Rochester, New York

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INTRODUCTION

About Rochester

Rochester New York is a small city well known for its cold winters and record-setting snowfall accumulation. The city of 210,600 deals with an annual average of nearly 102 inches of snow, and the city can thank (or blame) Lake Ontario for much of that snowfall from lake-effect snow.[1] The unique geography and weather effects of the lake make getting around Rochester in the winter challenging. It is not uncommon for the highways and roads to be shut down due to a quick onset storm or a very large accumulation of snow.

Three interstate highways run through the Rochester MSA, 390, 490, and 590, which connect to I-90 and I-86. These surround state expressways and parkways. The map to the right shows the details of Rochester's road network. The interstate highways and expressways connect Rochester to its neighboring cities, Buffalo to the east, and Albany to the west. Rochester is a small city of approximately 210,000 people. However, the city's metropolitan statistical area is much larger, and encompasses 3,569 square miles over six counties: Livingston, Monroe, Ontario, Orleans, Wayne, and Yates as shown in Figure 2. Together these counties have 317 census tracts and an estimated total population of 1,088,373 people as of 2021.

Figure 1 Winter in Rochester

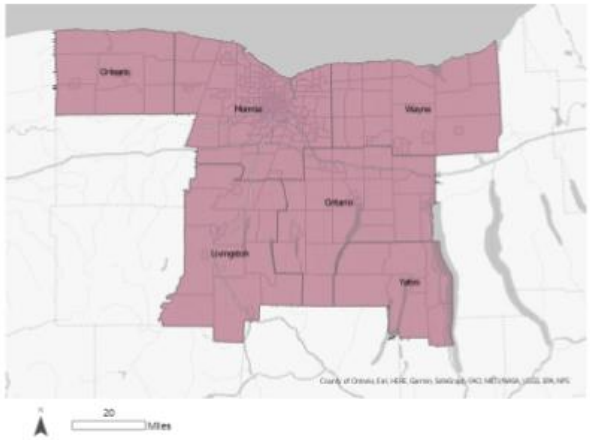

Figure 2 Rochester Metropolitan Statistical Area (MSA) – Study Geography

[1] Population Source: U.S. Census Quick Facts // Snowfall Source: NOAA, Rochester Climate Narrative.

INTRODUCTION

Rochester's Economy and Demographics

The city proper of Rochester is a dense employment center. The counties to the southeast are largely residential with a negligible employment count, as shown in Figure 3 as the gray areas. As of 2019, total employment for Rochester MSA is 346,000 workers.[2] 12 percent of employees work in retail, 63 percent work in service, and 25 percent work in basic sectors.

There are an estimated 445,000 households in the Rochester MSA according to the 2021 American Community Survey. Household distribution outside of the urban core county is fairly consistent across the five counties. The exception is Ontario and Yates counties in the southeast which has less population. These counties do not have a large employment count.

