MICOM

MI-Support

Prepared For Anything

A data analysis, capacity building program

Examples of Projects

Types of projects we can help with include:

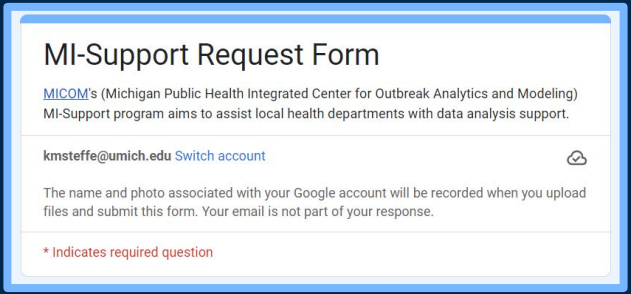
- Evaluating the effectiveness of a vaccination campaign
- Analyzing data from wastewater testing sites
- Building a COVID-19 data dashboard
- Creating an RSV disease forecasting model
- Automating report of daily Excel files
- Hosting MI-Support-led data analysis workshops

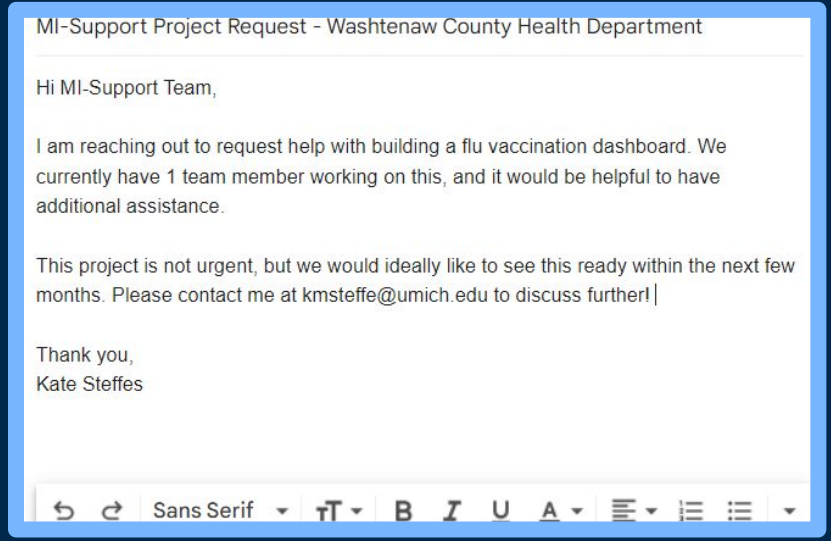
MICOM

Submitting a MI-Support Request

- Submit a request through our Google Form

- Not sure about your request or want more information? Email us at micom-misupport@umich.edu





MICOM

All Code, Files, etc. are available at:

https://micom-hub.github.io/r_workshop_page.html

Please download the
28 March 2025 data files.

