

Toronto Homeless Shelters

Occupancy Levels & Transit Accessibility

York University

ENVS 4520: Applications in GIS

Project Part 3

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Introduction:

Homelessness in the City of Toronto is an ongoing problem. While the number of homeless seems to have remained steady, the number living on the streets has actually increased (Peat & Chief, 2013). In fact, this past winter of 2014-2015 has seen the deaths of three homeless men as a result of sleeping on the streets during extreme cold weather (Colbert, 2015). As a result of these facts it is necessary to look at options homeless individuals have for obtaining shelter as well as the distance they have to travel to get to a shelter.

Our research project has focused on occupancy levels in homeless shelters during “extreme cold weather alert” days in the City of Toronto, as well as access to the homeless shelters using public transit and by walking from various points in Toronto where homeless people spend the day. The goal of this research is to see how accessible homeless shelters are to public transit routes as most homeless individuals will be using public transit or walking to get to the shelters for the night. Also, to look at how accessible the shelters are to spaces homeless individuals stay during the day, such as public libraries and warming centers. Finally, with the recent deaths due to homeless individuals sleeping on the streets during extreme cold weather events, it is necessary to see what the occupancy levels can be at the shelters and if the issue is a shortage of beds or another unrelated issue.

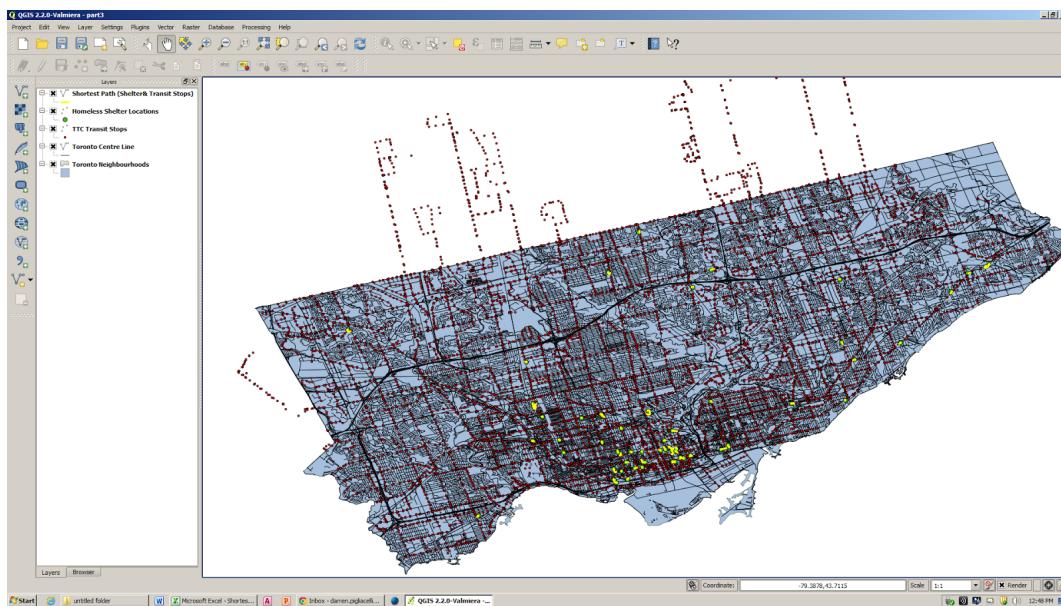
Shortest Path Analysis to Transit Stops (Road Graph)

Objective:

- To find the route of least impedance between each homeless shelter and its closest transit stop, taking into account average walking speed and travel restrictions throughout the city.