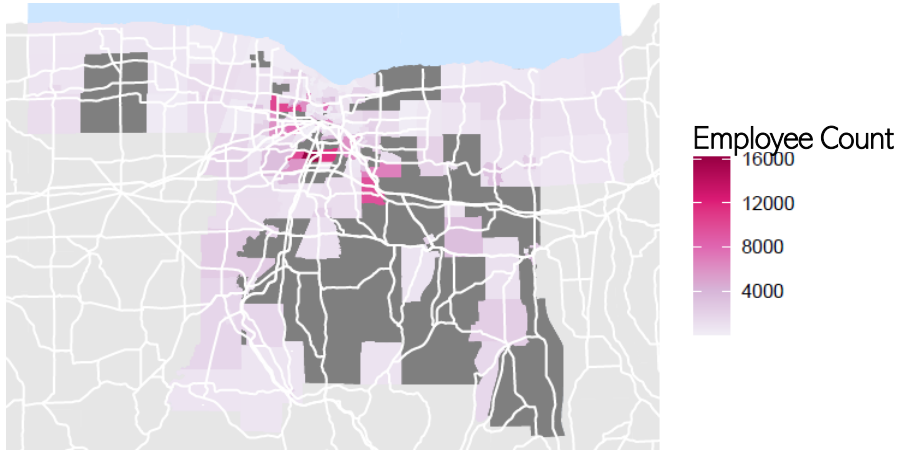

Figure 3 Employment Zones

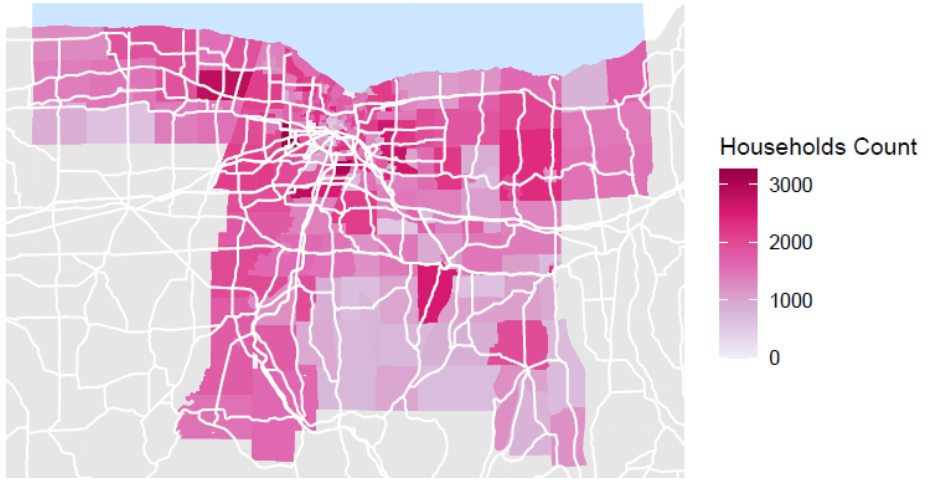

Figure 4 Households by Tract

[2] LEHD Origin Destination Statistics, 2019.

INTRODUCTION

Rochester's Economy and Demographics

The following demographics describe household characteristics in Rochester's metropolitan region. As shown in Figure 5, households without a vehicle are largely limited to Rochester proper, which is equivalent to Monroe County. 10 percent of households in Monroe County do not have access to a vehicle, which is comparable to all households in the Rochester MSA. Most households have two or less members in Rochester at 67 percent, the next greatest share is four people or more households at 22 percent. Multi person households include family and non-family households. Data in Figure 6 show the geographic distribution of four person households, which is fairly evenly distributed apart from the less populated census tracts in the south. Almost, 100,000 households in Rochester have an income below $30,000 annually, this represents 22 percent of all households. Lower income households are predominately in Monroe county census tracts and a few isolated areas in other counties, as shown in Figure 7.

