



Human Health Implications (HHI) Scoping Study of the Highway 400 to Highway 404 Link (Bradford Bypass)

FINAL HUMAN HEALTH IMPLICATIONS SCOPING REPORT

INTRINSIK PROJECT # 401279

Ministry of Transportation of Ontario (MTO)
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SCIENCE INTEGRITY KNOWLEDGE

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1. INTRODUCTION

The Ontario Ministry of Transportation (the Ministry) and AECOM Canada Ltd. (AECOM) retained Intrinsic Corp. (Intrinsic) to undertake a Preliminary Design and project-specific assessment of human health impacts for the proposed Highway 400 – Highway 404 Link (Bradford Bypass). The Bradford Bypass (the Project) is being assessed in accordance with Ontario Regulation 697/21 (the Regulation) (October 7, 2021).

The proposed Project is part of the Government of Ontario’s plan to expand highways and public transit across the Greater Golden Horseshoe to fight congestion, create jobs and prepare for the massive population growth expected in the next 30 years. Simcoe County’s population is expected to increase to 416,000 by 2031, with the Regional Municipality of York growing to 1.79 million by 2041. The Bradford Bypass has been proposed as a response to this dramatic growth in population and travel demand in the area and the forecasted increase in congestion on key roadways linking Highway 400 to Highway 404 (AECOM, 2022).

The project is a new 16.3 kilometre-controlled access freeway. The proposed highway will extend from Highway 400 between 8th Line and 9th Line in Bradford West Gwillimbury, will cross a small portion of King Township, and will connect to Highway 404 between Queensville Sideroad and Holborn Road in East Gwillimbury. There are proposed full and partial interchanges, as well as grade separated crossings at intersecting municipal roads and watercourses, including the Holland River and Holland River East Branch. This project also includes the design integration for the replacement of the 9th Line structure on Highway 400, which will accommodate the proposed future ramps north of the Bradford Bypass corridor. The Ministry is considering an interim four-lane configuration and an ultimate eight-lane design for the Bradford Bypass. The interim condition will include two general purpose lanes in each direction and the ultimate condition will include four lanes in each direction (one high-occupancy vehicle lane and three general purpose travel lanes in each direction). The interim and ultimate designs are being reviewed as the project progresses. Should the footprint change or be modified in any way, a review of the changes shall be undertaken, and this plan will be updated to reflect the changes, impacts, mitigation measures, and any commitments to future work.

The design, build, and operation of transportation infrastructure has potential impacts on the overall health and well-being of residents who live in proximity or access these various modes of transportation. Transportation has enormous positive health impacts, but motorized modes of transport can also have potential negative health impacts, mainly due to impacts to air quality and increased traffic congestion (**Figure 1-1**). As such, transportation planning plays a crucial role in influencing health behaviours, especially those related to levels of physical activity. Day-to-day health behaviours, in turn, impact health outcomes and rates of morbidity and mortality.

With over four million additional people to call Ontario home in the next 25 years and combined with associated economic development activities, Ontario faces many land use and transportation planning challenges in how future growth and development in the Province is carried out. As such, a multi-pronged approach to address these challenges is warranted. One approach being proposed by the Ministry is to develop the proposed Highway 400 – Highway 404 Link (Bradford Bypass), a brand-new highway between York Region and Simcoe County (connecting Highways 400 to 404). According to the Ministry, the Project would not only provide better highway connections to the local communities but is vital transportation infrastructure that can help meet the projected growth in both population and employment that has been identified in the Growth Plan for the Greater Golden Horseshoe.

To assess the potential human health impacts of the proposed Highway 400 – Highway 404 Link (Bradford Bypass), Intrinsic has undertaken a Human Health Implications (HHI) Scoping Study¹ on behalf of the Ministry. An HHI Scoping Study, is the first step of the broader HHI Study (MTO, 2022a), which is an adapted method for a broad assessment of positive and negative health-related impacts of transportation projects. MTO’s full HHI Study process is aligned with the MTO class EA process and applicable to individual EA and Group A and B class EA projects. The proposed project is being assessed in accordance with Ontario Regulation 697/21.

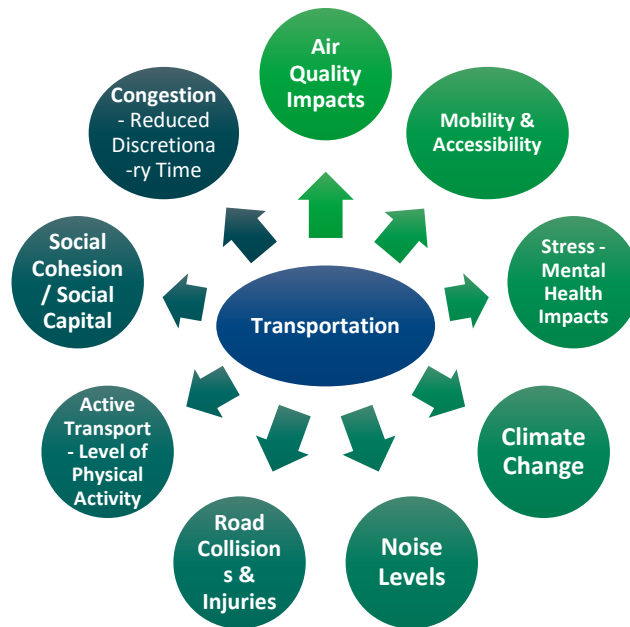


Figure 1-1: Some Potential Positive and Negative Human Health Implications of Transportation

2. APPROACH AND METHODOLOGY

The World Health Organization (WHO) defines health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1948). This definition identifies the holistic nature of health and can be expanded to include physical, mental, social, economic and spiritual factors. The Ministry’s Draft HHI Study Guide (MTO, 2022a) aims to adapt and utilize the human health risk assessment framework (to assess air quality impacts), as well as an adapted health impact assessment framework (to assess broader health impacts) to holistically assess and understand the potential health impacts, both positive and negative, of a transportation project or policy. An advantage of using such a holistic approach is that it allows project proponents, the public, Indigenous communities, and other stakeholders to gain a balanced overview of the potential overall impacts of a given project.

The Ministry’s HHI Study approach for transportation projects is aligned with the project-specific assessment of environmental impacts in accordance with Ontario Regulation 697/21 that is being

¹ This HHI Scoping Report has been prepared using ministry of Transportation of Ontario’s Environmental Guide for Assessing Human Health Implications of Provincial Transportation Projects (“MTO’s Draft HHI Guide”) (MTO, 2022a).

undertaken for the Project. The key steps in the decision-making process during a full HHI Study are detailed in Figure 2-1 below.

