Introduction to the Web & Spreadsheet Basics

Unit 1

Nepal Data Literacy Program, 2019

Organized by

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Objectives of the Unit

- Understand the different components of Web
- Understand the importance of using spreadsheets
- Learn to create a spreadsheet, export data, sort and filter data, freeze panes
- Use spreadsheets to perform basic calculations like divisions, sums, averages, percentages etc.

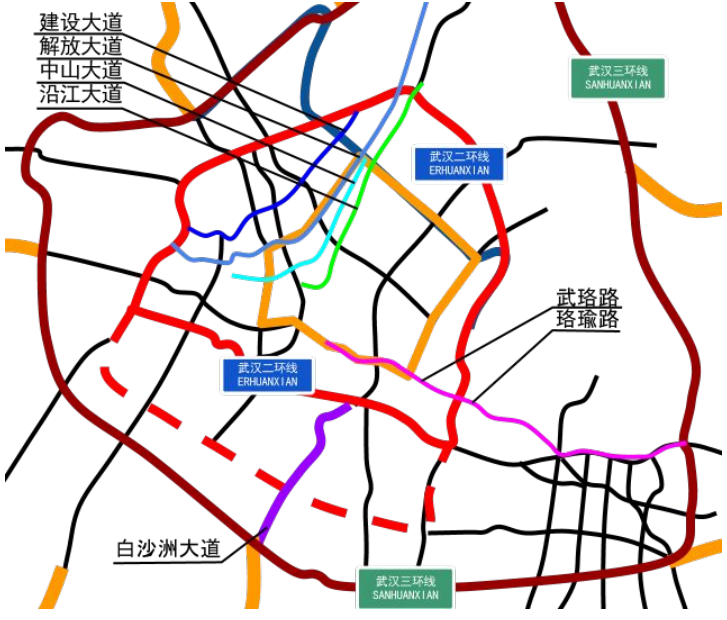
Image source: Cookerly.com

Module 1

Introduction to the Web

Internet vs Web -- Road network vs transport network

Road Network



Transport Network

Image credit*: Wikimedia Commons*

Internet

- A global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardized communication protocols
- Just as how vehicles, pedestrians move through roads, ideas and information move through cyberspace.

World Wide Web (WWW)

- **WWW** is an information system on the Internet with documents connected by links called *hyperlinks*.
- A **web page** is a document containing web resource (text, images, etc) on the World Wide Web.
- A **web server** is server software, or hardware dedicated to running said software, that can satisfy World Wide Web client requests.
- A **website** contains related **web** resources, such as **web pages**, multimedia content, which are typically identified with a common domain name, and served by at least one **web** server

Helpful Video that explains how the internet works

Web Browser

- Software for *retrieving, rendering and transmitting* information resources on the World Wide Web
- **Operating Systems** for the web
- Examples: Microsoft **Edge**, Mozilla Firefox, Google Chrome, Opera, Apple Safari

Recommendation:

- Have more than one web browser to troubleshoot web issues

Web Browser Features

- All web browsers have common features like *address bar, favourite button, refresh button, forward button, backward button, etc.*

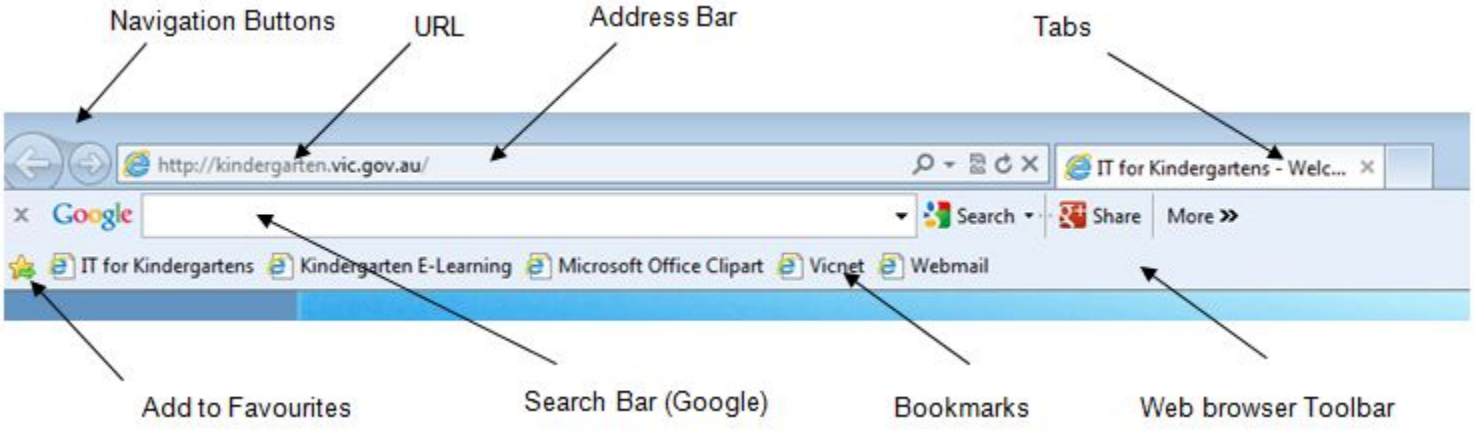


Image source: *Kindergarten IT Program*

Search Engines

- A **search engine** is designed to carry out **web search**, which means to search the web in a systematic way for particular information specified in a search query

Few Search Engines:

- Google
- Bing
- DuckDuckGo
- Yahoo! Search

Image source*: Google Images*

Web Services

- Services offered via the World Wide Web using web-based interface

Examples:

- Microsoft Office 365
- Google Suite
- Dropbox
- Amazon Web Services

Images source: *Google Images*

Google Services

- **Gmail**: Send, receive, store messages with attachments and *many other* ...
- **Google Drive** (*15* GB free Storage): Standard and universal storage for all the major Google services
- **Google Docs**: Google variant of Microsoft Word
- **Google Sheets**: Google variant of Microsoft Excel
- **Google Slides**: Google variant of Microsoft Powerpoint
- Other google services like **Google Data Studio** (for data visualization), **Google Colab** (for machine learning)

Module 2

Introduction to Spreadsheets

Overview of spreadsheets

- Spreadsheets are a basic tool used for data management and analysis. They store data in a structured, machine-readable format making it easy to sort, filter and perform various calculations and analysis.
- There are different spreadsheet applications and programs. For example: Microsoft Excel, Google Sheets, Open Libre
- For this workshop, Google Sheets, a free internet based spreadsheet will be used.