Quick Introductions

Name, Department, Role

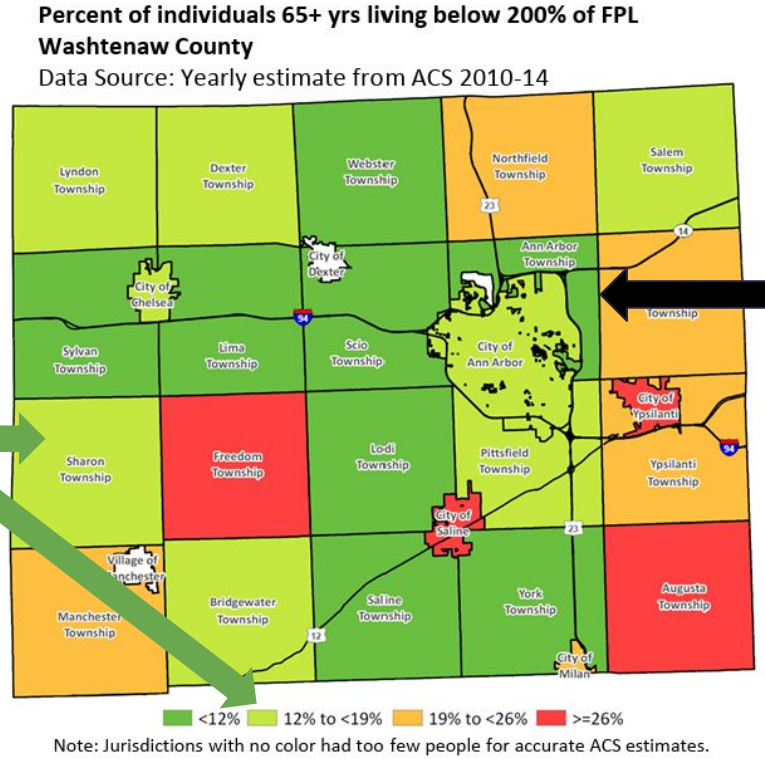
Geography & Mapping in R

2025-03-28

Making Maps Requires Two Types of Data

The metric / data you want to present

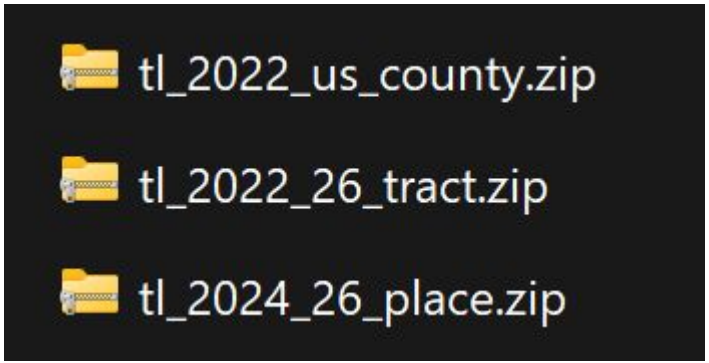
The physical geography outlines

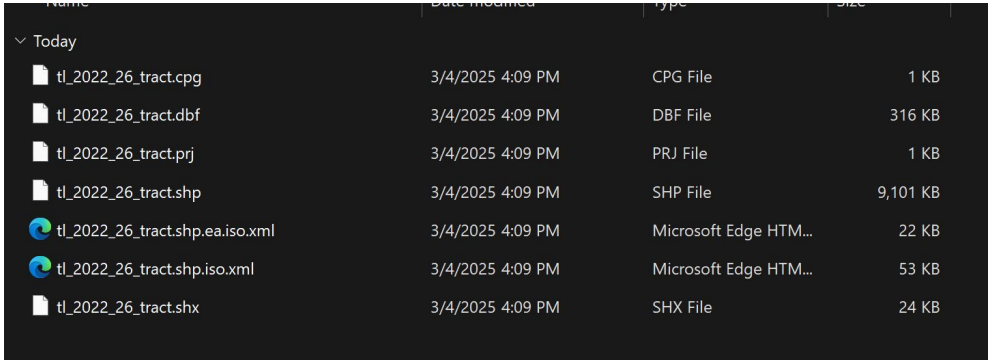


https://content.civicplus.com/api/assets/5a437802-b391-40bc-a405-4b3111130036?cache=180

To make the geographic outlines, we need a “new” Data Type: Shape Files!