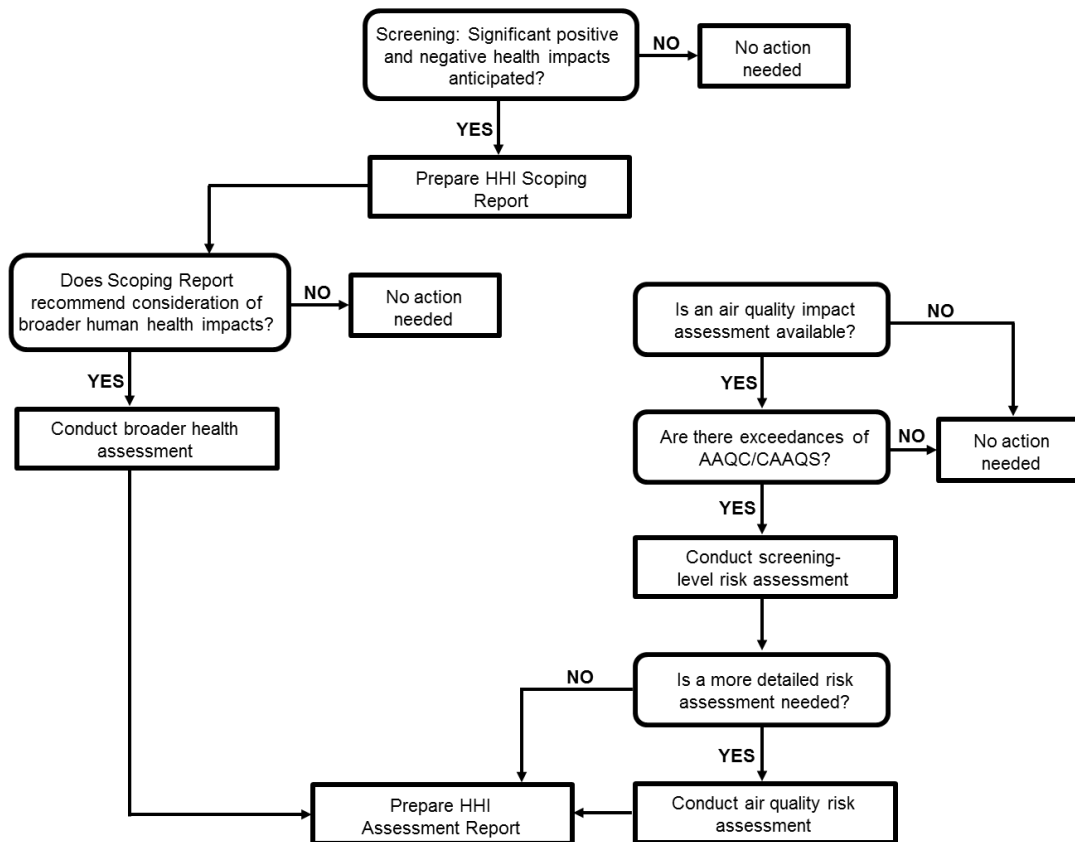


Figure 2-1: Structure of Human Health Implications (HHI) Study Process (MTO, 2022a).

The full HHI Study consists of four main phases – screening, scoping, broader health assessment, and air quality risk assessment. The HHI Scoping Report, which documents the HHI Scoping Phase, informs the need for a broader health assessment. The need for a Screening-Level Human Health Risk Assessment (SLHHRA) is contingent upon the completion and findings of an air quality impact assessment. The results of the air quality impact assessment inform the need for further screening-level and detailed air quality risk assessments. The findings of the broader health assessment and SLHHRA are documented in the full HHI Study Report.

This HHI Scoping Report focuses mainly on the Scoping Phase of the study (Table 2-1). The overall aim of the Scoping Phase is to identify the potential health impacts due to the project (related to both air quality and the broader social determinants of health), identify the Indigenous communities/stakeholders to be consulted/engaged while determining the scope of the HHI Scoping Study, provide health-based input during the project specific assessment of environmental impacts, and record all activities undertaken in the HHI Scoping Report.

The Assessment Phase (not part of this current report) involves preparation of a Screening-Level Human Health Risk Assessment (SLHHRA) of air quality impacts, as well as the assessment of the potential

broader health impacts initially identified in the HHI Scoping Phase. Recommendations to enhance potential positive impacts and mitigate potential negative ones are also made during the Assessment Phase.

Table 2-1: Human Health Implications Study Approach for Highway 400 – Highway 404 Link (Bradford Bypass)

STAGE	PLANNING	PRELIMINARY DESIGN
HHI Study	Scoping Phase	Assessment Phase
TASKS	<ul style="list-style-type: none"> Identify existing sensitive populations Identify relevant stakeholders and Indigenous communities within the Study Area Using a human health lens, identify broad human health implications (beneficial and non-beneficial) Document in the HHI Scoping Report 	<ul style="list-style-type: none"> Conduct the risk assessment for air quality impacts; utilize information obtained from the AQ & GHG Study Conduct a qualitative human health assessment of the Study Area as needed: air quality, climate change, noise levels, level of congestion, active transport options, mental health, social cohesion, etc. Provide recommendations, if needed, to enhance positive impacts, and on monitoring and mitigation measures required to limit potential adverse impacts Document in the HHI Assessment Report

3. HHI SCOPING PHASE

The steps in the HHI Scoping Phase, as per the Ministry’s Draft HHI Guide (MTO, 2022a), are as follows:

1. Identifying the project-specific and other local sources of air pollution likely to impact the health of the affected local population.
2. Providing a Baseline Health Profile of the Study Area.
3. Identify the main social and ecological determinants of health of concern due to the Project.
4. Identifying and engaging/consulting with Indigenous communities and stakeholders to provide human health-based input to the scope of the HHI Study.
5. Identifying sensitive populations or facilities particularly sensitive to changes in air quality.
6. Characterizing, as well as possible, the amount of time these sensitive population groups are likely to spend over a year/month/day in the Study Area, the life-stage of the sensitive population groups (child, adult, elderly), and the general health status of each sensitive population group.
7. Identifying the primary list of contaminants of concern to be included in the air quality assessment.
8. Preliminary identification of the potential health impacts, based on the list of the most relevant pollutants and exposure pathways, particularly, the exposure analysis during the Assessment Phase. Also, developing the preliminary Conceptual Site Model using guidance published by the Ministry of the Environment, Conservation and Parks (MECP).
9. Using a social determinants of health approach, identifying the potential broader human health implications (positive and negative) and their significance.

This HHI Scoping Report relied on a high-level review of the peer-reviewed scientific literature and reputable grey literatures (e.g., government documents and reports, policy literature, white papers, urban plans, etc.). Where readily available, the HHI Scoping Report utilized feedback pertaining to

human health from Indigenous communities, stakeholders, and the general public gathered as part of the Indigenous communities engagement process and the public consultation process during the course of the Project. Together, the HHI Scoping Report and the HHI Study focus on potential health impacts to residential receptors within the Study Area, considering both the construction and operational phases of the Project.

3.1. Traffic & Air

3.1.1. Traffic volumes and commercial vehicle percentage on the planned infrastructure

The sections of the Bradford Bypass identified to be operating at a level where speeds decline due to increasing traffic and are reaching capacity for the 2002 EA interchange locations scenario are (AECOM, 2023c):

- Eastbound lanes from County Road 4 to Bathurst Street during the 2031 AM peak hour;
- Eastbound lanes from Bathurst Street to Leslie Street during the 2031 AM peak hour;
- Westbound lanes from Leslie Street to Bathurst Street during the 2031 PM peak hour; and
- Westbound lanes from Bathurst Street to County Road 4 during the 2031 PM peak hour.

The sections of the Bradford Bypass identified to be operating at a level where speeds decline due to increasing traffic and are reaching capacity for the updated interchange locations scenario are (AECOM, 2023c):

- Eastbound lanes from County Road 4 to 2nd Concession Road during the 2031 AM peak hour;
- Eastbound lanes from County Road 4 to Bathurst Street during the 2041 AM peak hour;
- Eastbound lanes from Bathurst Street to 2nd Concession Road during the 2041 AM peak hour;
- Eastbound lanes from 2nd Concession Road to Highway 404 during the 2031 AM peak hour;
- Westbound lanes from Highway 404 to 2nd Concession Road during the 2031 PM peak hour;
- Westbound lanes from 2nd Concession Road to County Road 4 during the 2031 PM peak hour; and
- Westbound lanes from Bathurst Street to County Road 4 during the 2041 PM peak hour.