"No, Smith, that's NOT why they're called 'spreadsheets'."

Advantages of Google Sheets

- Built-in formulas, pivot tables and conditional formatting among other options to save time and simplify common spreadsheet tasks
- Ability to choose from a wide variety of pre-made spreadsheets (e.g., budgets, schedules etc.)
- Ability to access, create, and edit spreadsheets from phone, tablet, or computer — even when there's no connection
- All changes are automatically saved on google drive (revision history keeps old versions of the same spreadsheet, sorted by date and who made the change)
- All that is needed to access Google Sheets is:
  - An Internet connection
  - A Google account
  - A Web browser

Content source: https://www.google.com/sheets/about/

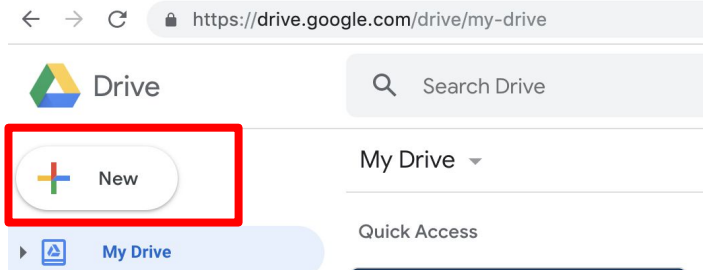
Limitations of Google Sheets

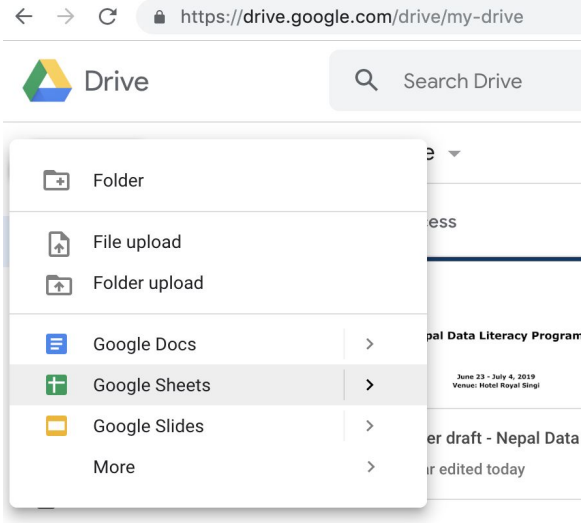
- **Number of Cells**: Total of 400,000 cells across all sheets
- **Number of Columns**: 256 columns per sheet
- **Number of Formulas**: 40,000 cells containing formulas
- **Number of Tabs**: 100 sheets per workbook
- **GoogleFinance formulas**: 1,000 GoogleFinance formulas
- **GoogleLookup formulas**: 1,000 GoogleLookup formulas
- **Complexity**: VLOOKUP and HLOOKUP formulas tend to be more complex than other functions, and may slow down your spreadsheet.

Content source: https://docs.google.com/document/d/1E7sT_BMkFOXR4EsDMUUhOgeD6BrEjFzS8fHv8tNrfPU/edit

Creating a Google spreadsheet

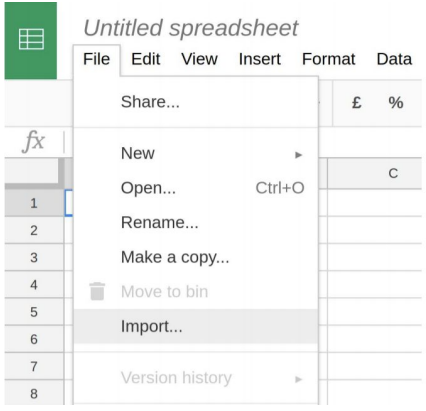
1. Go to Google Drive (drive.google.com)
2. If you are not yet logged into Google Drive, you need to login
3. Create a new spreadsheet by clicking the **New** button to the left and select **Google Sheets**

