombia*
https://www.gapminder.org/dollar-street/families/castaneda?topic=stoves&media=all&active=5ec4fb43f0611d7ddd7426a5 and is licensed under **CC BY 4.0**, no changes have been made to the images

Family name	Country	Income per month	Type of stove - description	Type of stove - categorised	Number of pots & pans	Fuel source
Casteneda	Colombia	654	Gas hob^ & microwave*		6#	Gas and electricity

Figure 8. Data for the Castaneda family for the stove example

^used the video cooking to see that it was only a gas hob and not a stove with a gas hob

*from a different photograph that shows the oven

from cooking pots photograph and from video on cooking (an additional two pots in the video)

Remember that students can interpret the images how they want and that there is no "correct" way to do this. As long as they are consistent across the data they collect.

⌗ DATA - Checking data

Once the students have finished collecting their data they should check their spreadsheet to make sure they have recorded things consistently and there are no obvious errors. For example they should check:
- That the income per month is recorded as a number only with no dollar signs
- That the spelling of country names is consistent and with a capital letter
- That the types of stoves, for example, are consistently categorised. It might be easier for them to write in full what they see, and then to categorise these later in another column (see Figure 8, type of stove - description and type of stove - categorised).

By the end of the lesson student groups should have collected data from many families. Make sure this is saved for students to use once the analysis starts.

Notes for teachers

Collecting data into a spreadsheet rather than directly into CODAP allows for some simple sorting and tidying up beforehand. Entering data directly into CODAP is also an option.

Using CODAP to record your own data - VIDEO

In this video you will learn how to make a table to input your own data. Once you have made the table, you enter the different attribute (variable) names and then double click in a cell to enter the data. To move across the row you use the tab key. To move down a column you use enter. To move from the end of a row to the beginning of the next row use the tab key. **VIDEO** (5:22 min)
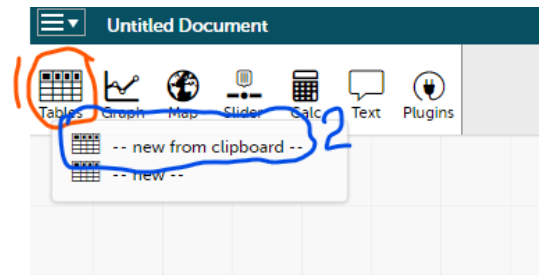
Google Sheets

Students can record their data in Google Sheets. The teacher could set up a Google Sheet for them to use with some initial variable headings, e.g., Family name, Country, Income per month, that everyone will use.

Students could enter their data into their own copy of the Google Sheet or they could use separate sheets within the same Google Sheet document. This second option could work well if students wanted to explore other students' data as well as their own.

If using Google Sheets, or another type of electronic spreadsheet, the data can be copied and then pasted into CODAP. This is a newer feature than when the video (below) was made.

- Select the data in the Google Sheet (including variable headings) that you want to import into CODAP, copy it.
- Open a new CODAP document
- Click on Tables (1)
- Then click on new from clipboard (2).

This creates a data table in CODAP.

Getting data into CODAP to analyse - VIDEO

In this video you will learn about how to import data into CODAP. We will look at getting data from CensusAtSchool, from a google spreadsheet, and from a csv file (not in the video, but mentioned above is copying the data and importing as **new from clipboard**). Your setup might be a bit different to mine, but hopefully this will give you enough of an idea of what to do. **VIDEO** (3:11 min)
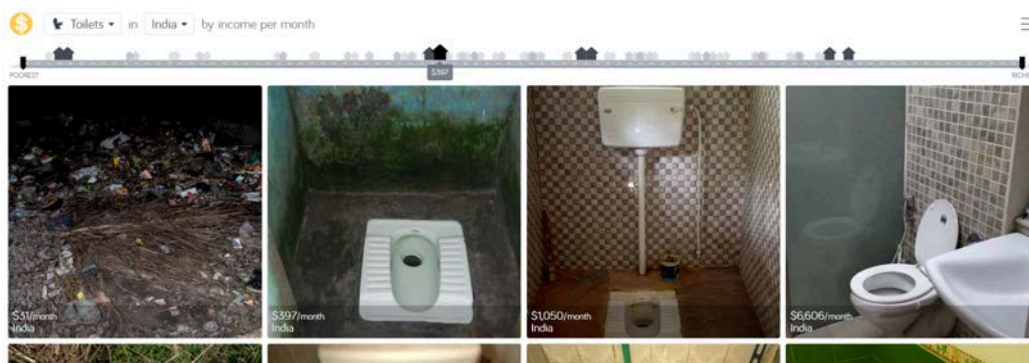
Example on toilets from China and India