Figures 14, 15, 33 & 34 in AECOM's (2023c) Draft Traffic Report (provided under separate cover) show the scenario comparison output between the build and no build scenarios during the AM and PM peak hour in 2041 for the 2002 EA interchange locations and the updated preferred interchange locations. These figures indicate that the build scenarios will redistribute traffic within the vicinity of the Bradford Bypass, including to the south of the corridor (AECOM, 2023c). The southern portion of the corridor which will see significant reductions in traffic volumes include the east-west oriented links between Highway 400 and Highway 404, which incorporate the communities of Bradford West Gwillimbury, East Gwillimbury, and Holland Landing. Other locations (i.e., local, or arterial roads) that will see reductions in traffic include the Town of Newmarket and the Town of Aurora (AECOM, 2023c). The largest reduction in traffic volumes in both AM and PM peak hours is Bridge Street (Highway 1/11), which is reflective of the only existing east-west link crossing Holland River north of Davis Drive in Newmarket (AECOM, 2023c). Additionally, a slight reduction in traffic volume will be seen on south of the Bradford Bypass on Highway 400, due to vehicles using the new linkage (AECOM, 2023c).

3.1.2. Traffic volumes and commercial vehicle percentage on adjacent roads, and/or rail traffic

There is expected overflow onto 5th Side Road corridor, which is located parallel and to the west of Highway 400 (AECOM, 2023c). Although once Highway 400 is widened to 10 lanes, the majority of capacity constraints will be resolved, primarily for adjacent arterial corridors (AECOM, 2023c). The following locations were identified as constraints to capacity for the 2031 model (AECOM, 2023c):

- Highway 89 & 5th Side Road;
- Simcoe County Road 88 & 5th Side Road;
- Woodbine Avenue & Ravenshoe Road;
- Green Lane East & Leslie Street; and
- Green Lane East/Herald Road & Woodbine Avenue

The following additional locations were identified as constraints to capacity for the 2041 model (AECOM, 2023c):

- Queensville Sideroad & Woodbine Avenue; and
- Green Lane East & Leslie Street.

3.1.3. Local major point sources of air pollution

Information on local major point sources of air pollution, such as chemical plants and incinerators, or other industries, are presented in the Final Environment Conditions Report Section 2.2.4.3.3 in Table 3-36 (AECOM, 2022).

3.1.4. Background air quality in Study Area

Information related to background air quality in the Study Area were based upon four National Air Pollution Surveillance air quality monitoring stations (AECOM, 2022), including:

- Roadside Wallberg
- Newmarket
- Toronto North Downsview
- Gage Institute

Data obtained from the above monitoring stations is presented in the Final Environmental Conditions Report Highway 400 to Highway 404 Link (Bradford Bypass), in Section 2.2.4.3.1 in Table 2-26 to Table 2-32 (AECOM, 2022).

3.1.5. Gross estimate of impact of alternatives

As indicated from information from the Public Information Center No. 2 which took place on November 24, 2022 (AECOM & MTO, 2022), alternatives for the Bradford Bypass were developed for:

- Bradford Bypass mainline;
- Freeway-to-freeway interchange configurations; and
- Crossing road interchanges configurations.

The Highway 400 Freeway to Freeway Interchange included the evaluation of four alternative freeway to freeway interchange designs, including:

- Alternative 1 – 750m radius ramps with Basketweave to County Road 88;

- Alternative 2 – 440m Radius Highway 400 Southbound to Bradford Bypass Eastbound and Highway 400 Northbound to Bradford Bypass Eastbound Ramp with Basketweave to County Road 88;
- Alternative 3 – 525m Radius Bradford Bypass to Highway 400 Southbound Ramp with Lanes to County Road 88; and
- Alternative 4 – Dual Curve Bradford Bypass to Highway 400 Southbound with Lanes to County Road 88.

Overall, Alternative 3 was chosen as the preferred alternative as it provides connectivity to County Road 88 from Bradford Bypass and Highway 400, consistent ramp radii, less additional property than Alternative 1 & 2, with less land parcels impacted overall, and is environmentally preferred (AECOM & MTO, 2022).

The alignment between 10th Sideroad and Country Road 4 included the evaluation of four alignment design alternatives (including base case), including (AECOM & MTO, 2022):

- 2002 Approved EA (Base Case);
- Alternative 1 – 1700 Radii Curves;
- Alternative 2 – 1700m and 1300m Radii Curves; and
- Alternative 3 – 1300 Radii Curves.

Overall, Alternative 2 was chosen as the preferred alternative as it avoids a known archaeological site, mitigates to the Country Road 4 Early Works design, and provides required geometric standards while mitigating impacts to adjacent current and future land uses (AECOM & MTO, 2022).

The East Holland River location included the evaluation of three alignment alternatives, including (AECOM & MTO, 2022):

- Alternative 1 – 2002 Approved EA Alignment (Base Case);
- Alternative 2 – Curved Transition; and
- Alternative 3 – Tangent Transition.

Overall, Alternative 2 was chosen as the preferred alternative as it best mitigated river sinuosity impacts, results in less impacts to the meandering river from the construction and placement of bridge piers, less permanent in-water footprint, mitigates impacts to an archeological site, and meets commitments from the Approved 2002 EA to mitigate impacts to adjacent properties (AECOM & MTO, 2022).

The location of the Hydro Towers included the evaluation of three design alternatives, including (AECOM & MTO, 2022):

- Alternative 1 – Relocation to Hydro Towers (2002 Approved EA Base Case);
- Alternative 2 – Realignment of Bradford Bypass Eastbound and Westbound to the North; and
- Alternative 3 – Realignment of Bradford Bypass Eastbound to the South and Westbound to the North.

Overall, Alternative 2 was chosen as the preferred alternative as it avoids costly and complex relocation of hydro towers, land parcels impacted were consistent with other alternatives, and it avoids undesirable utility maintenance access roads in the highway median (AECOM & MTO, 2022).

The Highway 404 Freeway to Freeway Interchange included the evaluation of four design alternatives, including (AECOM & MTO, 2022):

- Alternative 1 – Extend two lane ramp from Bradford Bypass eastbound ramp to Queensville sideroad ramp;

- Alternative 2 – Extend two lane ramp from Bradford Bypass eastbound ramp and Close Queensville sideroad ramp;
- Alternative 3 – Extended one lane from Bradford Bypass eastbound ramp to Queensville sideroad ramp; and
- Alternative 4 – Basketweave ramp connection to Queensville.

Overall, Alternative 1 was chosen as the preferred alternative as it provides connectivity to Queensville Sideroad from Bradford Bypass and Highway 404, has property requirements consistent with other alternatives, and is environmentally preferred (AECOM & MTO, 2022):

The 10th Sideroad Interchange location included the evaluation of three design alternatives, including (AECOM & MTO, 2022):

- Alternative 1 – Parclo A4 Interchange;
- Alternative 2 – Parclo AB Interchange; and
- Alternative 3 – Partial Parclo A Diamond Interchange.

Overall, Alternative 1 was chosen as the preferred alternative as it is the most common interchange configuration in Ontario facilitating all movements, has highest interchange capacity, has the lowest conflicting vehicle movement at ramps, and provides opportunities for a carpool lots with minimal complexities (AECOM & MTO, 2022).