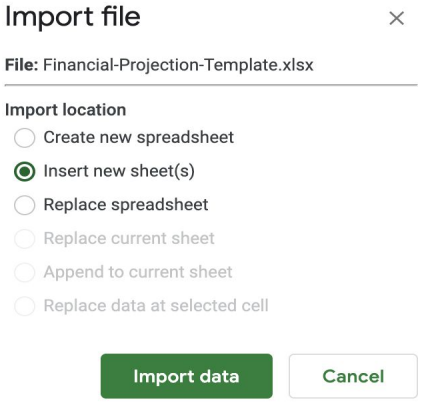




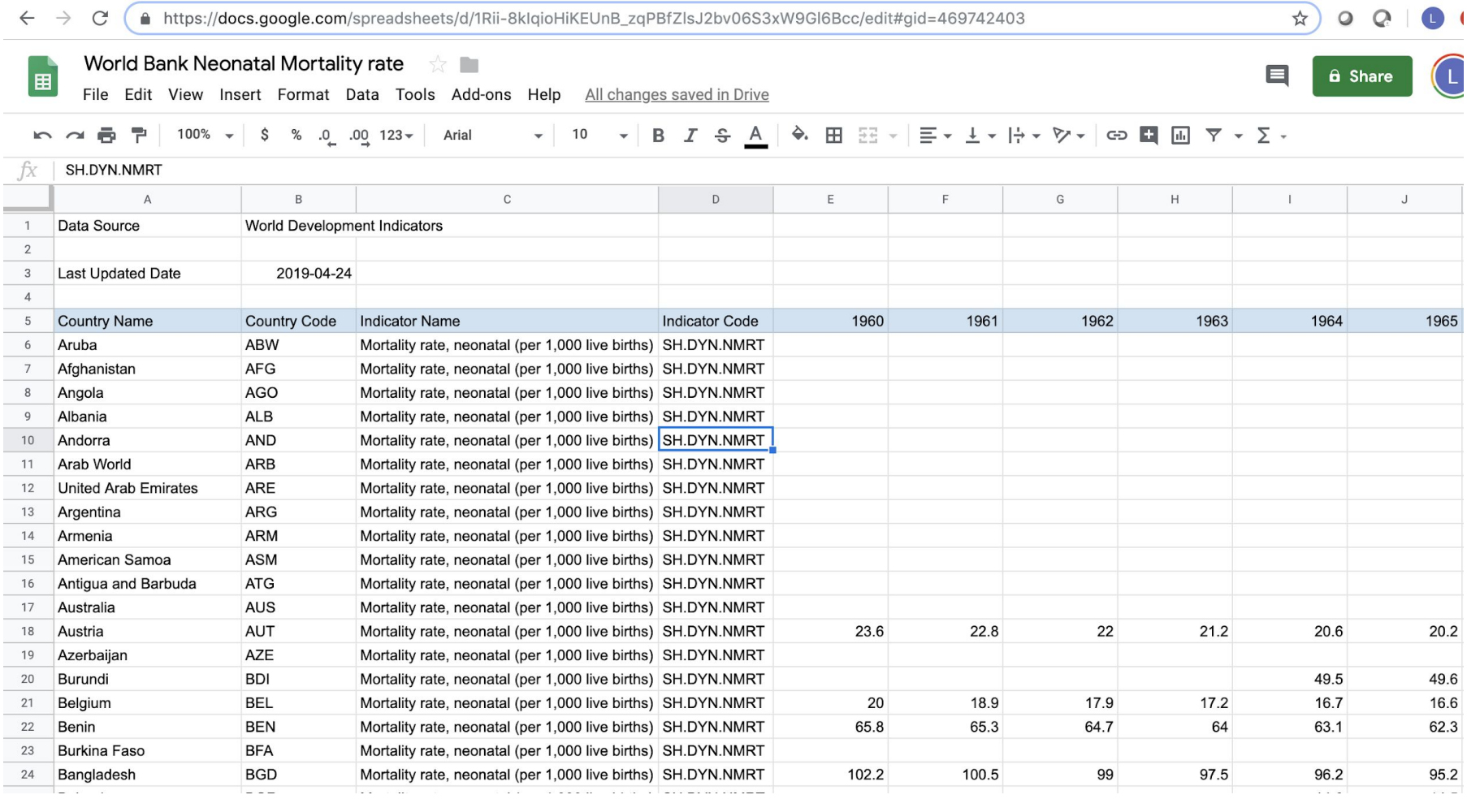
Importing data to Google Sheets

1. We will be uploading a “GDP Health Expenditure and Life Expectancy” dataset from the World Bank Data Portal. You can download the file directly from here or from your Module 1 Data folder.
2. In Google Sheets select **import** from the File menu. This will open a dialog for you.
1. Choose the **Upload** option and click **Select a file from your computer** choose the file you downloaded.
3. Under the Import location section, select **Insert new sheet(s)**, and click **Import data**
4. Google Sheets may take a few seconds to upload the file but should open a document.





Navigating and using the spreadsheet



https://docs.google.com/spreadsheets/d/1Rii-8kIqioHiKEUnB_zqPBfZlsJ2bv06S3xW9Gl6Bcc/edit#gid=469742403

World Bank Neonatal Mortality rate

File Edit View Insert Format Data Tools Add-ons Help All changes saved in Drive

Share

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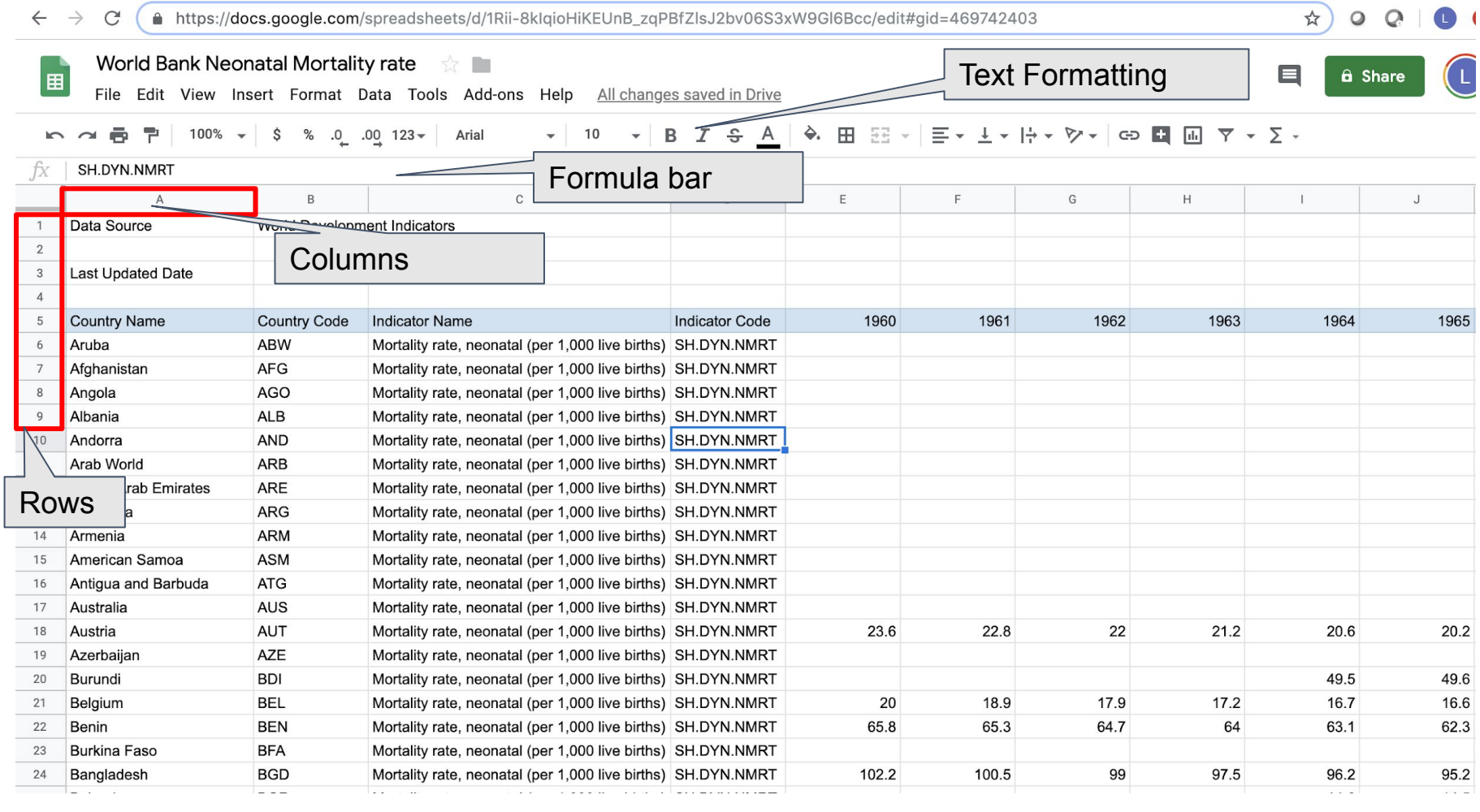
fx SH.DYN.NMRT