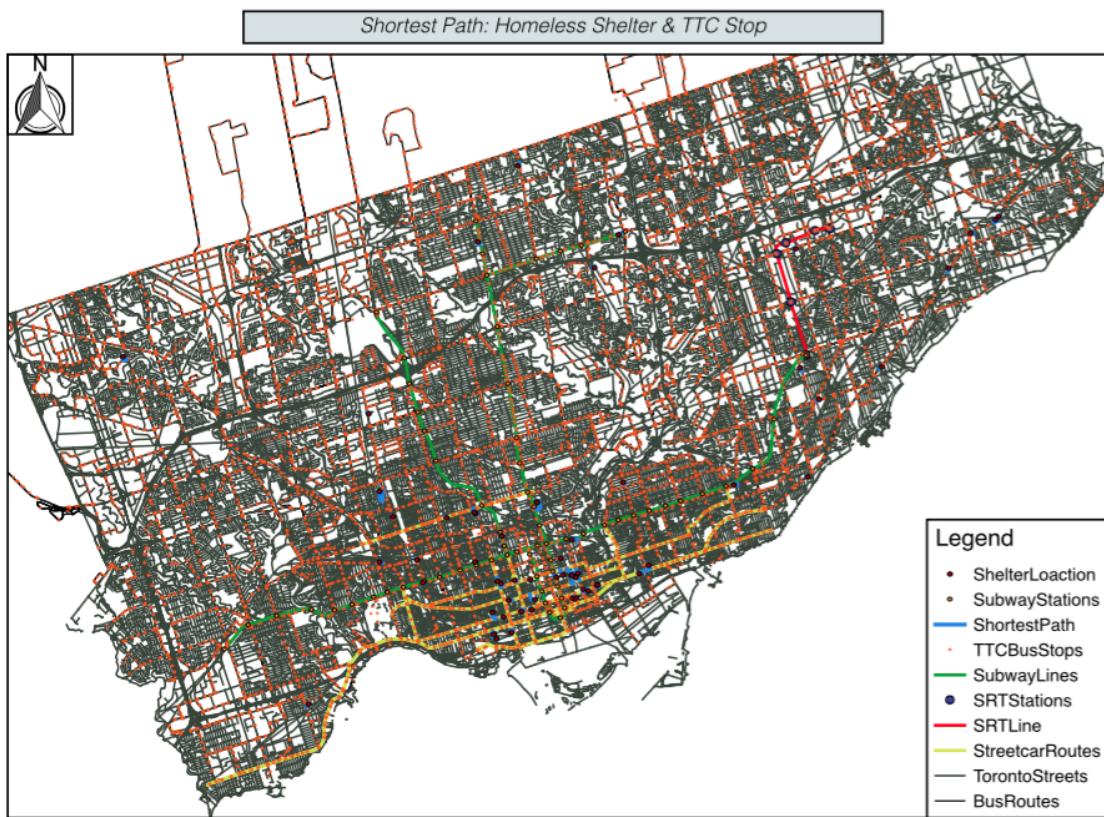
Data Assembly: Data Layers

- City of Toronto Neighbourhoods
- Toronto Centreline
- Toronto Homeless Shelters
- TTC Bus Routes and Stop
- TTC Streetcar Routes and Stops
- Subway Stations and Stops
- Road Graph Plugin
- SRT Stations/Lines



Map 1

Final Map: Shortest Path Analysis



Map 2

Close-Up: Shortest Path Calculations:



Map 3

Descriptive Statistics: Sum / Average (Shortest Path)

<u>Sum (Meters)</u>	<u>10640.93</u>
<u>Average Distance (Meters)</u>	<u>183.46</u>
<u>Average Time (1.3 m per second)</u>	<u>141.14</u>
<u>Average Time (Minutes)</u>	<u>2.35</u>

Table 1

Key Variables:

The Road Graph Plugin was used to calculate the shortest path between two point based in a network, which involved calculating the cumulative cost length between homeless shelters and the nearest transit stop. Our key variables included: Area of Interest (Toronto neighbourhoods), Toronto Centerline, TTC bus stops, Subway stops, Shelter locations, and SRT stations.

Estimates of Error:

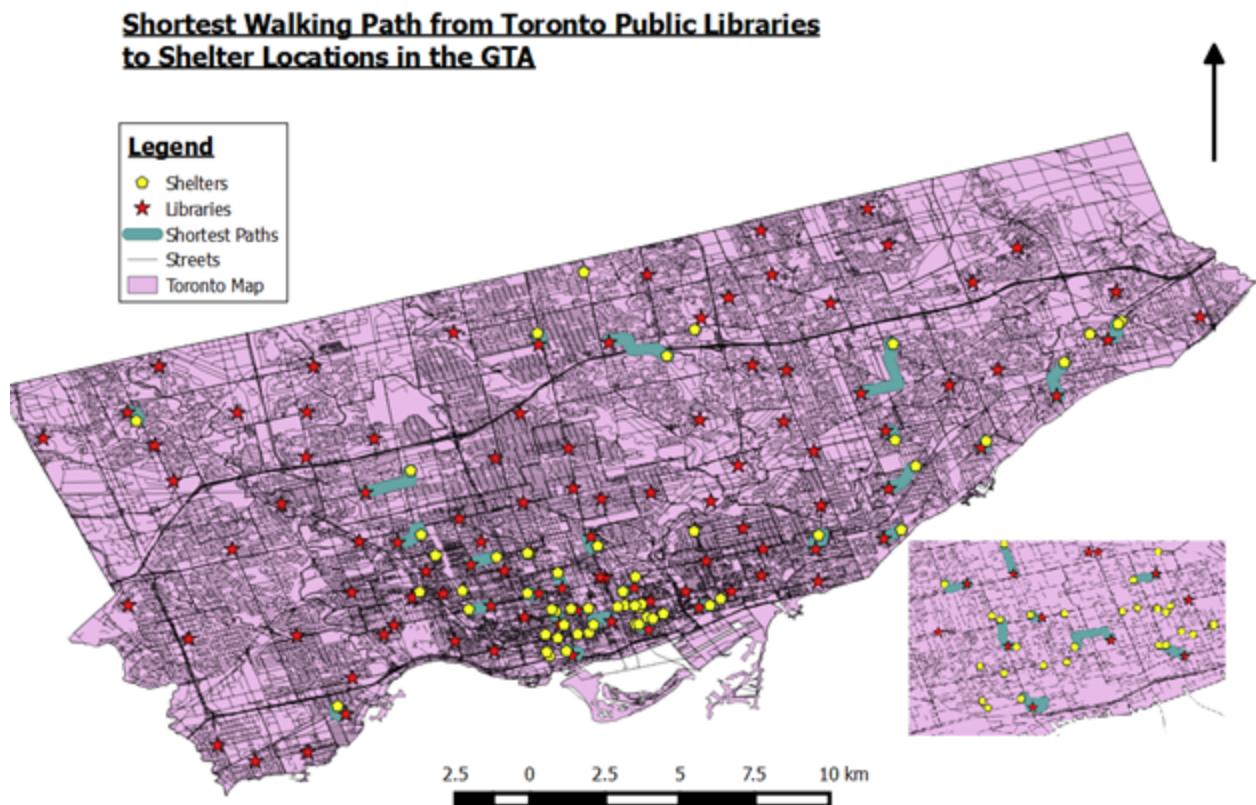
As is evident in **Map 3**, the shortest path analysis is subject to error due to misrepresentation and outliers in the data set. As suspected, the high concentration of both homeless shelters and transit stops in the downtown core has resulted in a falsification of the data, making it appear as though all shelters are situated close to transit stops. Although, as you can see in the close-up picture (Map 3), this is not the case for many shelters located on the outskirts of Toronto.

Results of the Shortest Path Analysis/Data Accuracy:

On average, it takes approximately two and a half minutes to travel from a homeless shelter to a TTC bus stop in Toronto. This is primarily due to the fact that shelters in downtown Toronto are located within close proximity to bus stops, causing a misrepresentation of the average distance. In

reality, some shelters located around the periphery of Toronto have travel times of over ten minutes, while those in the core are situated much closer.

Shortest Path Analysis From Public Libraries to Shelters



Map 8

Analysis:

For this map, we analyzed the shortest path between shelters and public libraries. The reason for this analysis was to determine how long it would take an individual in the winter time to walk between these two points. The reasons that an individual would have to walk between these two locations would be due to lack of available funds required to take the TTC or lack of access to token distribution centers. Looking at the map, we can see that libraries, represented by red stars, are fairly

equally distributed throughout the map. They are dispersed farther apart throughout the GTA but are fairly equally spread. The shelters are clustered downtown with a much greater dispersal rate in the surrounding GTA. We can see that in the downtown core, shelters are much more prevalent and spaced much closer together. Looking at the map and at the data, we can clearly see that the amount of time spent walking in the periphery of Toronto is much greater than what individuals living in the downtown core would experience. This is not always the case, as there are a few shelters away from the downtown core that are located extremely close to a shelter, making walking times fairly short. The average walking time was about 12 minutes, with the average distance being about 1km. This may vary greatly depending on the distance between the library and shelter. This data raises a number of questions, regarding experiences of homeless people, especially on an extremely cold winter night when the individual has to trek, with insufficient clothing, to a shelter which may be potentially full, risking hypothermia, frost bite and potentially death. This begs the question of how these individuals deal with this walking distance, especially if the shelter is closed and located far away from the downtown core.