The Bathurst Street Interchange location included the evaluation of three designs (including the base case), including (AECOM & MTO, 2022):

- Alternative 1 – Diamond Interchange (2002 Approved EA Base Case);
- Alternative 2 – Diamond Interchange with North Entrance Realignment 400m to the North; and
- Alternative 3 – Diamond Interchange with Roundabout Ramp Terminals.

Overall Alternative 1 was chosen as the preferred alternative as it requires the least property and impacts and least land parcels among the alternatives, it has the smallest area of disturbance, and maintains access to adjacent land parcels through entrance realignments (subject to further discussions with landowners and the municipality (AECOM & MTO, 2022).

The 2nd Concession Road location included the evaluation of three design alternatives, including (AECOM & MTO, 2022):

- Alternative 1 – Parclo A4 Interchange;
- Alternative 2 – Parclo A2 Interchange; and
- Alternative 3 – Diamond Interchange.

Overall, Alternative 1 was chosen as the preferred alternative as it is most common interchange configuration in Ontario facilitating all movements, has highest interchange capacity, the lowest conflicting vehicle movements at ramps, and provides opportunities for a carpool lot with minimal complexities (AECOM & MTO, 2022).

The Leslie Street Interchange location included the evaluation of two design alternatives including (AECOM & MTO, 2022):

- Alternative 1 – Partial Diamond Interchange (2002 Approved EA Base Case); and
- Alternative 2 – Partial Parclo A2 Diamond Interchange.

Overall, Alternative 1 was chosen as the preferred alternative as it has the least number of property parcels impacted, avoids direct impact to a designated cultural heritage resource, and provides well performing ramp terminals with no weaving issues (AECOM & MTO, 2022).

3.2. Baseline Health Profile

The Baseline Community Health Profile presents high-level information on the overall current health status of the Local Study Area (LSA). The LSA includes Simcoe County and the Regional Municipality of York. Within Simcoe County the LSA includes the town of Bradford West Gwillimbury and within the Regional Municipality of York includes the Township of King, and the Town of East Gwillimbury. Where possible, baseline health information is provided for the individual municipalities located within the LSA and for Indigenous communities whom the Ministry has a Duty to Consult for this Project. The purpose is to provide context for the Assessment Phase, by describing at a high level how healthy the local population currently is, in comparison to other areas of Ontario, and identifying the health issues of top concern. Data from the following sources was utilized:

- Statistics Canada 2021 Census Profile;
- York Region Public Health;
- Simcoe-Muskoka District Health Unit;
- Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC);
- Ontario First Nations Regional Health Survey Phase III;
- Walkscore.com; and
- Other publicly available reputable open data sources.

The LSA includes the following municipalities:

- Bradford West Gwillimbury
- East Gwillimbury
- King Township
- Regional Municipality of York
- Simcoe County

The following Indigenous communities were engaged by the Ministry:

- Alderville First Nation
- Beausoleil First Nation
- Chippewas of Georgina Island First Nation
- Chippewas of Rama First Nation
- Curve Lake First Nation
- Hiawatha First Nation
- Mississaugas of Scugog Island First Nation
- Kawartha Nishnawbe First Nation
- Métis Nation of Ontario – Georgian Bay Métis Council
- Huron-Wendat Nation

Publicly available socioeconomic data was not available for the Kawartha Nishnawbe First Nation, Métis Nation of Ontario and Huron-Wendat Nation.

For some of the baseline health information, the information was not as granular as the individual municipalities and Indigenous communities listed above; instead, information was provided for the larger health units that are included in the LSA. The health units that represent the LSA include the Simcoe Muskoka District Health Unit and the York Regional Health Unit (aka York Region Public Health) and are compared to Ontario in the sections below.

Related Indigenous communities data was obtained from Ontario First Nations Regional Health Survey (Chiefs of Ontario, 2019) and may not be completely representative of individual Indigenous

communities, but provides a high level overview of the overall health of Indigenous communities in Ontario.

3.2.1. Socio-Demographic Profile

When assessing potential future health impacts, it is important to be aware of the size of a population as well as how that population is changing over time. It is also crucial to recognise and comprehend the diversity of communities since this knowledge may be used to better understand the obstacles that various groups could encounter both in their daily lives and while trying to access essential services. Some highlights about population changes and sociodemographic data in the LSA are provided in this section.

Table 3-1 below illustrates population demographics of the LSA, in comparison to Ontario. All locations within the LSA report positive population changes from 2016 to 2021, most of which are higher than Ontario (i.e., 5.8%), except for the Regional Municipality of York (i.e., 5.7%). The proportion of visible minorities in most locations is lower than Ontario (i.e., 34.3%), except for the Regional Municipality of York (i.e., 55%), with the lowest being Simcoe County (i.e., 12.4%). Simcoe County also has a higher percentage of First Nations peoples (i.e., 4.7%) than Ontario (i.e., 2.9%). The municipality with the lowest percentage of First Nations peoples was the Regional Municipality of York (i.e., 0.5%). As shown in Table 3-2, the First Nations with Aboriginal or treaty rights in the LSA all experienced positive population growth with the exception of Beausoleil First Nation and Chippewas of Rama First Nation. Change in population statistics was not available for Chippewas of Georgina Island First Nation and Hiawatha First Nation.

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	King Township	East Gwillimbury	Ontario
Population (2021)	533,169	42,880	1,173,334	27,333	34,637	14,223,942
Population Change (%) 2016 – 2021	11.2	21.4	5.7	11.5	44.4	5.8
First Nations Population (%)	4.7	1.3	0.5	0.9	1.4	2.9
Total visible minority population (25% sample data) (%)	12.4	31.1	55	18.4	30	34.3
South Asian (%)	3.1	9	11	5.8	4.7	10.8
Chinese (%)	1.1	2.6	24.6	3.8	11.1	5.8
Black (%)	2.4	3	2.8	2	2.8	5.5
Filipino (%)	1	2.1	2.4	0.8	1.2	2.6
Arab (%)	0.5	1.1	1.2	0.7	0.9	2
Latin American (%)	1.5	3.8	1.5	1	1.5	1.8
Southeast Asian (%)	0.7	2.9	1.3	0.6	0.9	1.2
West Asian (%)	0.8	4	5.3	2.1	4.1	1.5
Korean (%)	0.3	0.5	1.7	0.3	0.6	0.7
Japanese (%)	0.1	0.1	0.2	0.1	0.2	0.2
Visible minority, n.i.e. (%)	0.5	0.8	0.9	0.5	0.8	0.9
Multiple visible minorities (%)	0.5	1.2	2	0.6	1.1	1.3

Source: Statistics Canada 2021 Census

Table 3-2: First Nations Population Demographics

	Population (2022)	Population (2016)	Population Change (%) 2016 – 2022
Alderville First Nation	1,385	495	180
Beausoleil First Nation	655	655	0
Chippewas of Georgina Island First Nation	953	265	260
Chippewas of Rama First Nation	870	870	0
Curve Lake First Nation	2,800	1,060	164
Hiawatha First Nation	1,030	365	182
Mississaugas of Scugog Island First Nation	263	140	88

Source: Government of Canada First Nations Details. Available at: <https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng>

Notes: NA – Data not available.

Table 3-3 below, shows the population demographics of on and off reserve First Nations members. As indicated below, the Nation with the highest percent of the population residing on their own reserve is Chippewas of Rama First Nation (i.e., 35%), followed by Curve Lake First Nation (i.e., 29%). Although, for all the Nations in the LSA there is a greater percentage of registered First Nations individuals residing off reserve rather than on their own or on other reserves.