	A	B	C	D	E	F	G	H	I	J
1	Data Source	World Development Indicators								
2										
3	Last Updated Date	2019-04-24								
4										
5	Country Name	Country Code	Indicator Name	Indicator Code	1960	1961	1962	1963	1964	1965
6	Aruba	ABW	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
7	Afghanistan	AFG	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
8	Angola	AGO	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
9	Albania	ALB	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
10	Andorra	AND	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
11	Arab World	ARB	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
12	United Arab Emirates	ARE	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
13	Argentina	ARG	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
14	Armenia	ARM	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
15	American Samoa	ASM	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
16	Antigua and Barbuda	ATG	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
17	Australia	AUS	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
18	Austria	AUT	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT	23.6	22.8	22	21.2	20.6	20.2
19	Azerbaijan	AZE	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
20	Burundi	BDI	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT					49.5	49.6
21	Belgium	BEL	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT	20	18.9	17.9	17.2	16.7	16.6
22	Benin	BEN	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT	65.8	65.3	64.7	64	63.1	62.3
23	Burkina Faso	BFA	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT						
24	Bangladesh	BGD	Mortality rate, neonatal (per 1,000 live births)	SH.DYN.NMRT	102.2	100.5	99	97.5	96.2	95.2

Navigating and using the spreadsheet



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Freezing pane

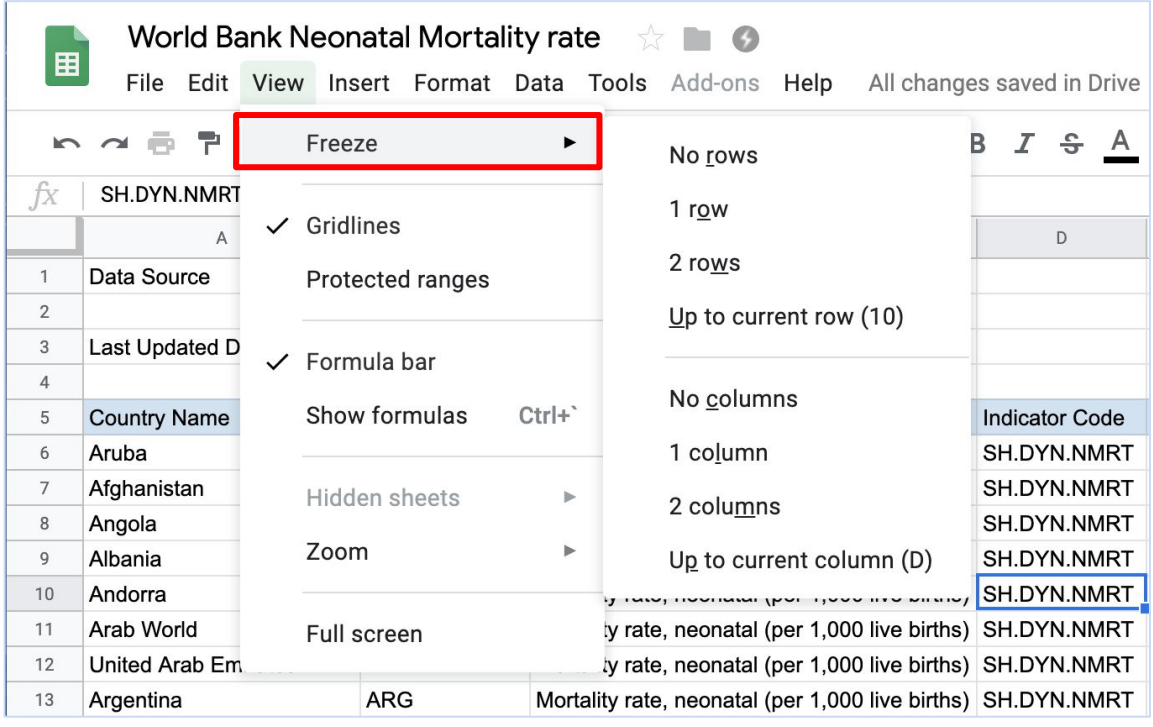
When you scroll down the page, freezing pane helps to keep titles in sight (rows, columns or both)

To freeze row:

- Click **View** > **Freeze** > **1 row**

To freeze column:

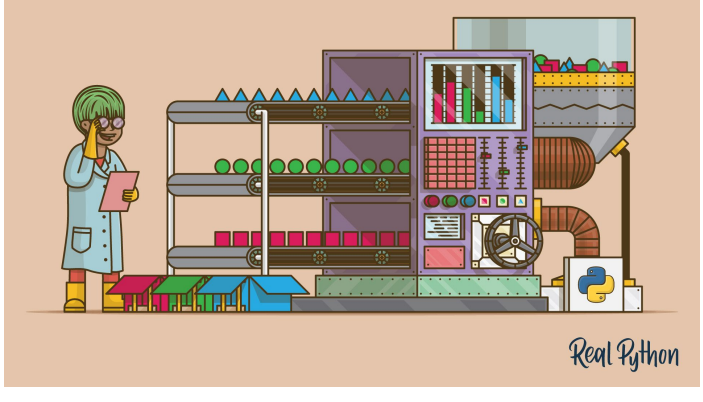
- Click **View** > **Freeze** > **1 column**



Filtering and Sorting Data

The first thing to do when looking at a new dataset is to orient yourself. This involves looking at maximum/minimum values and sorting the data so it makes sense

