Lab 1: Introduction to GIS and Mapping Malaria Prevalence

Introduction to Core GIS Concepts

1. Key Concepts and Terminology

Term	Description
GIS (Geographic Information System)	A system for capturing, storing, analyzing, and visualizing spatial (location-based) data.
Vector Data	Data made of points, lines, or polygons. In this lab, each district is represented as a polygon.
Raster Data	Data stored in a grid of cells (e.g., satellite imagery). Not used in this lab.
Attribute Table	A table linked to a map layer. Each row represents a feature and columns contain data.
Choropleth Map	A thematic map where regions are colored based on a statistical variable.
Graduated Symbology	A method to color features using color intensity based on values.
Coordinate Reference System (CRS)	Defines how the 2D map corresponds to real-world locations.
Joining Tables	Combines spatial data and attribute data using a shared field.

2. QGIS Tools and Features Used

Tool / Feature	Purpose
Add Vector Layer	Loads spatial data like shapefiles or GeoPackages.
Add Delimited Text Layer	Loads CSV or Excel tables with health data.
Joins	Connects datasets by a common field.
Symbology	Changes how features are displayed based on attribute values.
Print Layout	Designs maps for export with legends and titles.
Map Composer Tools	Used to add elements like title, scale bar, legend, etc.

3. Common GIS File Types

File Type	Description

Shapefile (.shp)	Widely used vector format that represents point, line, or polygon features.
GeoPackage (.gpkg)	Single file format that stores all spatial and tabular data.
CSV (.csv)	Comma-separated values table storing non-spatial health data.
QGIS Project (.qgz)	Stores your map layers, settings, and styles.

4. Spatial Data in Public Health Mapping

Concept	Relevance
District Boundaries	Spatial units for aggregating health data.
Health Indicators	Numeric values (e.g., malaria prevalence) linked to a location.
Map Scale & Legends	Helps communicate data clearly to public health stakeholders.
Symbology Choices	Color ramps or intervals influence interpretation.
Spatial Analysis	In Lab 1, focus is on visual exploration.

Lab 1: Mapping Malaria Prevalence in QGIS

Lab 1: Mapping Malaria Prevalence by District in Uganda using QGIS

Objective:
Participants will learn how to create a choropleth map showing malaria prevalence by district using QGIS. This includes loading spatial and tabular data, joining attribute tables, symbolizing the data, and exporting the final map layout.

Materials Needed:

QGIS software (pre-installed)

Uganda_districts.gpkg (or shapefile version)

malaria_prevalence_uganda.csv (provided)

Step-by-Step Instructions:

1. Start QGIS and Create a New Project

Open QGIS.

Click Project > New to start a blank project.

Save your project: Project > Save As (e.g., Malaria_Map.qgz).

2. Load the District Shapefile

Go to Layer > Add Layer > Add Vector Layer.

Browse to select Uganda_districts.gpkg.

Click Add to load the district boundaries.

3. Load the Malaria Prevalence Table

Go to Layer > Add Layer > Add Delimited Text Layer.

Browse and select malaria_prevalence_uganda.csv.

Ensure "CSV" is selected, and confirm that the table loads correctly.

Click Add.

4. Join the CSV Table to the District Layer

Right-click on the district layer in the Layers Panel, then click Properties.

Go to the Joins tab and click the "+" (Add) button.

Set the join parameters:

Join layer: malaria CSV

Join field: District

Target field: matching district name field in the shapefile (often also District)

Click OK, then OK again to close the Properties window.

5. Style the Map by Malaria Prevalence

Right-click the district layer > Properties > Symbology.

Change from "Single symbol" to Graduated.

In the Value field, select Malaria_Prevalence_Percent (from the joined table).

Choose a color ramp (e.g., Reds), then click Classify.

Adjust class breaks if needed.

Click OK to apply the style.

6. Add Labels (Optional)

Right-click the district layer > Properties > Labels.

Select Single Labels and choose the district name field.

Adjust font and placement as needed.

7. Create a Print Layout

Go to Project > New Print Layout. Name it Malaria_Map_Layout.

Use the Add Map tool to draw the map frame.

Add map elements:

Legend

Title (e.g., "Malaria Prevalence by District - Uganda")

Scale Bar

North Arrow

Adjust positions and sizes as needed.

8. Export the Map

In the Layout window, go to Layout > Export as PDF.

Save the file (e.g., Malaria_Prevalence_Map.pdf).

Outcome:
Participants will have created a professional-quality malaria map showing variations in prevalence across Ugandan districts, with clear visualization and exportable results.

Optional Extensions:

Try different color schemes or classification methods.

Combine with health facility data to analyze access gaps.

Create maps for other diseases (HIV, TB) using similar steps.