Common to download as .zip file:





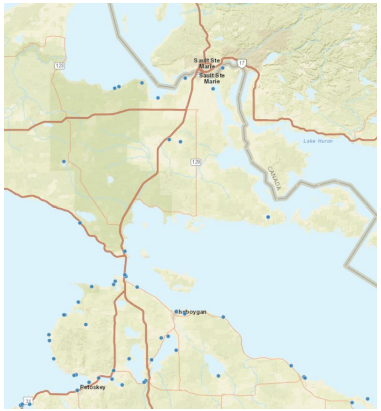
Name	Date modified	Type	Size
Today			
tl_2022_26_tract.cpg	3/4/2025 4:09 PM	CPG File	1 KB
tl_2022_26_tract.dbf	3/4/2025 4:09 PM	DBF File	316 KB
tl_2022_26_tract.prj	3/4/2025 4:09 PM	PRJ File	1 KB
tl_2022_26_tract.shp	3/4/2025 4:09 PM	SHP File	9,101 KB
tl_2022_26_tract.shp.ea.iso.xml	3/4/2025 4:09 PM	Microsoft Edge HTM...	22 KB
tl_2022_26_tract.shp.iso.xml	3/4/2025 4:09 PM	Microsoft Edge HTM...	53 KB
tl_2022_26_tract.shx	3/4/2025 4:09 PM	SHX File	24 KB

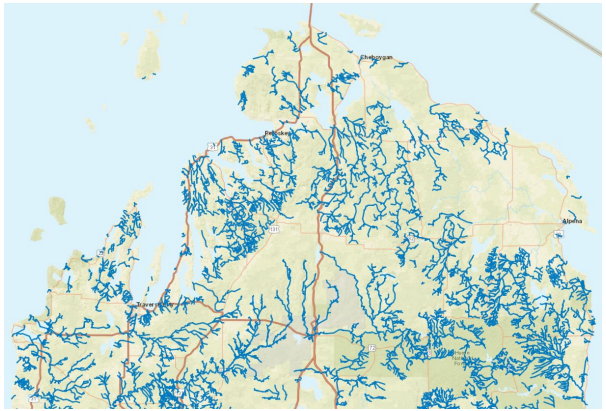
But contain more than just a .shp file, and you need all the pieces together in a folder for R to “use” the .shp file

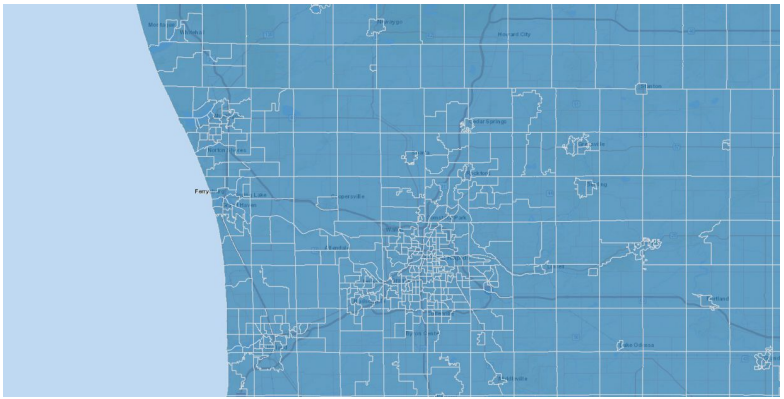
https://gis-michigan.opendata.arcgis.com/

A “new” Data Type: Shape Files!

- The shapefile format is a geospatial vector data format.
- The shapefile format stores the geometry as geometric shapes like points, lines, and polygons. These shapes, together with data attributes that are linked to each shape, create the representation of the geographic data.







A “new” Data Type: Shape Files!

Generally, these files are very large, as they often encode a lot of information.