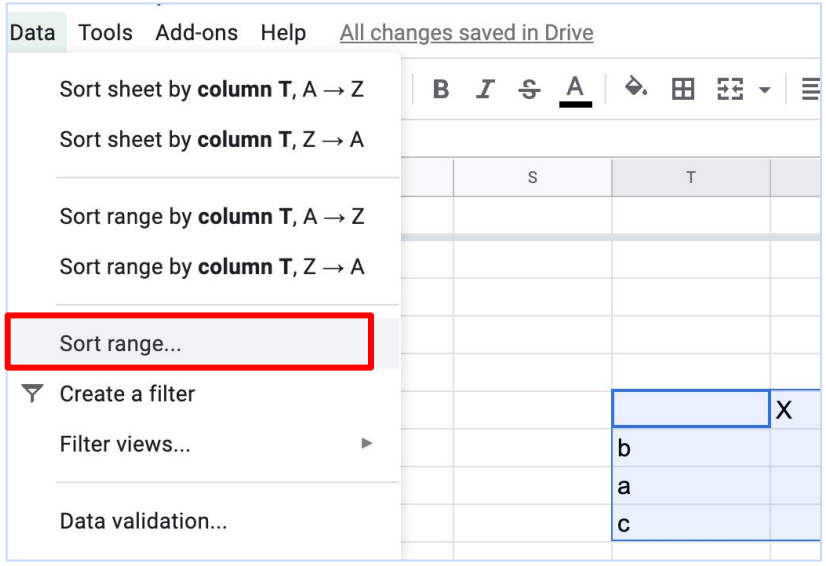
- Sorting arranges data alphabetically or numerically in ascending or descending order
- Filtering hides (filters out) unwanted records displaying only the records you want to see

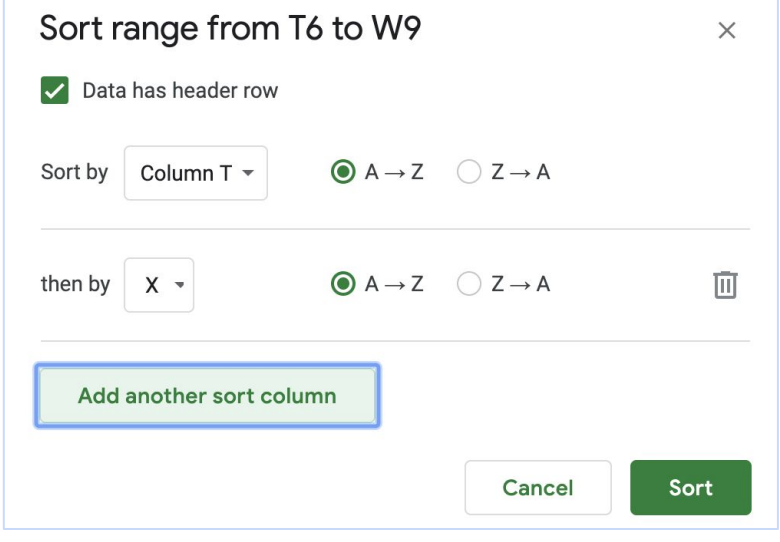


Picture credits: https://realpython.com/python-sort/

How to sort data

1. Highlight the group of cells you'd like to sort
2. Click **Data** and then click **Sort range**
   a. If your columns have titles, click **Data has header row**
3. Select the column you'd like to be sorted first and whether you would like that column sorted in ascending or descending order (also sorts numbers)
4. Click **Add another sort column** to add another sorting rule
5. To delete a rule, click **delete** button
6. Click **Sort** button when done. Your range will be sorted