Table 3-3: First Nations Population Demographics On and Off Reserves, 2016 Census of Population

	Total Registered Population 2022	Total Population on Own Reserve 2022 (%)	Registered Males (%)			Registered Females (%)		
			On Own Reserve	On Other Reserves	Off Reserve	On Own Reserve	On Other Reserves	Off Reserve
Alderville First Nation	1,370	22.48	10.66	0.15	37.45	11.82	0.36	39.56
Beausoleil First Nation	3,099	21.52	10.52	0.39	36.46	11.00	0.42	41.11
Chippewas of Georgina Island First Nation	950	22.0	10.11	0.11	37.79	11.89	0.0	40.11
Chippewas of Rama First Nation	2,122	35.01	17.91	0.38	31.39	17.11	0.38	32.75
Curve Lake First Nation	2,789	29.04	14.34	0.22	33.88	14.70	0.14	36.61
Hiawatha First Nation	1,015	20.3	8.77	0.0	36.55	11.53	0.10	42.76
Mississaugas of Scugog Island First Nation	261	18.77	10.73	0.77	39.46	8.05	1.15	39.85

Source: Government of Canada First Nations Details. Available at: <https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng>

Notes: NA – Data not available.

Figure 3-1 to Figure 3-12 show the population distribution at each location in the LSA, by both age and sex. This information helps us understand which communities may have higher proportions of specific vulnerable population sub-groups (for example, older adults) who may be in need of additional planning for programs and services. Compared to other municipalities, Simcoe County has a higher percentage of the population >65 years of age.