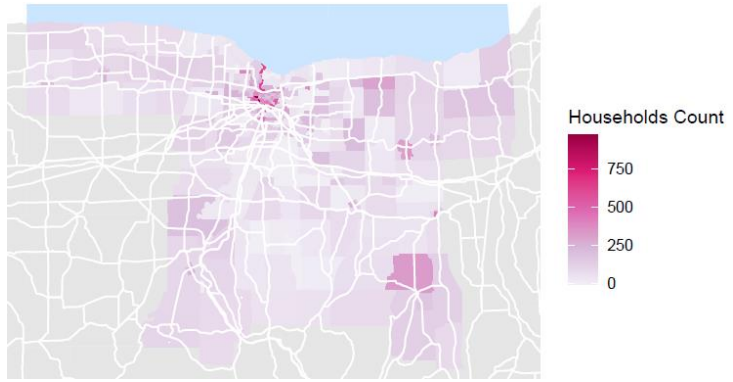

Figure 5 Households without a Vehicle by Tract

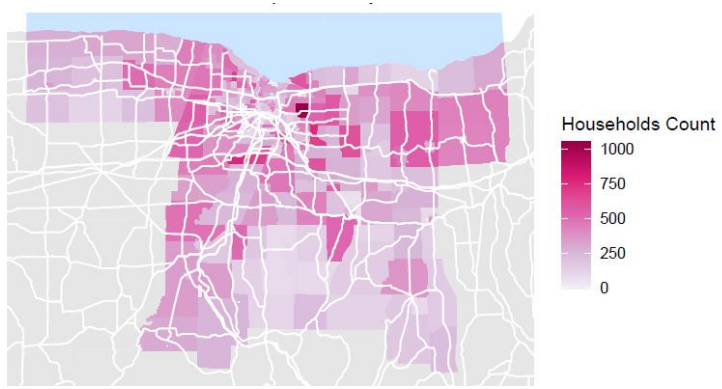

Figure 6 Households with four or more occupants by Tract

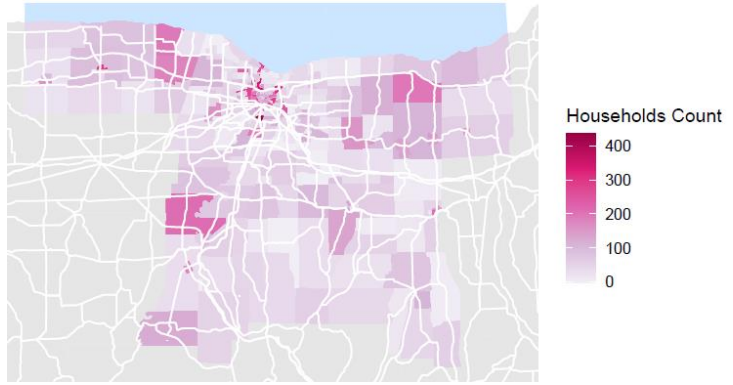

Figure 7 Households with income less than $30,000 by Tract

METHODS

Building a vehicle & transit network

I created a vehicle network from Open Street Map roadway files for Rochester's MSA. I used the following assumptions for the different road types: 55 mph on primary, 45 mph on secondary, 30 mph on tertiary, 40 mph on links, and 25 mph on trunk roads. I used lower speed limits than the suggested because Rochester recently instituted a speed limit cap of 25 mph on most city owned roads.[3] Another assumption was that my road network is entirely bi-directional with the exception for trunk roads and tertiary roads that are listed as one-ways in the Open Street Map dataset. However, I made some piecemeal changes to street directionality in the Northeast TZAs to improve network connectivity.

The transit model is for the hours 9 am to 12 pm, representing the tail-end of peak morning commuting hours. The speed for a bus traveling is 22 MPH because the MSA has very wide lanes and bus stops are on average spaced half a mile apart. Fares reflect current prices by the Rochester-Genesee Regional Transit Authority (RGRTA), which is $1.00 per ride and $0.50 per transfer.

[3] Public Works News, "Speed limit changes are taking place in the City of Rochester", 04/06/2021

RESULTS

Rochester Vehicle Network

I created a vehicle network for Rochester that totals 3,984 miles of roads, of which 21percent are primary (820 miles), 13 percent are secondary (504 miles), 47 percent are tertiary (1888 miles), 6 percent are trunk (245 miles), and less than 1 percent are link roads (15 miles). The average speed for a vehicle traveling is 38 MPH. Table 1 summarizes the time to travel between origin-destination values for all TZAs in Rochester. A traveler can typically expect a trip to take them 20 to 40 minutes, however there are extreme cases for neighboring and distant TZAs, the geographic distribution for arrival and departure time from TZA census tracts are shown in Figure 8 and Figure 9 respectively.

Measure	Travel Time to TZA-A to TZA-B
Minimum time	0.65 minutes
Maximum time	167 minutes
Mean	37 minutes
Median	30 minutes
Mode	20 minutes

