

Pharmacies are essential health resources that provide medical supplies, basic health checkups, and lab tests. However, there are always social disparities across different groups which limit access to these facilities, particularly low-income populations who are dependent on shorter travel distances. This uneven distribution was evaluated using the total population as a demand population, with the low-income residents as the aspatial group in the Peel Region. Pharmacies were selected as the service type which is expected to be in proximity to the residents, so a 5 KM buffer distance was applied as a proxy for short distance travel to nearby pharmacies. Therefore, the purpose of the project is to assess the Accessibility Index of Pharmacies in the Peel Region Dissemination Areas (DAs) with a focus on identifying where low-income residents face the most reduced access.

The study area selected for this project is the Peel region in Ontario, which consists of Mississauga, Brampton, and Caledon, where Dissemination Areas (DAs) were used as the neighbourhood units. The total number of people living in the region, i.e. the Demand Population, is 1451022, with the total number of low-income residents in the area being 111380. The total number of pharmacies is 673, where the capacity variable is the total number of employees (Total\_Empl), i.e., 6255 working across all the pharmacy services. The data for this project has been acquired from different sources including Statistics Canada, 2021 for the Peel Dissemination Areas and the Peel Boundary. The Pharmacy data was acquired from North American Industry Classification System (NAICS), 2022 which is accessed through SimplyAnalytics. The demand population i.e., the count of total population and the aspatial group i.e., the count and percentages of low-income population (Low-Income Measure After Tax: LIM-AT) were collected from Statistics Canada, Census, 2021 which was accessed through CHASS Data Centre (University of Toronto), November 2025.

Using the Two-Step Floating Catchment Area (2SFCA) method, the accessibility index was measured to integrate the supply and demand within the distance threshold. To carry out this project, a buffer distance of 5KM was applied around each pharmacy and centroid of the DAs in the peel region to define service catchments as a proxy for short range travel distances. Step 1 summed up the population within each buffer zone, used to compute supply and demand ratio. To find the provider to population ratio ( $R_j$ ), the  $S_j$  i.e. the pharmacy employee capacity was divided by  $P_k$ , which was the population within each 5km catchment. Step 2 calculates the spatial accessibility index ( $A_i$ ) by summing all  $R_j$  values for the pharmacies where the 5km catchment contain DA centroid. This score further helps in determining the accessibility level of pharmacies for the residents living in each DA in the Peel Region.

The Accessibility to Pharmacies in the Peel Region Dissemination Areas map clearly illustrates the different levels of access to the services in the form of high, medium, and low. Pharmacies are unevenly distributed, with the highest concentration being in the central Brampton and Mississauga area. The medium accessibility with 3.07 to 5.69 employees per 1000 residents covers most of Brampton and parts of Mississauga 943537 (65.0%) residents and 74800 (67.1%) low-income residents indicating that areas are predominantly under moderate access. Moreover, the high access areas are predominantly concentrated in Mississauga with more than 5.69 employees per 1000 residents with 195785 (13.4%) residents and 21080 (18.9%) low income residents signifying that even though the accessibility of the pharmacies is very high in these areas, they do not cater to a high proportion of people in the peel region as does the medium access. The low access areas include Caledon and Northern Brampton with less than 3.07 employees per 1000 residents. Moreover, in total, these areas have a total population of 311700 (21.4%) and 15500 (13.9%) of low-income population where the total population is higher than that of high access. However, the percentage of low-income population is a lot lower in the low access area compared to both medium and high access. Even though the percentages are less compared to low access, there should be equal attention given to the aspatial group especially in the low access areas as where they are already facing accessibility issues along with financial barriers.

When carrying out an analysis, several limitations must be acknowledged. The 2SFCA method estimates population within a distance threshold, however, it does not account for the actual travel routes and times. Moreover, a fixed distance threshold can even lead to misclassification of the pharmacies while categorizing the level of accessibility. One of the major drawbacks of the data is the use of centroids which may distort real travel distances. Furthermore, the pharmacy data only consisted of the total number of employees and did not have any information about the service load and working hours, hence not involving enough information to address how many residents are handled on average. As observed through the map, Caledon and North Brampton tend to have around 21% of the demand population but still have low access to pharmacies. The concerned authorities should pay close attention to Caledon and Northern Brampton, which has a low accessibility index and has around 13.9% of low-income population by expanding services, adding employees, and improving hours. For regions with medium access, i.e., central Brampton and parts of Mississauga here are high proportions of demand population and low-income population around 65.0% and 67.1% respectively indicating a need for better transportation services.