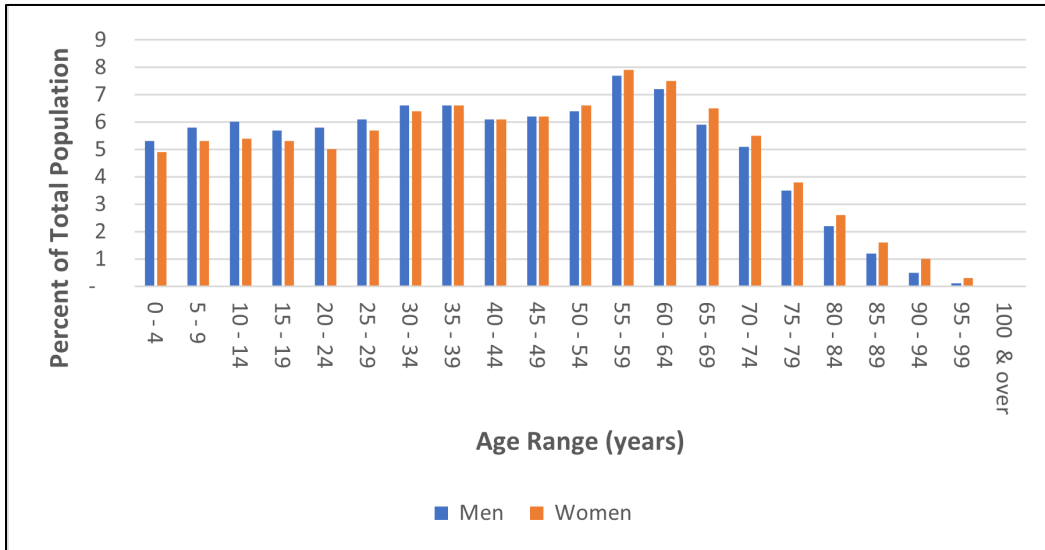


Figure 3-1: Simcoe County – Population by Age and Sex

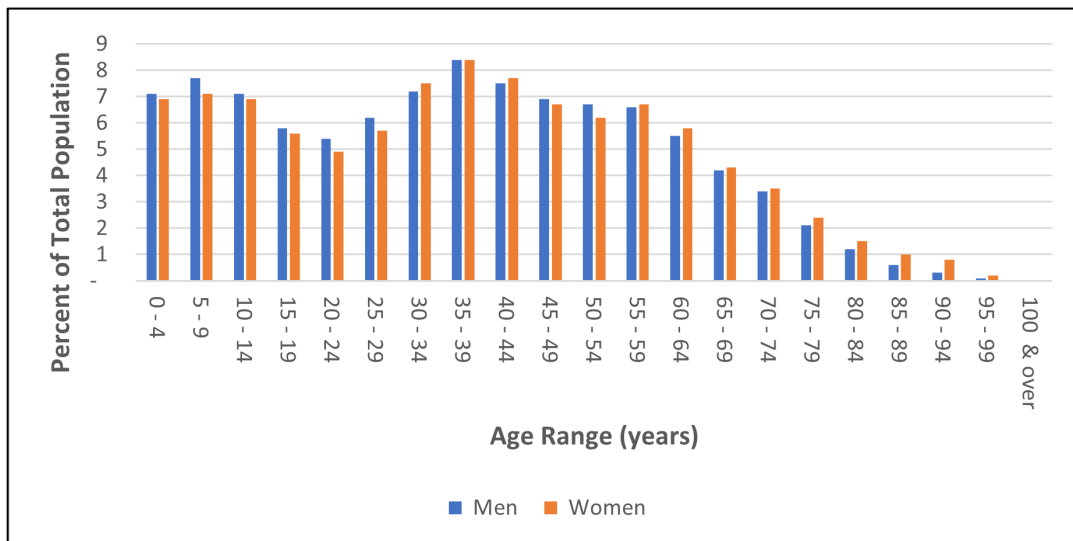


Figure 3-2: Bradford West Gwillimbury – Population by Age and Sex

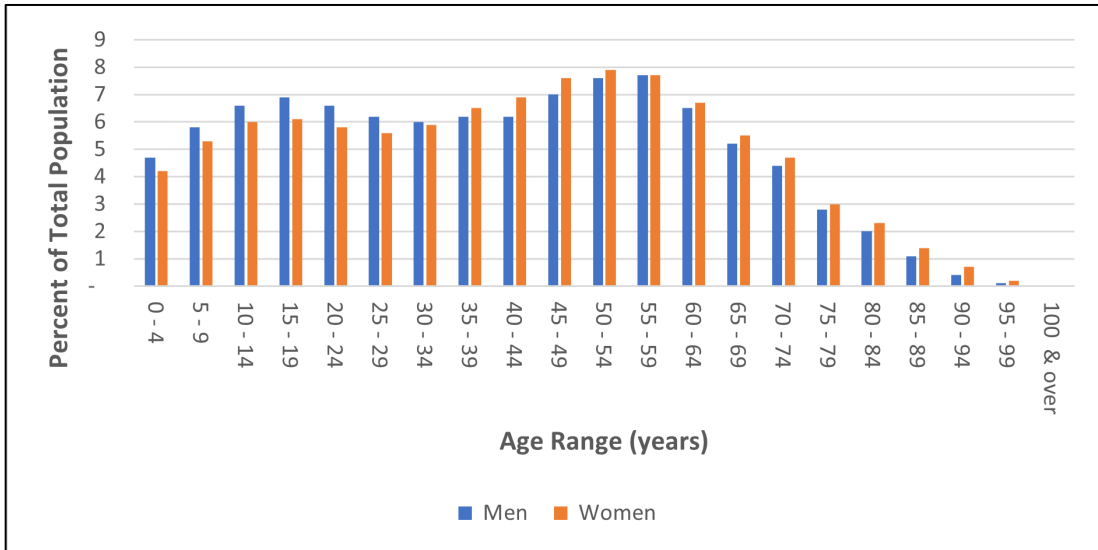


Figure 3-3: Regional Municipality of York – Population by Age and Sex

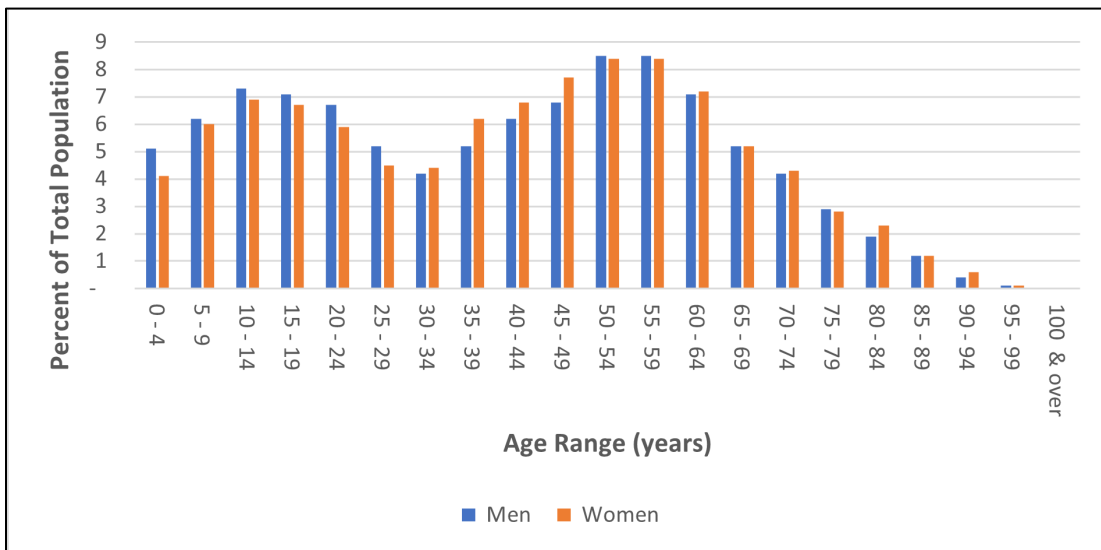


Figure 3-4: King Township – Population by Age and Sex

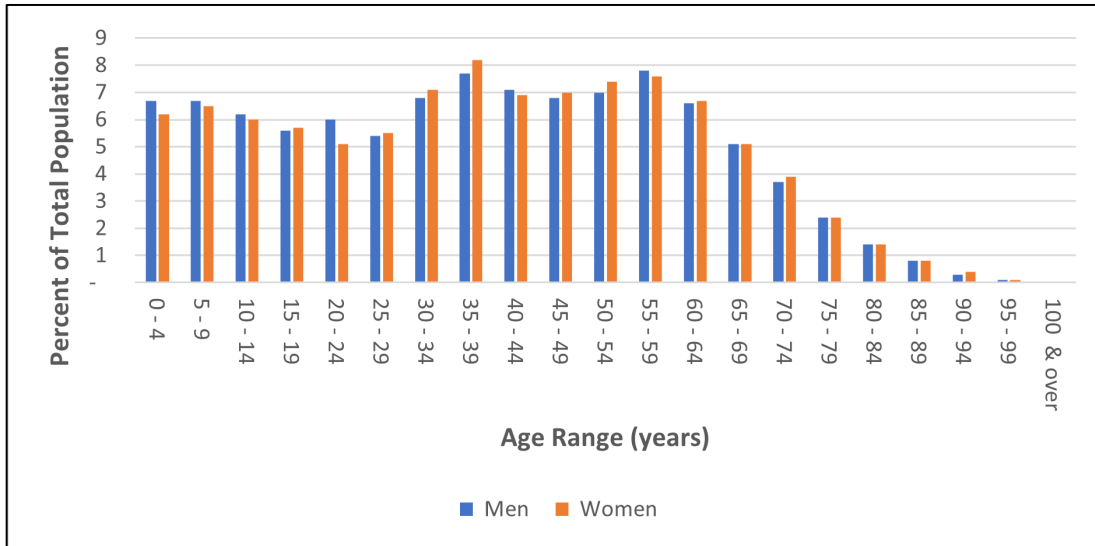