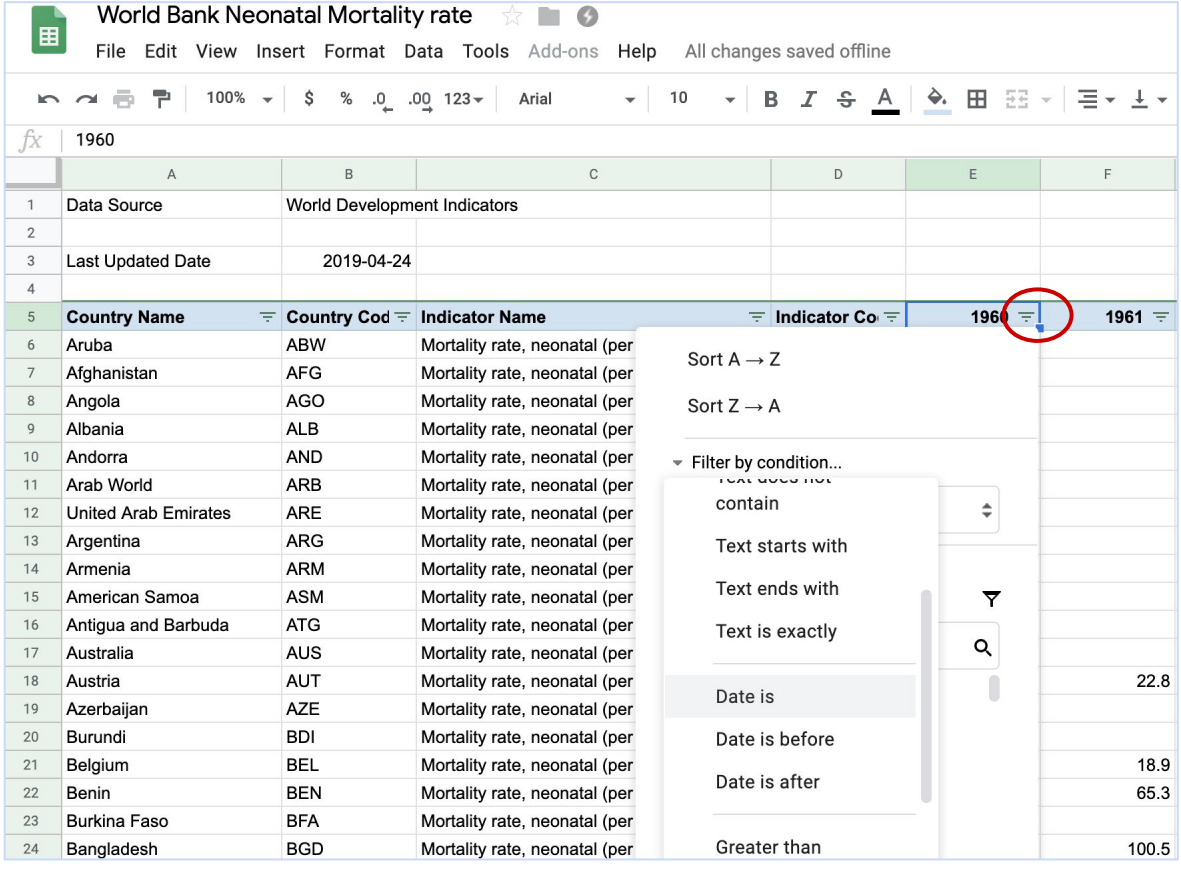




Filtering data

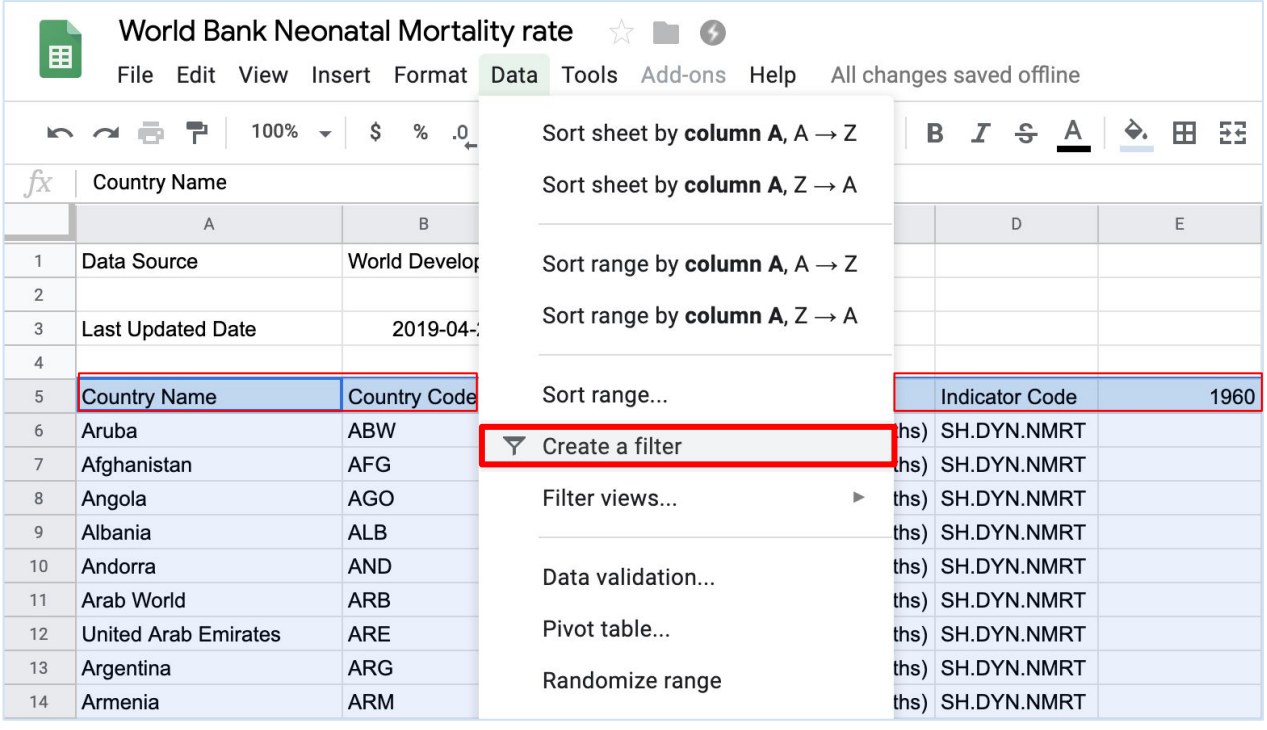
In Sheets, you can filter by:

- Alphabetical order
- Condition
  - Value ranges
  - Greater than/less than
  - Text match
- Values
  - Include certain values only



How to Filter data

1. Click on the header row to highlight the row
2. In the menu bar, click **Data** and then select **Create a Filter**
3. Click on the triangle in the column you want to sort/filter
4. To turn the filter off, click **Data** then select **Turn off filter**



Formulas and Functions in Spreadsheets

- Formula uses standard mathematical symbols to operate on cell references and/or numbers. Every formula must begin with an equal (**=**) sign
- Mathematical operator include:
  - **+** Addition
  - **-** Subtraction
  - ***** Multiplication
  - **/** Division
  - **^** Exponentiation (power)
- Formulas containing numbers do not change, but formulas containing cell references change depending on the data in the cell. e.g., formula 'A1**+**B1' will produce a result based on data in cells 'A1' and 'B1'
- Spreadsheets calculates formula using math operator in the following order: BMDAS (Brackets, Multiply, Divide, Add, Subtract). Examples:
  1. *(A1* **+** *A2* **+** *A3* **+** *A4)**/**4*
  2. SUM*(A1:A4)**/**4*
  3. AVERAGE*(A1:A4)*

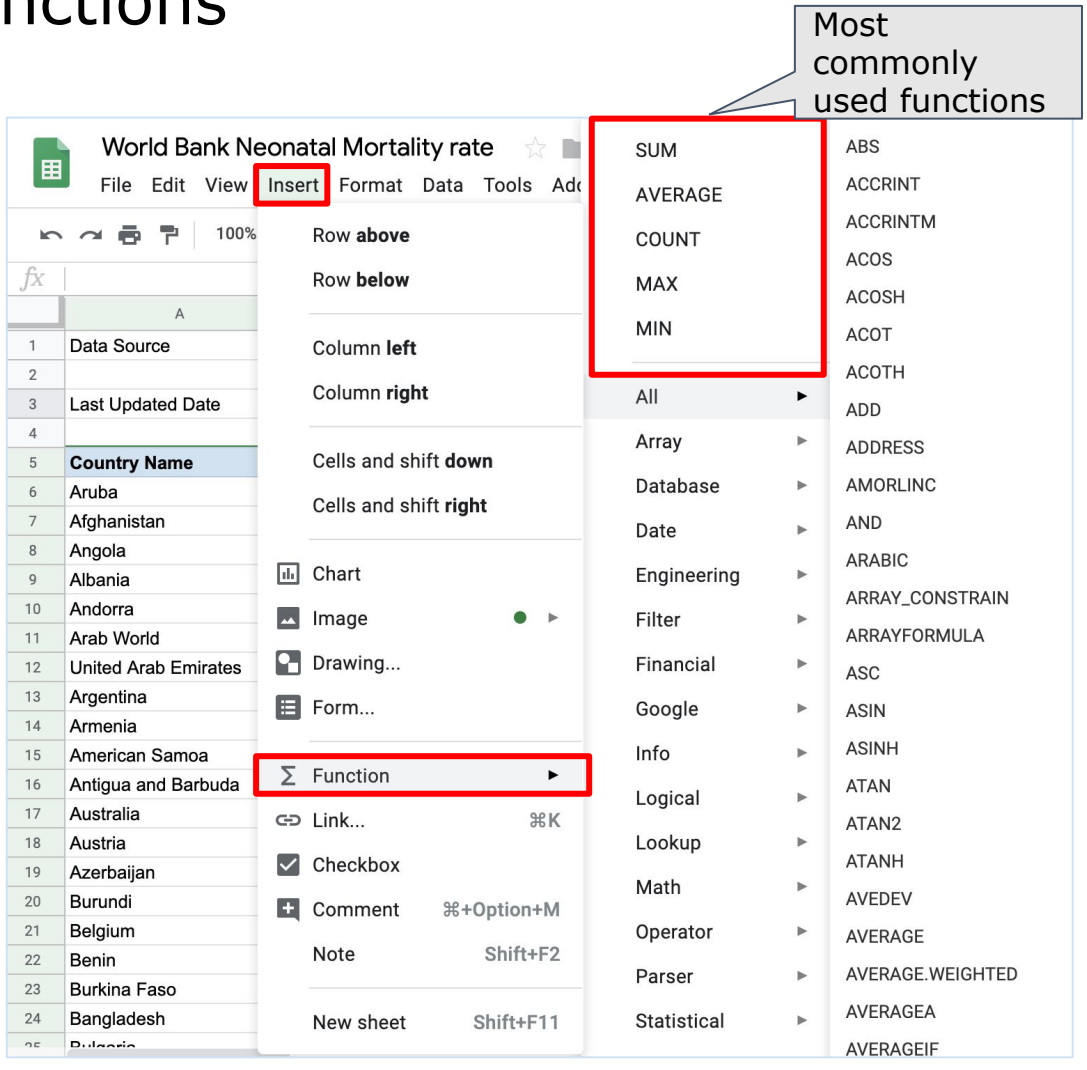
All three instances calculates the average of cells A1, A2, A3, A4