Data Assembly (Data Layers):

Shapefiles that we used for this map were, Toronto centerline, library locations in Toronto, Shelter locations in Toronto, as well as a Toronto wards map as our base map. These shapefiles contained specific information that allowed us to complete our project and conduct our shortest path formula, using the shortest path plugin. The Toronto centerline map allowed us to track the projected paths of the homeless individuals in order to best predict and analyze their movement. Library and shelter locations shapefiles both contained point data, allowing us to plot the shelters and the libraries on the map for our calculations. The Toronto ward map simply acted as our base map. For this assignment, we used the shortest path plugin, which allowed us to select over 60 points to

calculate the shortest route that an individual could travel, based on an average of 5km an hour walking speed. This gave us data that would allow a researcher to determine safety hazards for homeless individuals who are out in winter, predict movement patterns and to also devise strategies of safety, allowing homeless individuals better access to public transit or general protection from the cold, whether they make it to the shelter or not.

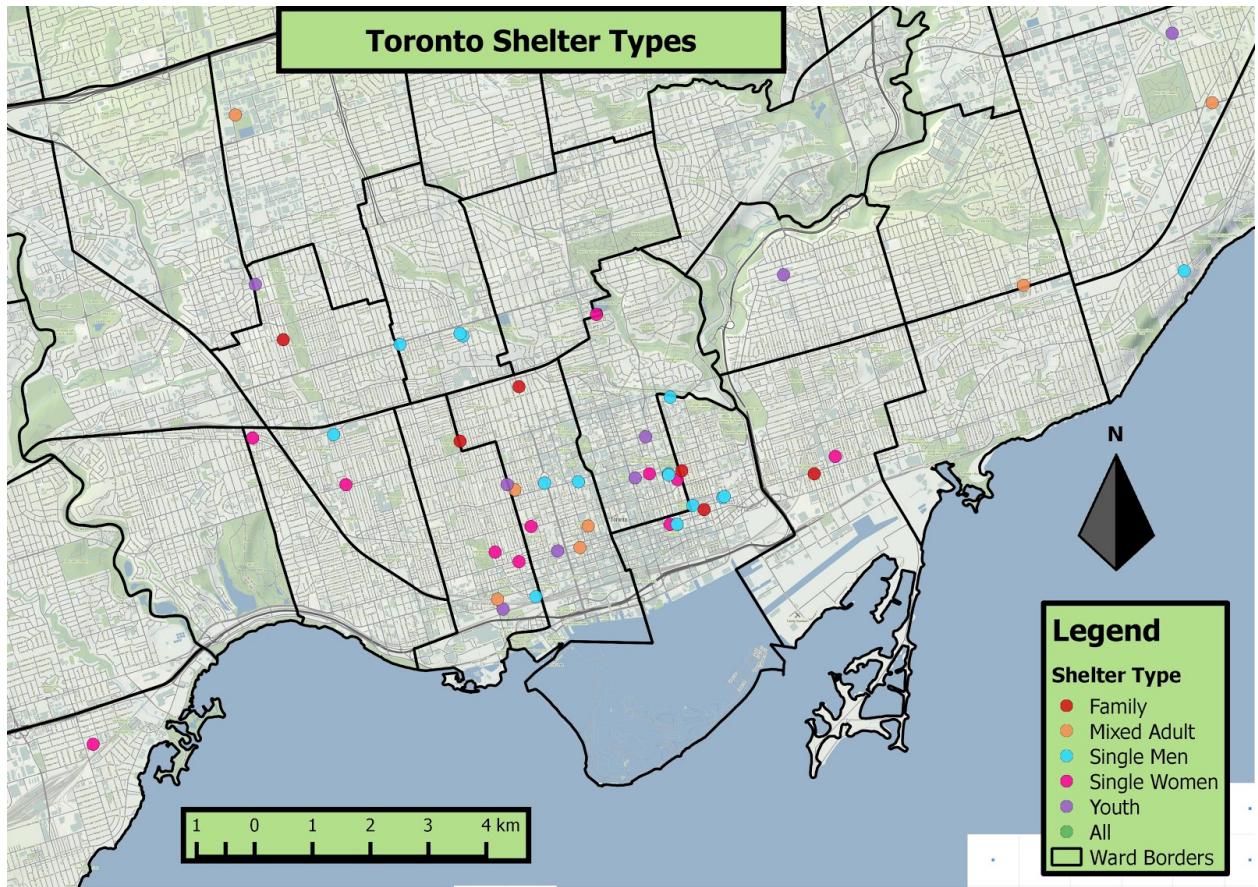
Occupancy Levels of Homeless Shelters

Objective:

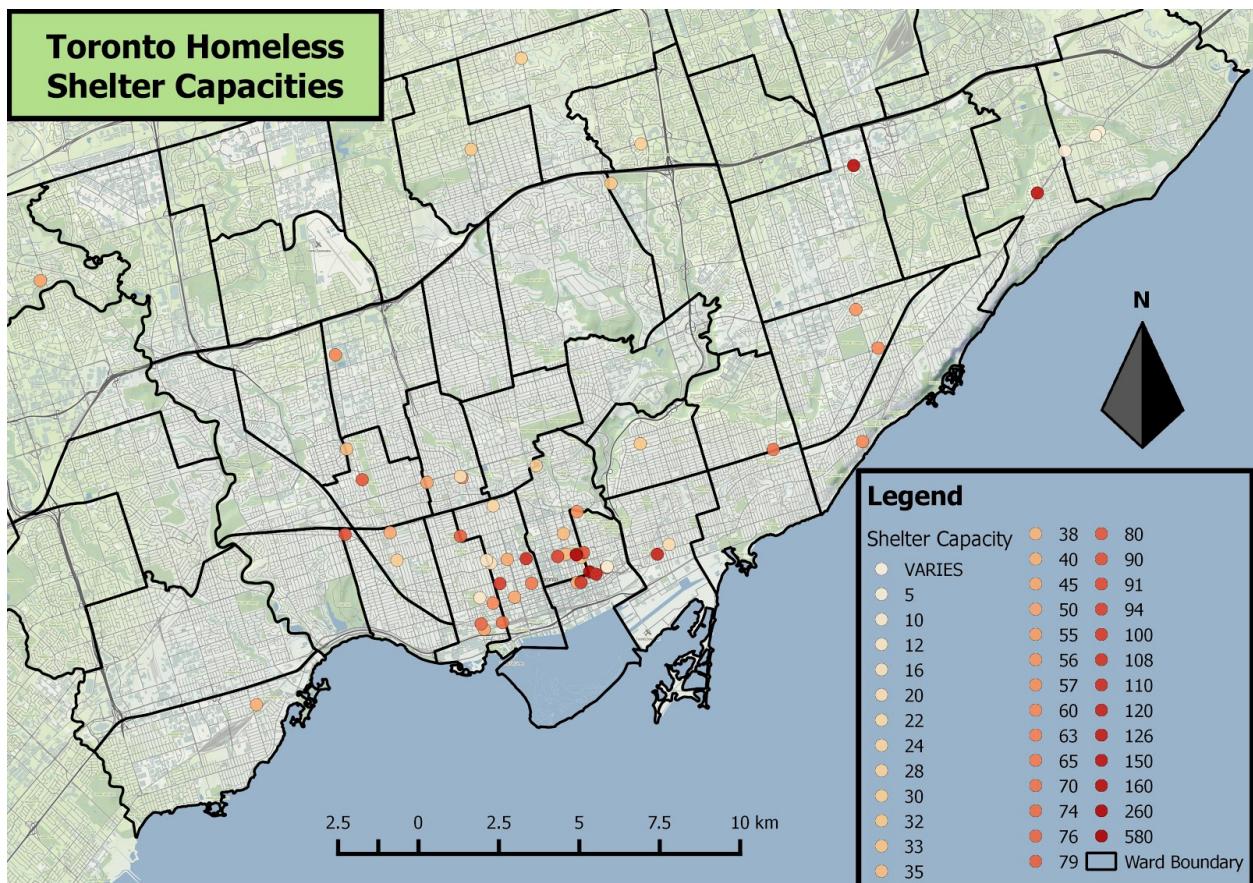
- To examine occupancy levels of Toronto homeless shelters in relation to occupancy during an extreme cold weather event using the night of January 21, 2013 as our reference night.

Data Assembly (Data Layers and Tables):

- Toronto Neighbourhoods
- Toronto Homeless Shelters
- Bing Street Map
- Shelter Occupancy Data for 2013
- Shelter Occupancy Data for January 21, 2013
- Toronto 24 Hour Drop-in Locations
- Toronto TTC Token Distribution Centres