Figure 3-5: Gwillimbury – Population by Age and Sex

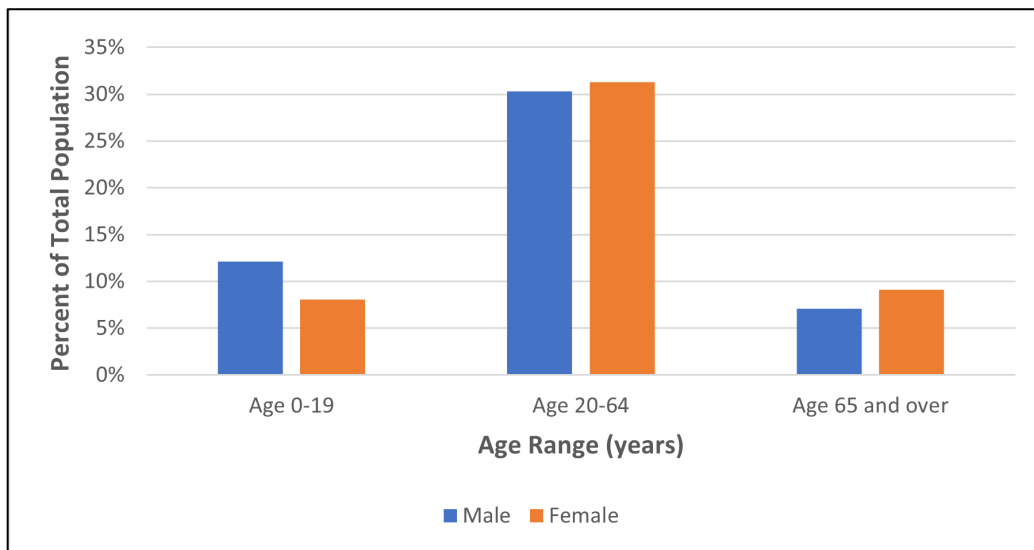


Figure 3-6: Alderville First Nation – Population by Age and Sex

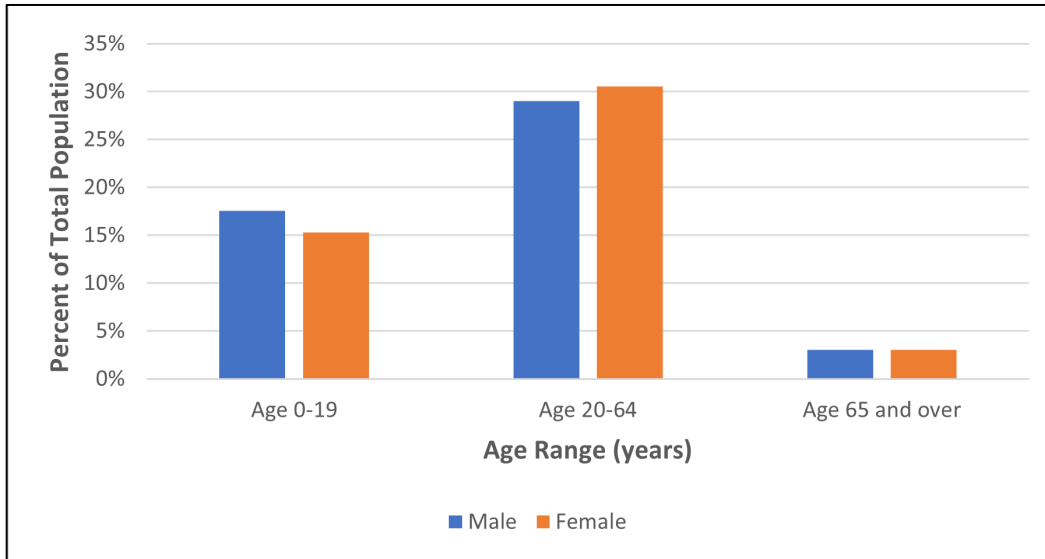


Figure 3-7: Beausoleil First Nation – Population by Age and Sex

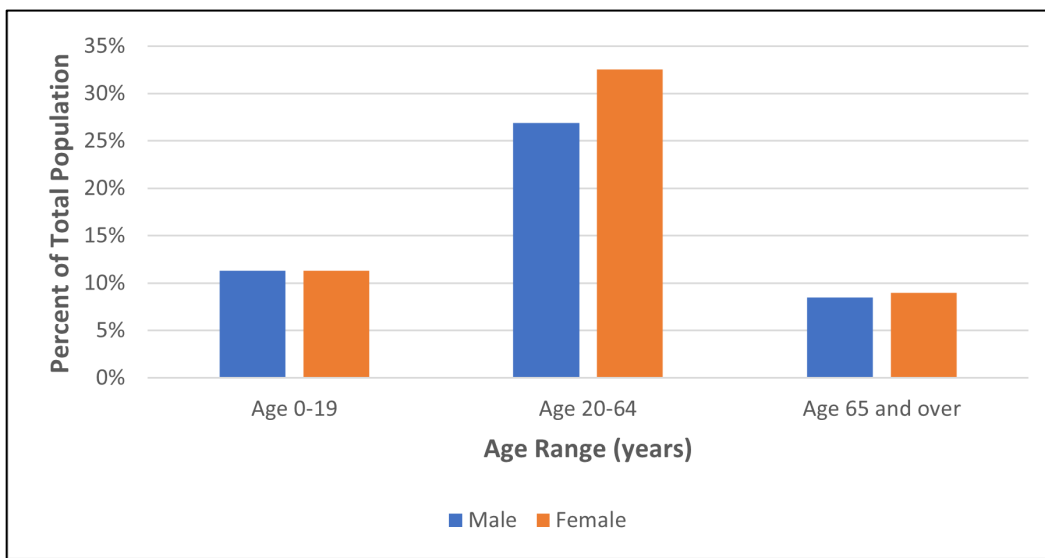


Figure 3-8: Curve Lake First Nation – Population by Age and Sex

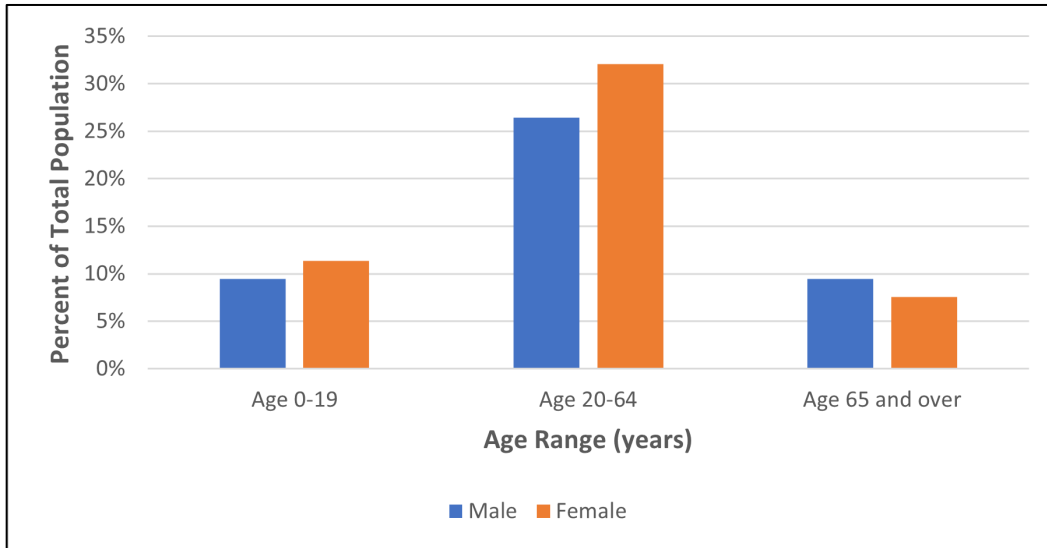


Figure 3-9: Chippewas of Georgina Island First Nation – Population by Age and Sex