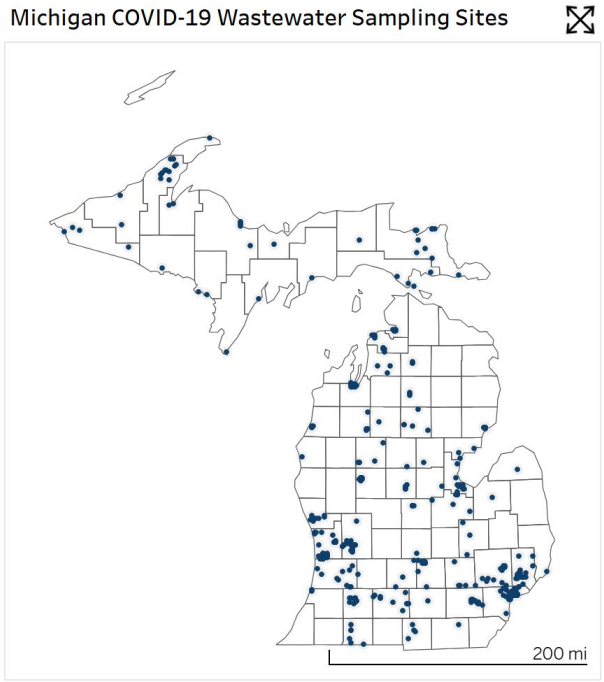
Common Sources:

- Census.gov: https://www.census.gov/geographies/mapping-files/time-series/geo/tiger-line-file.html
- Michigan GIS Open Data: https://gis-michigan.opendata.arcgis.com/

It’s also possible to make your own using ArcGIS.

Vocab - Types of Maps: Point Map

(or dot distribution map)



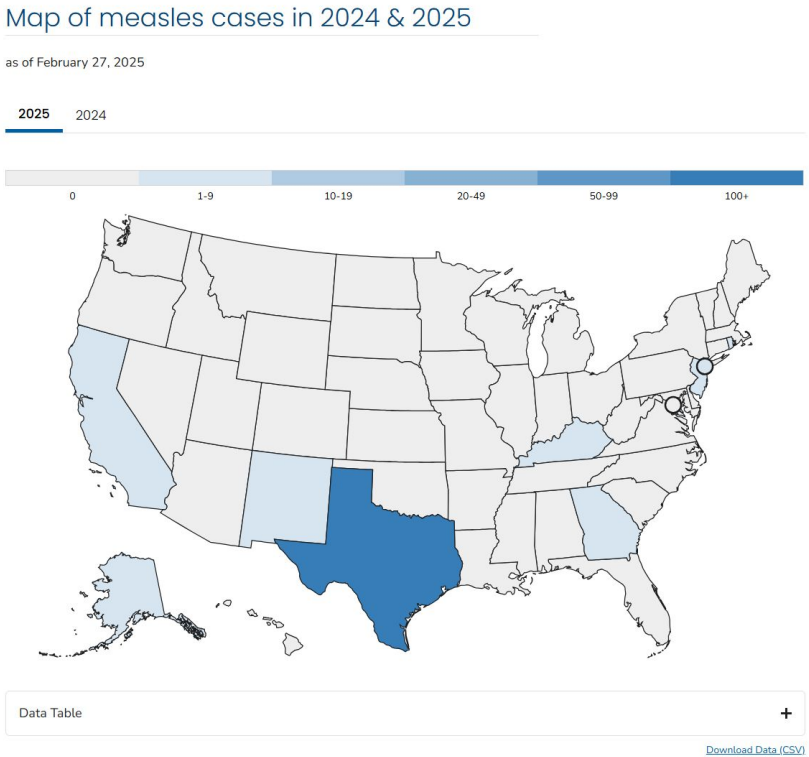
Note: This map displays sampling sites that have ever participated in this wastewater monitoring effort in Michigan since 2020. Both active and inactive sites are included.

Point maps are used to indicate exact locations (or central locations) for particular events.

They often serve as the base for network maps.

https://www.michigan.gov/coronavirus/stats/wastewater-surveillance/wastewater-surveillance-for-covid-19/dashboard

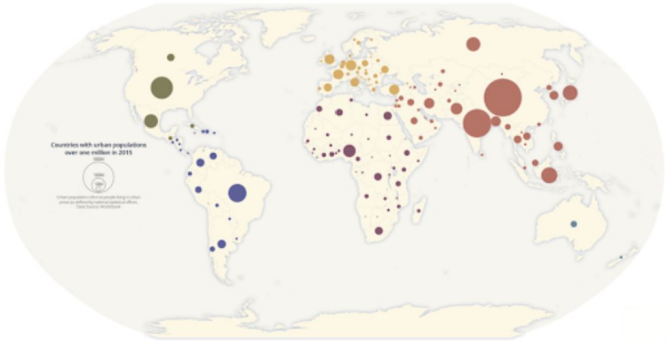
Vocab - Types of Maps: Choropleth



A type of map where geographic areas are outlined and filled with a color that represents an aggregate summary metric for the area.