Map 4

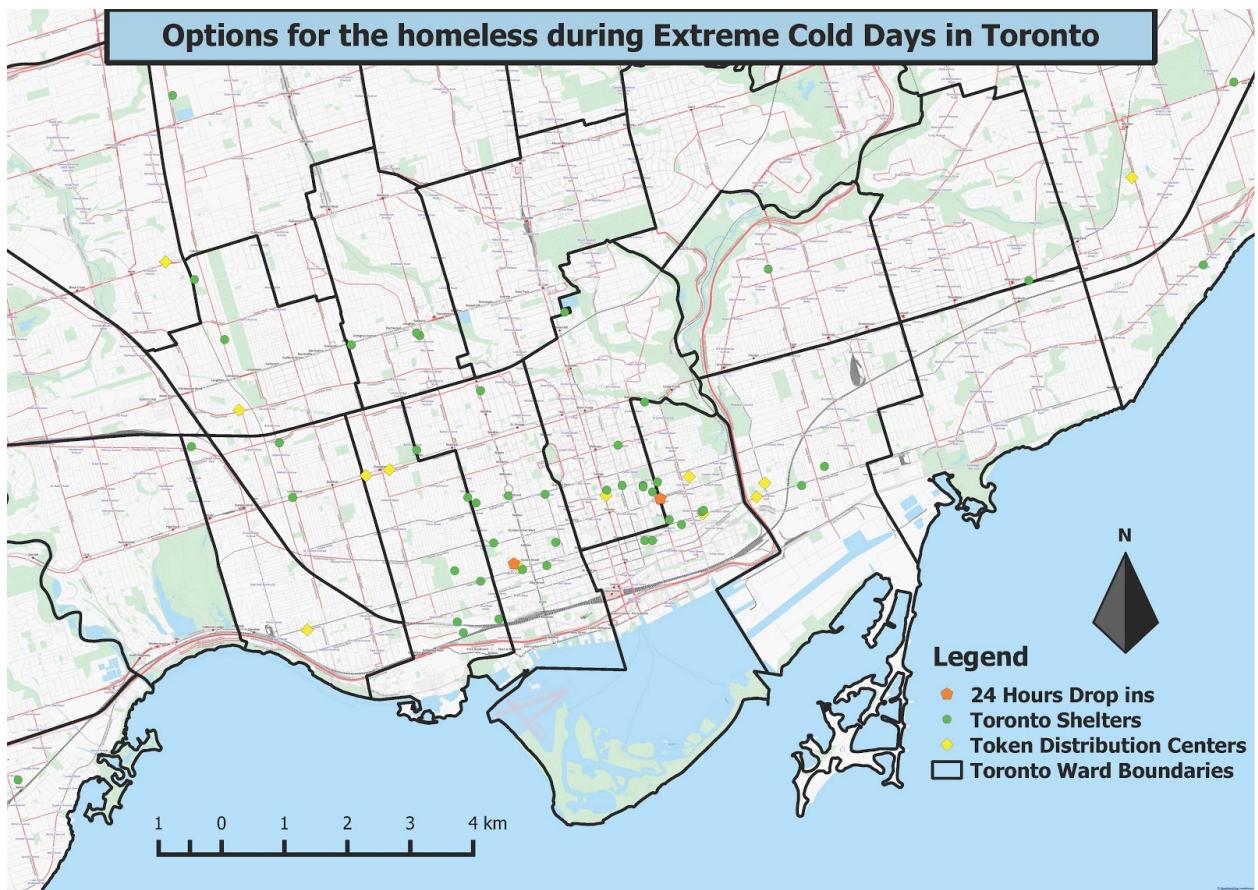


Map 5

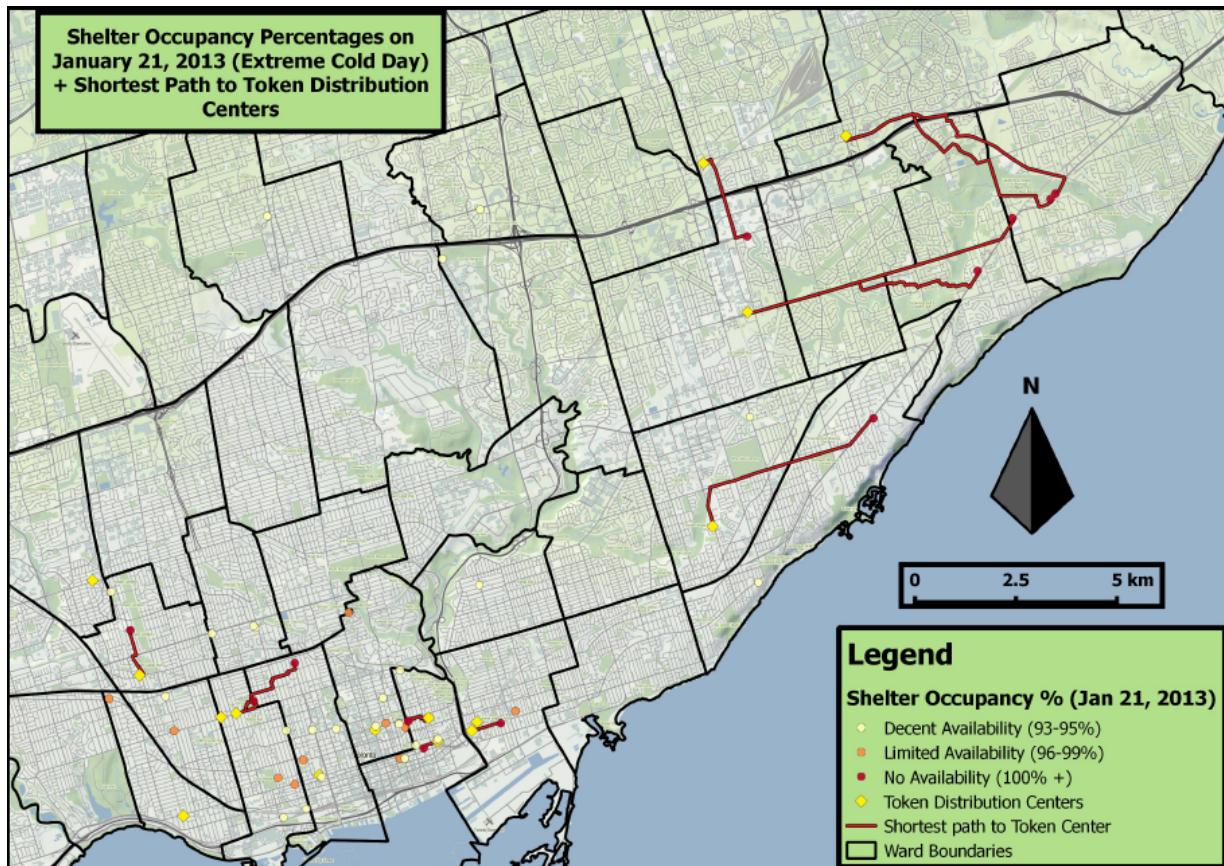
Shelter Capacities on January 21, 2013 (an Extreme Cold Weather Event)

Sector	occupancy on January 21, 2013 (extreme cold weather event)	capacity	occupancy rate
coed	330	298	111%
men	1539	1662	93%
women	532	537	99%
youth	474	497	95%
family (shelters)	876	806	108%
total	3751	3800	99%

Table 2



Map 6



Map 7

Shapefiles Used from Extreme Cold homeless Accessibility

The maps used within this sector of our project consisted of similar shapefiles. The primary three shapefiles, or “base shapefiles” that are found within all the maps are the “Toronto Ward Boundary” shapefile and the “shelters” shapefile. In terms of importance, the “shelters” shapefile proved to be the most useful considering the amount of data it contained in the attribute table. The ability to use various attributes such as capacity and shelter type to create different maps was one of the most useful aspects of this shapefile. The ward boundaries shapefile was important because it helps define the different areas within Toronto. Finally, the two last shapefiles used were “24 hour Drop ins” as seen on **Map 6** and “Token Distribution Centers” on **Map 6** and **Map 7**. These two shapefiles were manually digitized using addresses obtained on the city of Toronto website.[\[1\]](#)

[1] Distribution Locations =

https://www1.toronto.ca/City%20of%20Toronto/Shelter%20Support%20&%20Housing%20Administration/Article/Edited%20Articles/Jennifer/2014%20token_%20list.pdf

24 Hour Drop in Centers =

<https://www1.toronto.ca/wps/portal/contentonly?vgnextoid=b502ffeddc689410VgnVCM10000071d60f89RCRD&vgnextchannel=cfa2d62869211410VgnVCM10000071d60f89RCRD>