Figure 9. Showing filter for Toilets in India

Screenshot is from *Dollar Street* https://www.gapminder.org/dollar-street and is licensed under **CC BY 4.0**, no changes have been made to the images
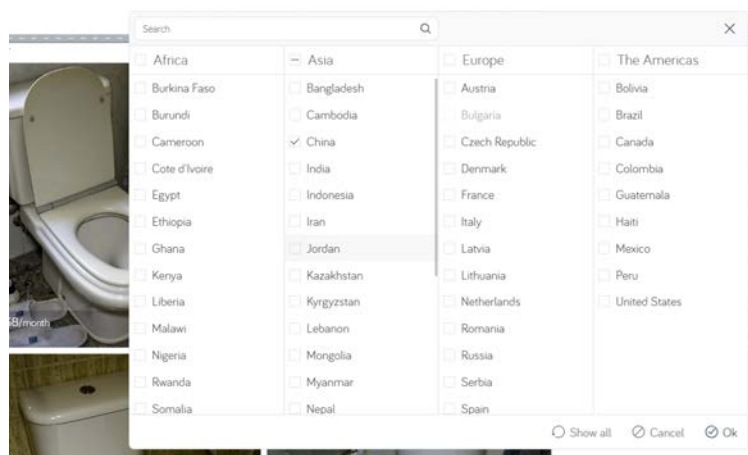
Figure 10. Showing selecting China for the filter for toilets

Screenshot is from *Dollar Street* https://www.gapminder.org/dollar-street and is licensed under **CC BY 4.0**, no changes have been made to the images

Figure 11. Example spreadsheet for toilet data for China and India

# Lesson 4 - Analysing our data from Dollar Street

- Students import their data into CODAP and create data visualisations for their data.
- Students make summary statements about the data, connecting it to the group that was investigated.

▁▂▃ANALYSIS: Making data visualisations

Students import their data into **CODAP**. If the data is stored in a spreadsheet (e.g., Google Sheets) then the following procedure can be used (also given in the teacher's notes in the previous lesson).

Importing data into **CODAP**.

- Select the data in the Google Sheet (including variable headings) that you want to import into CODAP, copy it.
- Open a new **CODAP** document
- Click on Tables (1)
- Then click on new from clipboard (2).
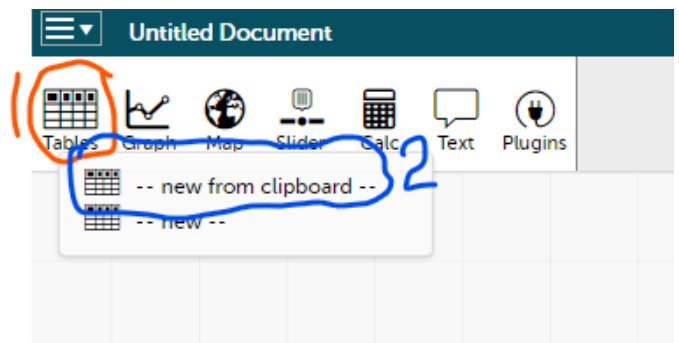
This creates a data table in CODAP.
Support students to save their CODAP document.

Using the graph tool in CODAP students create different graphs to look at the data they have collected.

- Students should consider their investigative question they need to answer.
- They can make multiple graphs, of different variables and combinations of variables., e.g., type of toilet by country.

Allow plenty of time to create graphs.

▂▃▅ANALYSIS: Describing what the data visualisations show

For the graphs that students have created, they need to describe what the graph shows.

Students can insert text boxes in CODAP, one per graph, and write their descriptions in these. They should align the text box with the graph.

Ask students once they are done to pick the graphs and descriptions that best help to answer their investigative question. They can sort these and minimise the ones they do not want to use.

Get students to share the CODAP document with you.

Notes for teachers

CODAP actions

Saving and sharing CODAP documents

It is good practice to always save your CODAP documents when you first set them up. If you save them to Google Drive they will automatically be saved.

The video also shows you how you can share your CODAP document with others. When you use the sharing link others can access a copy of your document (not your document) and then can save it for themselves. **VIDEO** (4:16 min)

The **link** to the document that was shared on the video.

Sorting graphs and minimising those not wanted

- Graphs and text boxes can be moved around by clicking on the blue-green header bar. They can also be resized if needed.
- When you click on the blue-green header bar a **dash** and a **cross** appear on the right hand side. Clicking on the dash will minimise a window, if the window is minimised, clicking on the dash restores the window.

Figure 12: Showing graph and description lined up (1) and the table minimised (2)

Lesson 5 - Communicating findings about Dollar Street

- Students are learning to choose the best descriptive statements to answer the investigative question.
- Students prepare their own evidence of undertaking a statistical enquiry to share with others.
- Students can reflect on their findings relative to initial conjectures they have made.

☀ CONCLUSION: Answering the investigative question

Students answer the investigative questions using evidence from their analysis. This can also be put in a text box in CODAP.

☀ CONCLUSION: Communicating findings

There are a number of ways the findings from their Dollar Street presentation can be communicated to others.