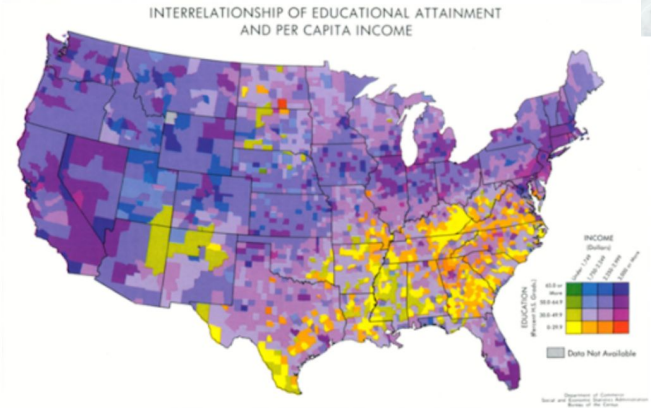
https://www.cdc.gov/measles/data-research/index.html

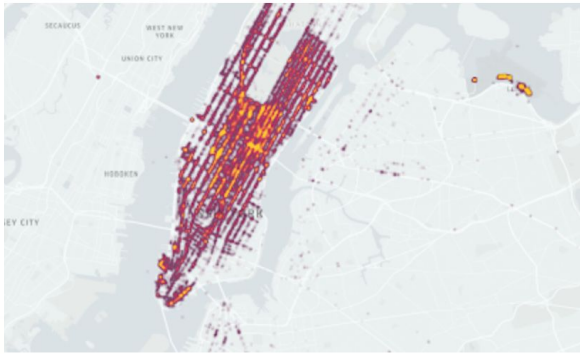
Lots of Maps Types!



Graduated Symbol Map

Bivariate Choropleth Map

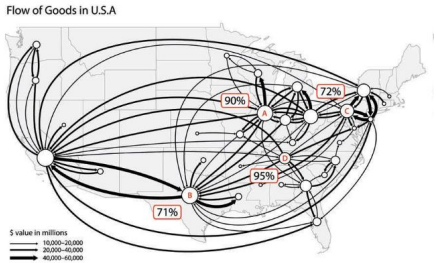


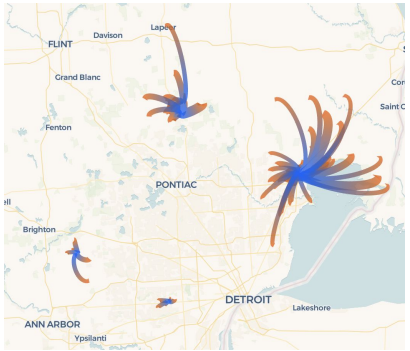


Heat Map

Map Images and Names from: https://builtin.com/data-science/types-of-thematic-maps

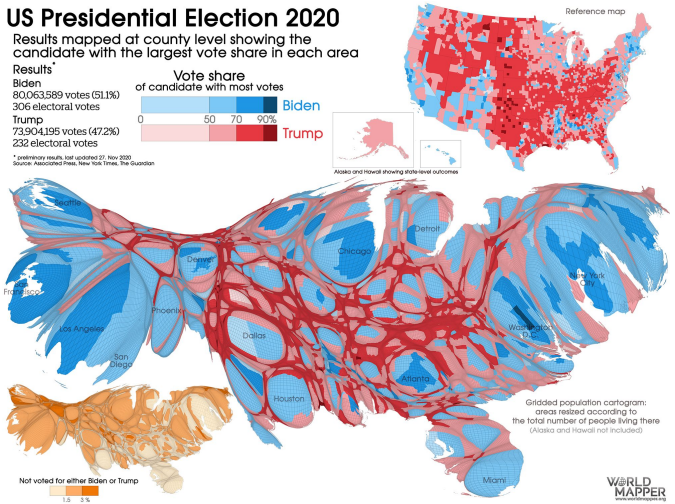
Lots of Maps Types!