Map Description and GIS Techniques used:

- **Map 4** was a simple enough map but helps illustrate the variety of shelter types available in Toronto. To create the type points, we simply used the shelters shapefile and categorized the “Type” attribute in the shelter attribute table. This resulted in multiple types of shelters categorized with different colour codes.
- **Map 5** utilised a similar strategy as **Map 4**, where categorization was used on the shelter shapefile, except instead of the “type” attribute, the “Capacity” attribute was used. This resulted in a graduated colour code, where lighter colours are attributed to low capacity levels while darker colours mean higher capacities. This map allows us to see the different capacities of shelters during normal times and is useful to pinpoint where the most carrying capacity is in the city.
- **Map 6** is an important map when looking at extreme cold days within the city. Since recreation centres and public libraries are not viable options for day-long stays (important during extreme cold days), **Map 6** contains the viable options for homeless persons within the city. The map outlines the sole two 24 hour centers and Token Distribution Centers (both only available during extreme cold alerts) as well as all shelters in the city. The 24 hour centers and Distribution Center shapefiles on this map needed to be manually digitized since there were none available. To do this, we took the addresses and used a site called GPSVisualizer

(<http://www.gpsvisualizer.com/geocoding.html>) to make a CSV file with the location name, address, and X/Y coordinates as attributes and imported the file as a delimited text file, giving us the points on the map.