Calculating using functions

Functions are predefined formulas that take values known as 'argument', performs calculations and returns an answer(s)

To add a function in google spreadsheet:

1. Select **Insert** > **Function** > choose a desired function
2. Alternative, begin typing '=' and the function name (e.g., SUM) directly on the spreadsheet



Examples of basic mathematical functions

Function	What it does
SUM	Adds its arguments
SUMIF	Adds the cells specified by one or many given criteria
SUMPRODUCT	Returns the sums of the products of two arrays
SUBTOTAL	Returns the subtotal of a filtered list or database
TRUNC	Truncates a number to an integer
ROUND	Rounds a number to a specified number of digits
ROUNDUP	Rounds a number up, away from zero
INT	Rounds a number to the nearest integer
ABS	Returns the absolute value of a number
MOD	Returns the remainder from division
SQRT	Returns positive square root
POWER	Returns the result of a number raised to a power

Note: You will have the opportunity to practice some of these functions and other functions in the lab exercises

Google Sheet function list: https://support.google.com/docs/table/25273?hl=en

Additional resources for Spreadsheets

Basic Excel Functions:

http://www.cdtl.nus.edu.sg/emodules/formulas-functions-excel.pdf

Intermediate Excel:

http://biostat.mc.vanderbilt.edu/wiki/pub/Main/TheresaScott/Excel.FnsFrmls.pdf

Advanced Excel:

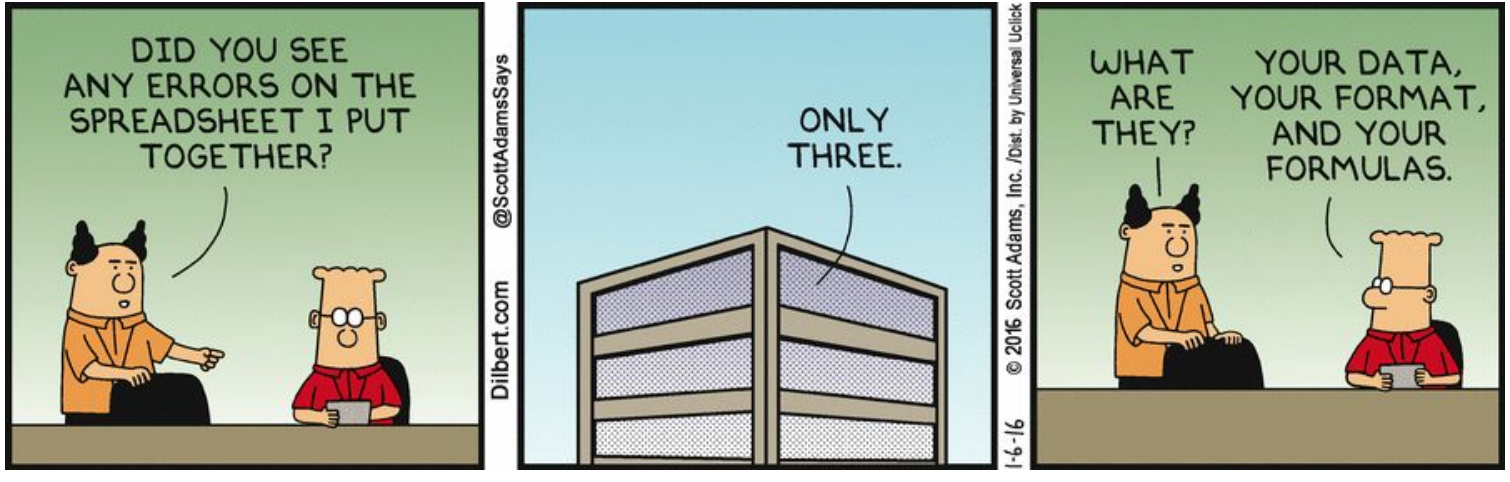
https://corporatefinanceinstitute.com/resources/excel/study/advanced-excel-formulas-must-know/

Shortcuts and Cheat sheets:

https://corporatefinanceinstitute.com/resources/excel/study/excel-formulas-cheat-sheet/

https://corporatefinanceinstitute.com/resources/excel/shortcuts/excel-shortcuts-pc-mac/

Note: Formulae and functions from Excel spreadsheets are applicable to Google Spreadsheets


DID YOU SEE ANY ERRORS ON THE SPREADSHEET I PUT TOGETHER?
Dilbert.com @ScottAdamsSays
ONLY THREE.
1-6-16 © 2016 Scott Adams, Inc. /Dist. by Universal Uclick
WHAT ARE THEY?
YOUR DATA, YOUR FORMAT, AND YOUR FORMULAS.