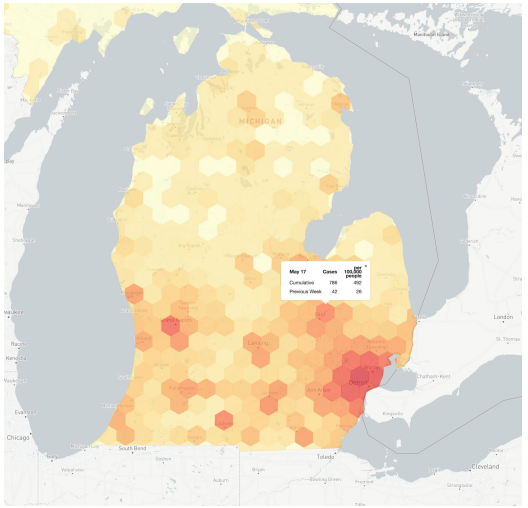




Spatial flows and networks

Cartograms



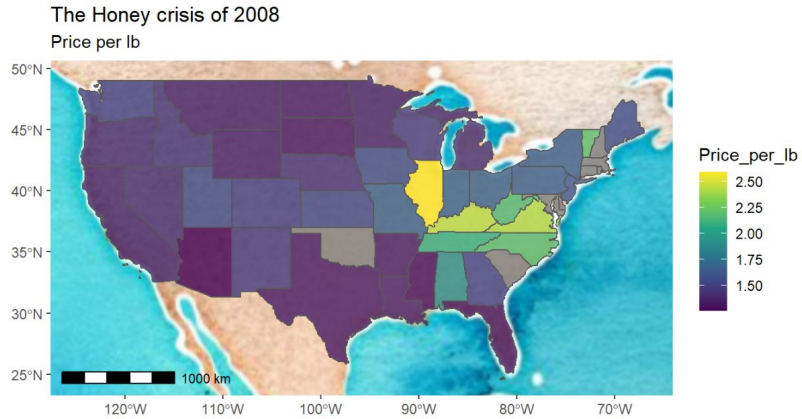


covidmapping.org

Hexbin Maps

R Package For Mapping: ggPlot

```r
ggplot(data = honey2008) +
  annotation_map_tile("stamenwatercolor") +
  geom_sf(aes(fill = Price_per_lb), alpha = 0.8) +
  annotation_scale() +
  scale_fill_viridis_c() +
  ggtitle(label = "The Honey crisis of 2008", subtitle = "Price per lb")
```



- Good for the basics!
- Static
- Same “layered” logic as tidyverse/general ggplot