- Students share the CODAP document with their teacher.
- They can print their graphs and write up onto the **Dollar Street Investigation one-pager template** provided in the student materials (see slide 7 **Y5 Exploring our World 2 Google Slides**).
- They could use an electronic **one pager** (see slide 7 **Y5 Exploring our World 2 Google Slides**).

Reflection

Students reflect on their findings relative to their initial conjectures made in the first lesson of this activity. They add their reflection to their findings.

Dollar Street Investigation student materials

Resource list with preparation

Resource	Preparation required	Approx numbers
Context analysis tool	Photocopy, could be enlarged to A3	One copy per pair or group
Dollar Street investigation	Photocopy, could be enlarged to A3	One as required for those pairs or groups who want to make a physical report

Context analysis tool

Contributing factors
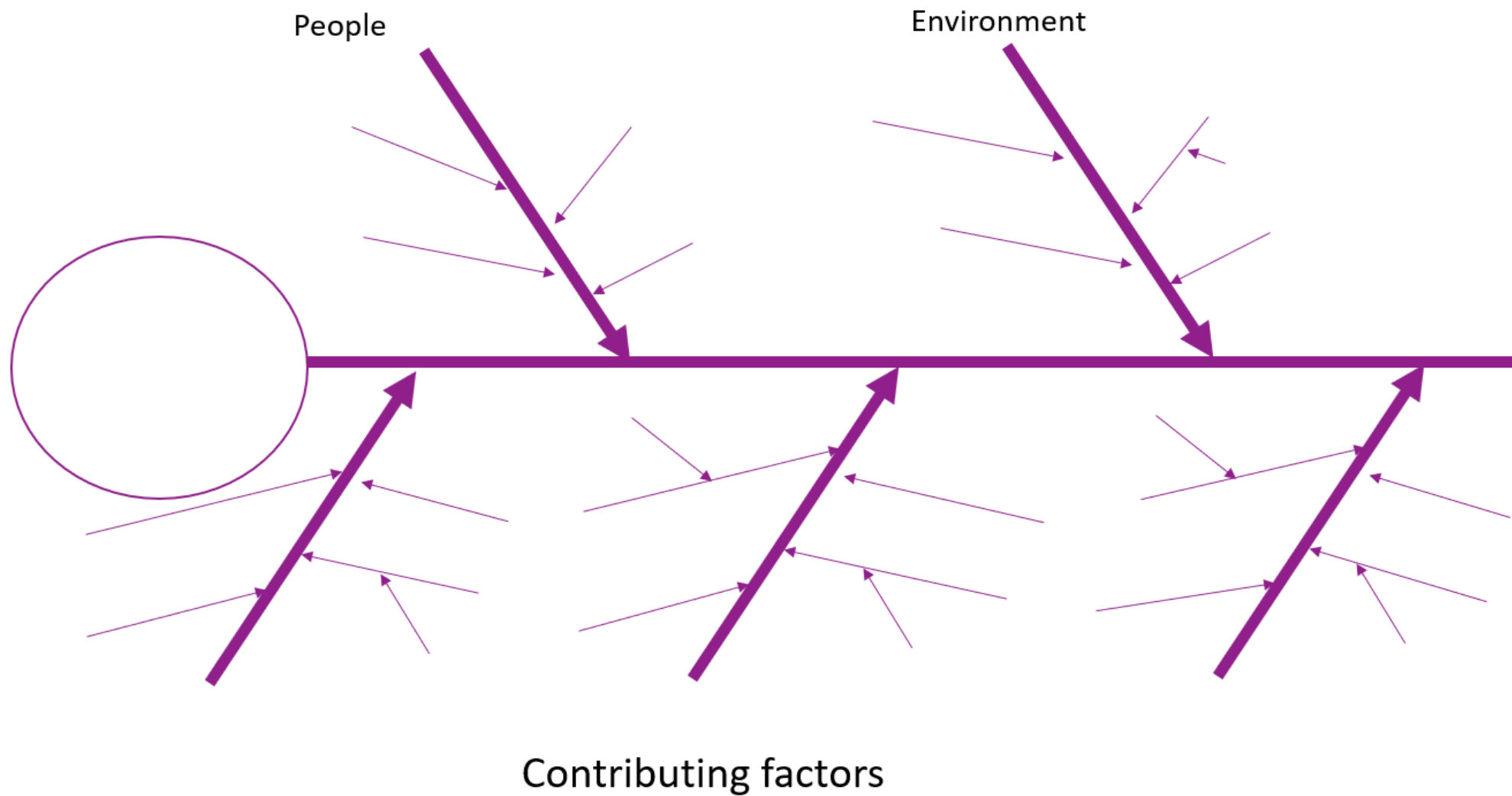
Dollar Street Investigation

INVESTIGATIVE QUESTION:

PLAN/DATA

ANALYSIS

CONCLUSION

NAMES