Project Prospectus

Title: Measuring Maternal Wellbeing Accessibility in Minnesota
Notice: Dr. Bryan Runck
Author: Lauren Roach
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Project Repository: https://github.com/L-roach/GIS5571/tree/main/Final%20Project
Google Drive Link: N/A
Time Spent: Five hours

Abstract

This project will explore the capacity of an area within the state of Minnesota to provide access to resources needed for maternal wellbeing. By sourcing point data from Google Places, maps will be created that depict the locations of these various resources (listed in Table 1). Using a tessellation grid and weighted sums of the cells, the accessibility of resources will be analyzed. Ultimately, the project will culminate in a Maternal Wellbeing Index, depicted at the census tract and county level via choropleth maps. I expect the urban areas to have a high score (high access to resources) and rural areas, particularly those in northern and western Minnesota, to have a low score (low access to resources).

Problem Statement

The prenatal and post-partum periods are very significant moments for maternal health. Access to resources can shape the trajectory of a pregnancy and specifically affect the health of both the mother and baby. For this reason, understanding access—or lack thereof—to resources like dental care, groceries, and fitness opportunities for prenatal and post-partum women is crucial for public health practitioners. Where disease mapping measures the burden of a disease over a particular area and population, this method of accessibility mapping measures the access to resources needed during a vulnerable state of health for women in the state of Minnesota.

Table 1. Data Needed

#	Requirement	Defined As	(Spatial) Data	Attribute Data	Dataset	Preparation
1	MN Shapefile	State of MN shapefile	Polygon	Shapefile	MN Geospatial Commons	N/A
2	Location data	Locations of resources needed during pregnancy and post-partum periods	Point	Type of resource	Google Places	Extraction
3	Tessellation grid	Hexagonal cells	Polygon	N/A	ArcGIS Tool	Create

Input Data

The data used in this project will be point data sourced from Google Places. The data identifies the location of various resources throughout the state of Minnesota, the geographical area of the analysis.

Figure 1 Resources Needed during Pregnancy and Post-partum Periods

Table 2. Resources Data

#	Title	Purpose in Analysis	Link to Source	Group
1	Dentist offices	Raw input data for point location	Google Places	Group 1
2	Mental health providers	Raw input data for point location	Google Places	Group 1
3	Grocery stores	Raw input data for point location	Google Places	Group 2
4	WIC locations	Raw input data for point location	Google Places	Group 2
5	OBGYN Offices	Raw input data for point location	Google Places	Group 1
6	Playgrounds	Raw input data for feature	Google Places	Group 3
7	Fitness centers	Raw input data for point location	Google Places	Group 3

8	Farmers markets	Raw input data for point location	Google Places	Group 2
9	Food shelves	Raw input data for point location	Google Places	Group 2
10	Pelvic Occupational Therapist/ Physical Therapist	Raw input data for point location	Google Places	Group 5
11	Libraries	Raw input data for point location	Google Places	Group 4
12	Midwifery clinics	Raw input data for point location	Google Places	Group 1

Methods

- Download and add MN shapefile
- Find points of resource locations through Google Places and add data to map
- Generate tessellation grid of 10-mile hexagonal cells
- Select by location for tessellation grid within MN
- Count the number of points in each grid using summarize within (add point count to each polygon) for each group; creating a new field which stores the count in each cell
- Group 1 is weighted more (50%) than other resources and this weighting calculation would be calculated in a new field
- Use weighted sum to find sum of scores of each cell
- Overlay county and census tract shapefiles
- Summarize cells with points within each shapefile and aggregate to an index score
- Create one map that displays the cells with points, and the immediate neighboring cells
- Create one map that shows the cells without points or their immediate neighbors
- Create one choropleth map that shows the index score for each census tract
- Create one choropleth map that show the index score for each county
- Perform sensitivity analysis with the counts of the tessellation cells

Results

There will be four maps produced for this project and report. These maps will display the location of resources via the tessellation cells throughout Minnesota, the location of areas without resources, the index scores for the census tracts, and the index scores for the counties. I expect the urban areas to have a higher score and rural areas to have a lower score.

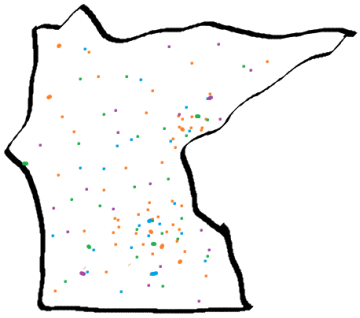

Figure 2 Point Locations of Resources

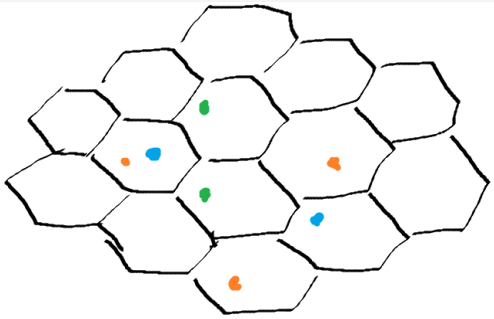

Figure 3 Tessellation Grid with Points

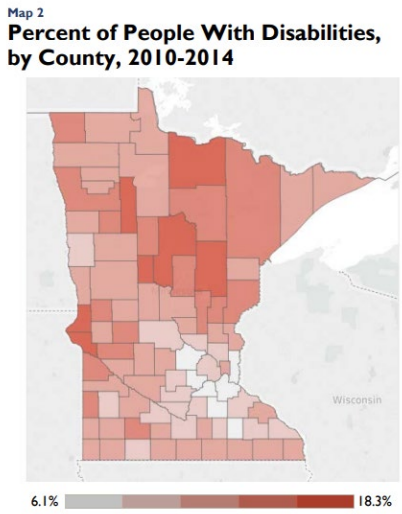

Figure 4 Example Choropleth Map from Minnesota Department of Health

Results Verification

To verify the results, I will perform a sensitivity analysis. This involves iteratively changing the value of cells by 5% to examine the difference in outputs from the original input and the test input.

Discussion and Conclusion
Since I expect the scores to vary based on urban/rural classification, I assume the resources will be more centralized around urban centers. Additionally, I think resources will be less available in more disadvantaged communities and near or on tribal lands.

References
None to list at this time.

Self-score

Category	Description	Points Possible	Score
Structural Elements	All elements of a lab report are included **(2 points each)**: Title, Notice: Dr. Bryan Runck, Author, Project Repository, Date, Abstract, Problem Statement, Input Data w/ tables, Methods w/ Data, Flow Diagrams, Results, Results Verification, Discussion and Conclusion, References in common format, Self-score	28	**N/A**
Clarity of Content	Each element above is executed at a professional level so that someone can understand the goal, data, methods, results, and their validity and implications in a 5 minute reading at a cursory-level, and in a 30 minute meeting at a deep level **(12 points)**. There is a clear connection from data to results to discussion and conclusion **(12 points)**.	24	**N/A**
Reproducibility	Results are completely reproducible by someone with basic GIS training. There is no ambiguity in data flow or rationale for data operations. Every step is documented and justified.	28	**N/A**
Verification	Results are correct in that they have been verified in comparison to some standard. The standard is clearly stated **(10 points)**, the method of comparison is clearly stated **(5 points)**, and the result of verification is clearly stated **(5 points)**.	20	**N/A**
		100	**N/A**