Break

Lab 1

Sums, Rates, and Percentages

Scenario

- You are looking at access to government health facilities in Nepal, and have been provided data about the the nearest government health facilities in Nepal by rural/urban areas, ecological zone, development regions, province, and wealth quintiles
- Since each group has varying population, you want to analyze this data in a manner that these numbers can be compared across the groups in a logical manner. In this lab, you will:
  - Calculate sums
  - Calculate percentages
  - Create summary charts

Residence	<30 minutes	30-60 minutes	60+ minutes	Don't know	Total	Number of households
Urban	54.9	37.6	6.7	0.8	100	6,781
Rural	40.5	40.7	18.7	0.1	100	4,259
Ecological zone						
Mountain	34.5	39.9	25.3	0.2	100	781
Hill	39.4	42.1	17.4	1.1	100	5,134
Terai	61.5	35.3	3.1	0	100	5,125
Development region						
Eastern	53.8	36	10.1	0.1	100	2,590
Central	57.9	34	6.8	1.4	100	3,949
Western	52.1	37.6	10.3	0	100	2,245
Mid-western	24.9	52	23	0.1	100	1,339
Far-western	28.7	50.8	20.3	0.1	100	915
Province						
Province 1	50.5	36.6	12.9	0.1	100	2,004
Province 2	69.1	29.2	1.7	0.1	100	2,014
Province 3	50.6	37.9	9.4	2.1	100	2,521
Province 4	46.5	39.7	13.7	0	100	1,173
Province 5	45.3	43.4	11.2	0.1	100	1,793
Province 6	23.6	47.9	28.5	0	100	619
Province 7	28.7	50.8	20.3	0.1	100	915
Wealth quintile						
Lowest	19.6	45.9	34.3	0.2	100	2,234
Second	39.5	46.7	13.8	0	100	2,225
Middle	55	39.1	5.7	0.1	100	2,065
Fourth	60.7	35.9	2.3	1.2	100	2,240
Highest	71.9	26.5	0.4	1.2	100	2,276
Total	49.3	38.8	11.3	0.5	100	11,040

Data Source: NDHS Data 2016
Sheet 4. Distance to nearest government health facility

Exercise

Use Google Sheets to calculate the following:

1. Using the "Ecological Zone" data, calculate the percentage of households that live in Mountains, Hills and Terai region. Create a Pie Chart to display the information breakdown
2. Using "Province 3" data, Calculate what percentage of Province 3 population lives more than 30 mins from the nearest health facility.
3. Using "Province" data, calculate which Province has the highest percentage of its total population living less than hour away from the nearest health facility.

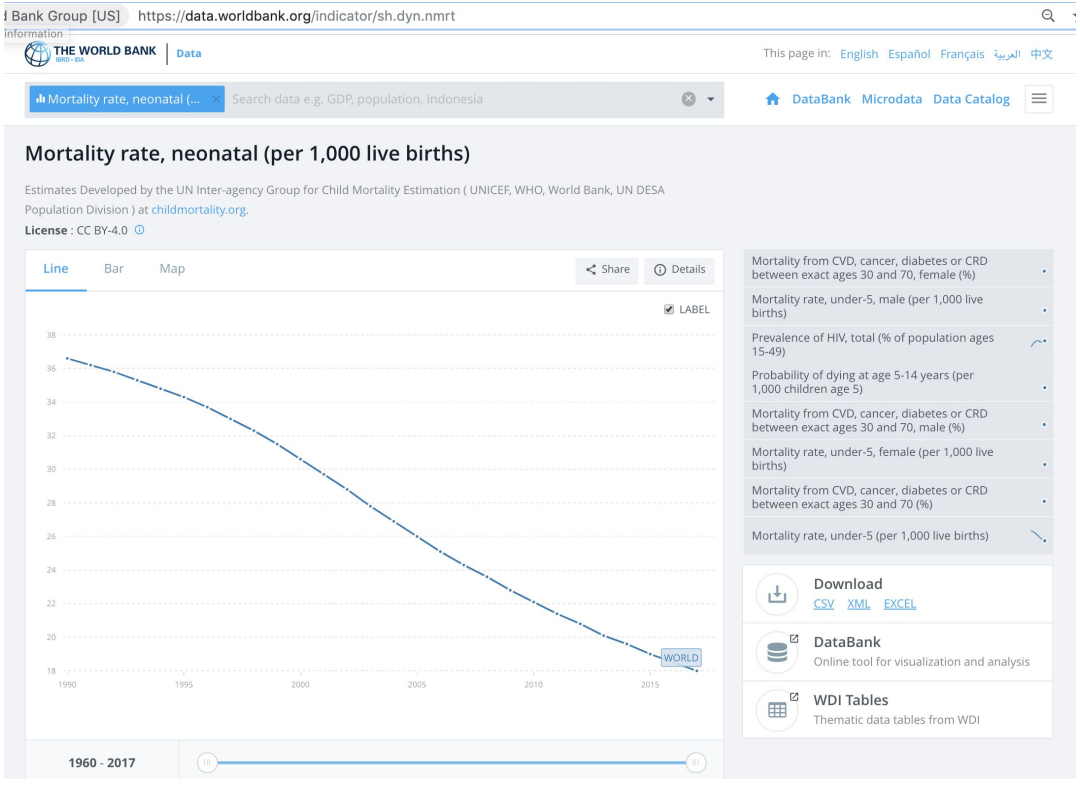
Here is the health data. Please create a copy of the data in your google drive and feel free to play with it (Add new tabs, create new formulas etc.)

Lab 2

Averages and Percentage changes

Scenario

- You want to conduct a regional comparison to investigate trends in under-five mortality using World Bank data.
- You will first find and download the appropriate data to analyze (CSV), upload it to sheets and then look for pattern on change in under-five mortality rate over time for Nepal and its neighbors.
- You will also look at individual countries and find out by how much have they reduced this rate over the decade.



Data Source: [World Bank Data Bank]

Exercises

Use Google spreadsheet to sort the data and calculate the following:

- Which country had the highest rate of neonatal fatalities in 2008?
- Which country had the lowest rate of infant deaths in 2017?
- Calculate the **percentage change in infant mortality rate** for all countries over 10 years between 2008 to 2017. What was Nepal's percentage change in infant mortality rate?