https://bookdown.org/nicohahn/making_maps_with_r5/docs/ggplot2.html

R Package For Mapping: leaflet

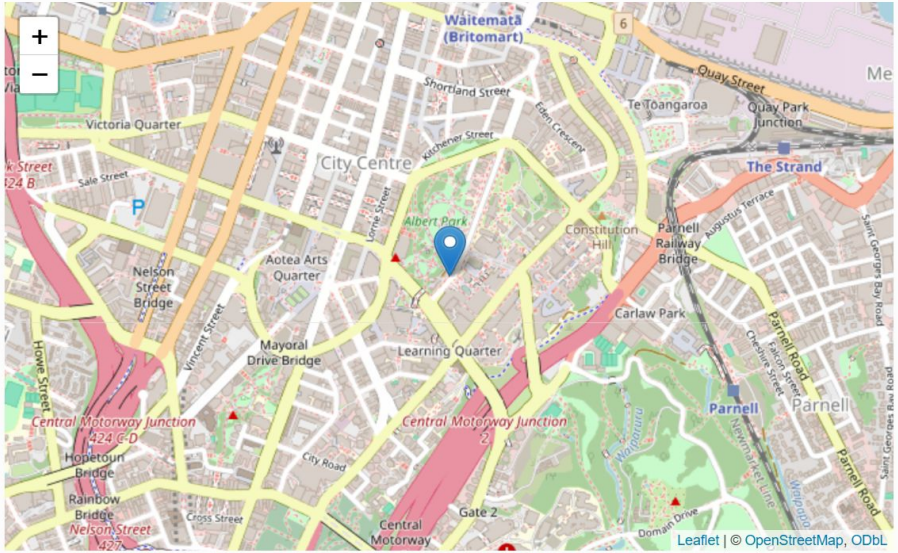
- More advanced/dynamic maps
- Can be interactive
- Still carries the same “layering” logic

https://rstudio.github.io/leaflet/articles/leaflet.html

Warning! Leaflet is a Javascript system first - so you often have to specify “leaflet r” in any google searches for help!

```
library(leaflet)

m <- leaflet() %>%
  addTiles() %>%  # Add default OpenStreetMap map tiles
  addMarkers(lng=174.768, lat=-36.852, popup="The birthplace of R")
m  # Print the map
```



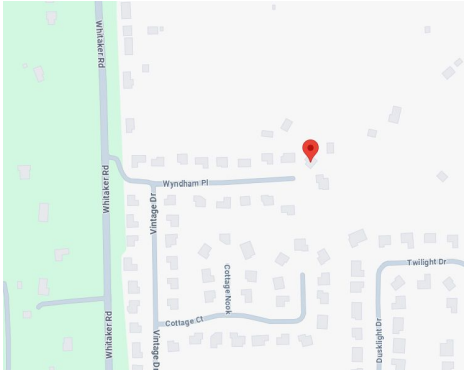
Geocoding Security

Geocoding: converting from address to lat-long (and sometimes need to do the reverse)

Usually requires sending the address to a service (google maps, whatever else)

This means sharing that data with an outside service, which can be complex from a identifying/security perspective (e.g. geocoding a list of cases)

1234 Street
Town, State 56789



(42.785823, -83.772496)

Geocoding Security

Likely not a regular concern, but -

R library can turn addresses into lat/long coordinates:

- ex. tidygeocoder

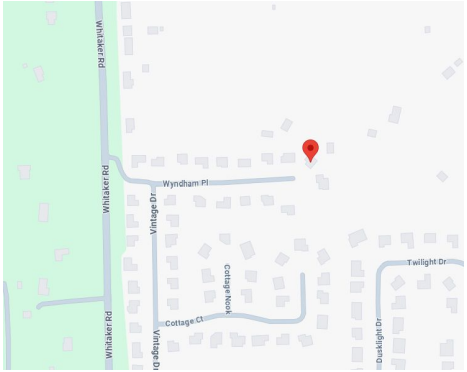
Default uses Nominatum service, others available - of note is the Census

None of these options are truly secure, though some are better than others

Local geocoding options exist but can be complicated

https://cran.r-project.org/web/packages/tidygeocoder/readme/README.html

1234 Street
Town, State 56789



(42.785823, -83.772496)

What We'll Learn to Do:

Shapefiles:

- Loading them in, what they look like

ggplot:

- Make a choropleth map (map with areas shaded by a variable)
- Make a point map
- Save a map as a png file
- Legends & Legend Placement

leaflet:

- Color Palettes & Base maps
- Make a more intricate choropleth map with points and pop-ups
- Legends (moving them too!)
- Saving a map