- For **Map 7**, the data from **Table 2** was taken and added to the shelters shapefile, where shelter types were matched and the occupancy percentage was added to the corresponding shelter types. This resulted in the ability to use a graduated classification within the shapefile, leaving us with 3 different graded types of points on the map: “Decent Availability” (93-95% occupancy), “Limited Availability (96-99% occupancy) and “No Availability” (100+% occupancy). These 3 occupancy types allowed the next use of technique, which was to use roadmap (along the Toronto Centerline shapefile) to determine the closest Token Distribution Centers to “No Availability” shelters. This is useful data to our analysis considering the potential for “no access” in these shelters, homeless people may need to travel (most likely by TTC) to another shelter during extreme cold days to take refuge.

Limitations:

There was some difficulty in combining the occupancy levels with the shelter map to create a map that showed occupancy levels during an extreme cold weather event. Eventually **Map 7** was created to be able to show some percentages on a map but it is only for one night of extreme cold instead of showing several nights worth of data.

Analysis:

There are several different types of shelters available across the City of Toronto to accommodate various groups of people. Based on **Map 4** it is evident that the various types are spread quite evenly across the city. The capacity of the shelters can be seen individually on **Map 5**.

However, all the data divides occupancy by the type of shelter, not by individual shelters. Therefore, it was necessary to find and create **Table 2** to show an example of occupancy rates during an extreme cold weather event in contrast to the various shelter type's capacities. **Map 7** was able to show the level of capacity for each type of shelter during the extreme cold weather of January 21, 2013. As can be seen, some types of shelters go way above capacity on an extreme cold weather night, while others remain below capacity. However, the City of Toronto has instituted a 90% capacity cut-off for shelters and all of the different types of shelters are well above this 90% cut-off rate.

Finally, **Map 6** shows all the various options for homeless individuals during an extreme cold weather event. As well as the shelters there are also some 24 hour drop in centers as well as TTC token distribution centers that offer tokens so individuals can ride public transit to get to a shelter for the night. **Map 7** also shows the shortest route from full shelters to the nearest token distribution center, as individuals who arrive at the full shelters will then have to obtain transit to another shelter further away from where they happen to be.

Ultimately, what this data suggests is that in 2013 the shelters were running at or above capacity on extreme cold weather nights, suggesting the need for more shelters or beds across the City of Toronto.

Final Analysis and Conclusion

Final Analysis

The maps above showcase that there is a large problem with a shortage of accessible homeless shelters in the Toronto area. This problem is exacerbated on those nights of extreme cold when more people are seeking shelter. While many of the downtown core shelters are readily and quickly accessible via public transit, they are also the quickest to reach capacity on an extremely cold night. This then requires homeless individuals to trek to a token distribution centre which, as seen in **Map 7**, are not as readily accessible to the homeless as transit stops are. As well, once they have received tokens they then must take transit to the nearest shelter that has space and as seen in **Map 3** this may take longer than the average travel time to reach a shelter on the outskirts of the City of Toronto.

Finally, as seen in **Map 8**, homeless persons have reasonable accessibility in regards to shelter during the day. The average walking time from a Toronto shelter to the nearest public library, which is a location of interest because of its open-arm accessibility, is only 12 minutes, usually meaning around a 1km walk. This is important to note because homeless do not need to remain in the cold during the day if they exit the shelter and are only a short walk away from their nearest public library.

Conclusions:

Based on the evidence above it is obvious to conclude that the City of Toronto not only needs more shelters for the Homeless but it also needs to make them more accessible as well. Simply moving the existing shelters out of the downtown core will not solve the problem of overcrowding during extreme weather events either. The simple fact is that more shelters need to be built close to transit hubs so that it is much easier for the homeless to access and find shelter on those nights of extreme cold and any other night as well. While the homeless do have reasonable access to shelters

from places where they spend time during the day, such as libraries, the fact remains that if the nearest shelter is full, then they will have to spend a large amount of unreasonable travel time to access another shelter.

Finally, this research does not even look at ways of preventing people from becoming homeless or ways to help the homeless find permanent shelters. Those are obviously more important issues than simply building more shelters. More shelters is simply a band-aid solution for a greater problem that requires funding and support from all levels of government and is simply beyond the scope of this report to address.

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