Table 1 Rochester Vehicle Network – origin-destination descriptive statistics

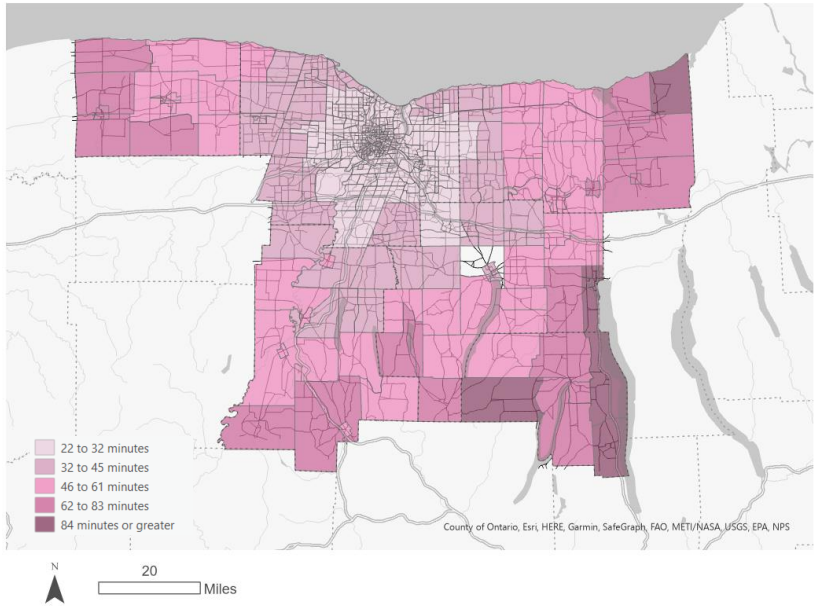

Figure 8 Rochester Vehicle Network – average time to arrive to TZA

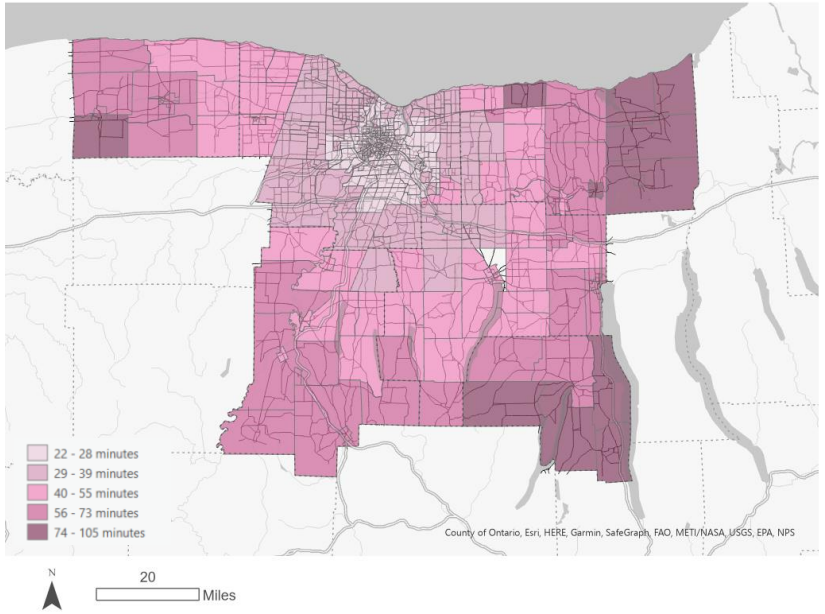

Figure 9 Rochester Vehicle Network – average time to leave TZA

RESULTS

Rochester Transit Network

The Rochester MSA public transit network is operated by Rochester-Genesee Regional Transit Authority and it covers 2,662 miles across the metro area. The system is entirely bus service, which has 210 routes and a combined total of 7,647 stops. However, most of the transit service is limited to Monroe county, this is Rochester city proper, but there is additional service in Livingston county, this is Geneseo city proper. Ontario, Yates, and Orleans are completely un-serviced by transit.

The Rochester metro area is not very well connected by public transit. The average transit commuter spends about 2 hours to get from their origin to their destination, and there is not significant variation from that when considering median or modal travelers. The actual headways for buses in the RGRTA are 60 minutes which is what I used in the model.

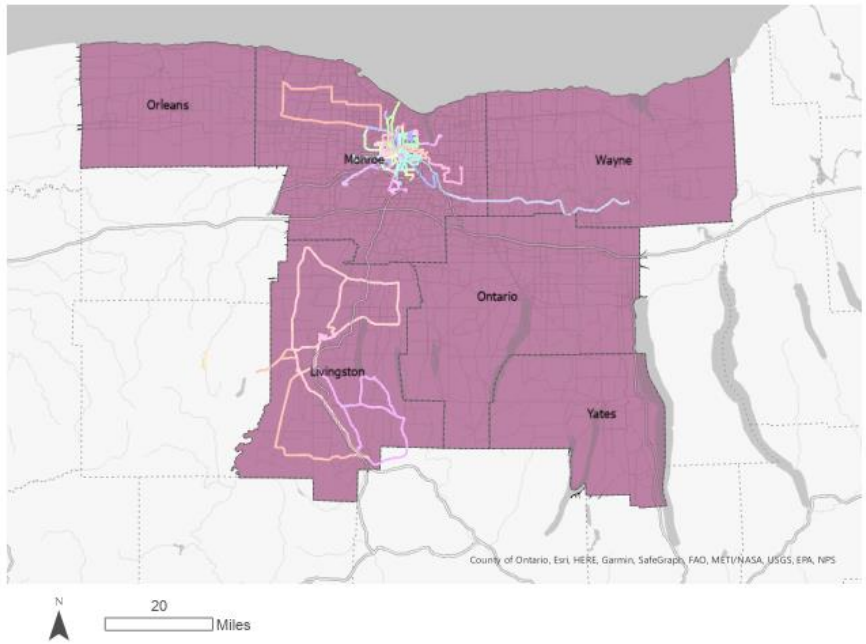

Figure 10 Rochester Transit Network – average time to leave TZA

Measure	Total Time from A to B	Fares	Wait Time
Minimum	1 minutes	$1.00	2 minutes
Maximum	474 minutes / ~8 hours	$6.00	60 minutes
Mean	133 minutes / ~ 2 hours	$3.00	32 minutes
Median	129 minutes / ~ 2 hours	$3.00	15 minutes
Mode	174 minutes / ~ 3 hours	$2.00	15 minutes

Table 2 Rochester Transit Network – origin-destination descriptive statistics

RESULTS

Rochester MSA Accessibility

The geographic cover of Rochester is varied, the urban core in Monroe County is dense compared to the outer lying counties. Livingston and Yates counties in the southeast are the least dense and more rural parts of the MSA, excluding the town of Geneseo in Livingston county. These areas are mostly foothills and apart of the Finger Lakes landscape. These more remote areas of the MSA have a lower car accessibility index, as shown in Figure 11, because there are fewer direct routes to reach these destinations which increases travel time and distance. The right skew of the histogram in Figure 11 shows that majority of census tracts do have a high car accessibility rate. This is starkly contrasted in transit, shown in Figure 12, where over 200 census tracts have a transit accessibility rate of zero. The remaining census tracts have a normal to slightly lower transit accessibility rate skew. Overall, Rochester is well connected by vehicle but is very limited by public transit bus routes.

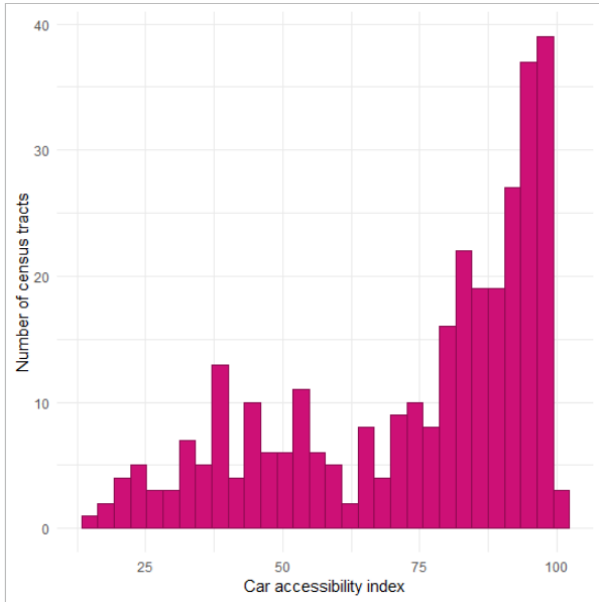

Figure 11 Rochester Vehicle Accessibility

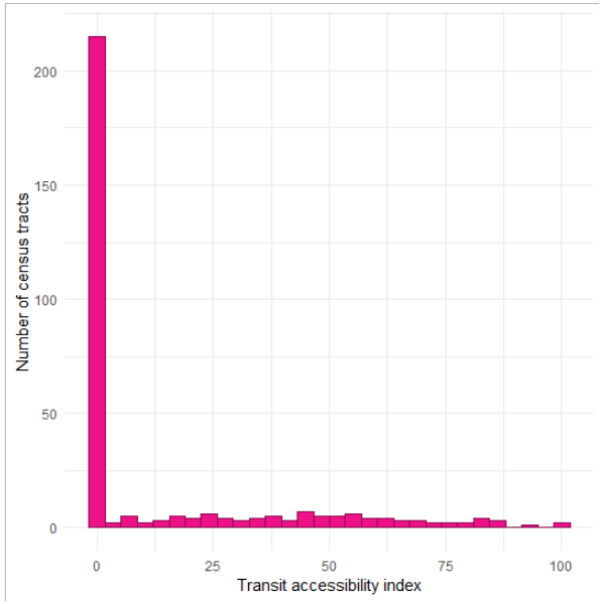

Figure 12 Rochester Transit Accessibility

Peer Feedback A05: Rita Bernardo & Kayla

- Kayla, great job in with aligning your model to have assumptions that are as close as possible to reality (60 minute wait time, which is crazy long and not worth it). I wonder how you can further tease out the story of household income with transit accessibility and car accessibility – it looks like transit doesn't serve those who are of low-income and live near the network.

- Inkoo wasn't able to submit A05 for me to review, she was having some transit centroid issues and is still working on the assignment.