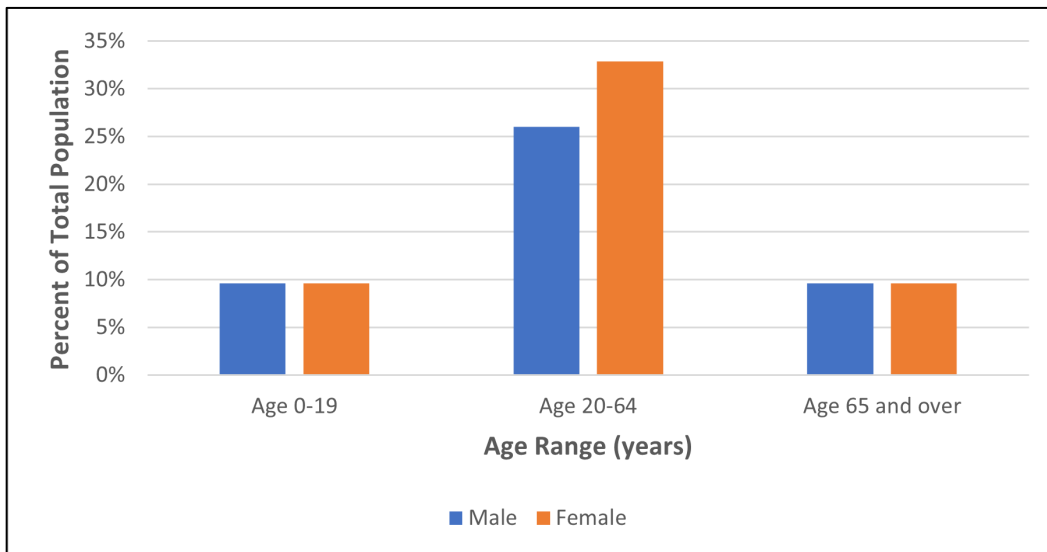


Figure 3-10: Hiawatha First Nation – Population by Age and Sex

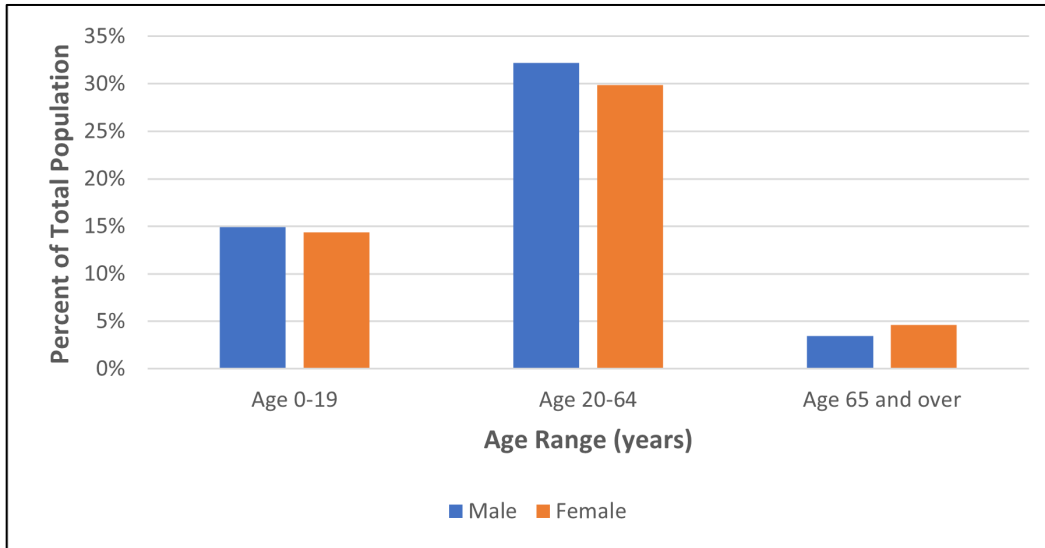


Figure 3-11: Chippewas of Rama First Nation – Population by Age and Sex

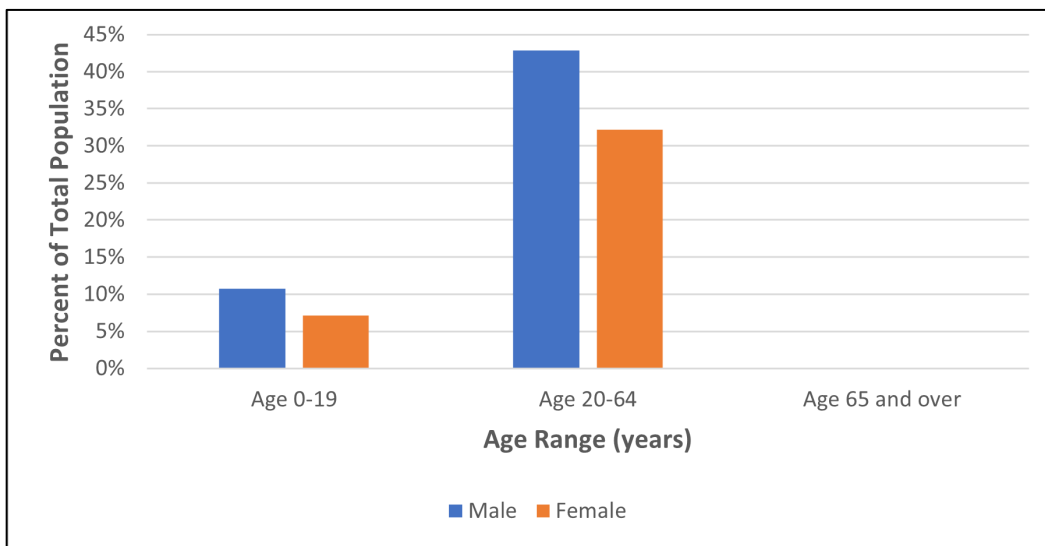


Figure 3-12: Mississaugas of Scugog Island First Nation

3.2.2. Education, Income and Employment

Education, income, and employment together contribute to one’s socioeconomic status and are integral determinants of health that can determine access to services and contribute to overall health and wellbeing.

Table 3-4 shows the highest level of education obtained in private households for each location in the LSA, in comparison to Ontario. The location which reports the highest percentage of postsecondary education is the Regional Municipality of York (i.e., 73.1%), which is higher than Ontario (67.8%). The location that reports the highest percentage of no certificate, diploma, or degree is Simcoe County (i.e., 10.3%), which is higher than Ontario (i.e., 8.8%).

Table 3-5 contains education characteristics for the First Nations within the LSA. The type of educational attainment with the highest percentage of individuals for all nations, is in the trades or another non university certificates, the highest being Beausoleil First Nation (i.e., 50%).

Table 3-4: Highest Level of Education in Private Household (25 – 64 yrs), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	King Township	East Gwillimbury	Ontario
No certificate, diploma or degree (%)	10.3	12.9	7.1	5.6	7.7	8.8
High (secondary) school diploma or equivalency certificate (%)	29.2	27.4	19.9	23	21.4	23.3
Postsecondary certificate, diploma, or degree (%)	60.5	59.7	73.1	71.5	70.9	67.8

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-5: Education Characteristics of First Nations, 2016 Census of Population

	Alderville First Nation	Beausoleil First Nation	Chippewas of Georgina Island First Nation	Chippewas of Rama First Nation	Curve Lake First Nation	Hiawatha First Nation	Mississaugas of Scugog Island First Nation
Population 15 years and over	410	500	210	670	880	315	120
No degree, certificate, or diploma (%)	21	22	24	32	25	22	25
High school diploma or equivalent only (%)	27	19	26	21	26	25	38
Trades/apprenticeship or other non-university certificate (%)	41	50	40	40	39	41	29
University certificate below bachelor level (%)	5	6	5	3	3	3	8
University degree (bachelor level or higher) (%)	7	3	7	4	7	8	8

Source: Government of Canada First Nations Details. Available at: <https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng>

Table 3-6 contains various income statistics of economic families in the LSA in comparison to Ontario, including median income, average family size, and prevalence of low income. Except for Simcoe County which has the lowest median income (i.e., \$109,000), all locations in the LSA have higher median incomes when compared to Ontario (i.e., \$111,000). The location with the highest median income is the Township of King (i.e., \$159,000), followed by East Gwillimbury (i.e., \$129,000).

For ages 0 to 17 years and 18 to 64 years, all locations in the LSA have lower prevalence rates of low income when compared to Ontario (i.e., 11.5% & 9.1%, respectively). The Regional Municipality of York

for ages 65 years and older, is the only location within that age range, in the LSA that has a higher rate of low-income prevalence (i.e., 12.2%) when compared to Ontario (i.e., 12.1%).

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	King	East Gwillimbury	Ontario
Median Income of Economic Families (\$) (2020)	109,000	123,000	126,000	159,000	129,000	111,000
Average Family Size	3	4	3	3	3	3
Prevalence of low income based on the Low-income measure, after tax (%) ²						
0 to 17 years (%)	9.1	8	9.6	6.3	7.8	11.5
18 to 64 years (%)	7.2	5.1	7.6	5.5	5.9	9.1
65 years and over (%)	9.8	8.5	12.2	8.1	7.8	12.1

Source: Statistics Canada 2021 Census

Notes:

- 1) An economic family refers to a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law union, adoption or a foster relationship.
- 2) The Low-income measure, after tax, refers to a fixed percentage (50%) of median adjusted after-tax income of private households (Statistics Canada, 2022a). Low-income status is typically presented for persons but, since the LIM-AT threshold and household income are unique and shared by all members within each household, low-income status based on LIM-AT can also be reported for households (Statistics Canada, 2022a). Available: <https://www12.statcan.gc.ca/census-recensement/2021/ref/dict/az/Definition-eng.cfm?ID=fam021>

Table 3-7 below, shows the average income of families in First Nations in the LSA. The highest average income is found in the Chippewas of Georgina Island First Nation (i.e., \$36,627), and the lowest is in Beausoleil First Nation (i.e., \$19,866).

	Alderville First Nation	Beausoleil First Nation	Chippewas of Georgina Island First Nation	Chippewas of Rama First Nation	Curve Lake First Nation	Hiawatha First Nation	Mississaugas of Scugog Island First Nation
Avg. total income in 2015 (\$)	31,276	19,866	36,627	31,609	28,057	26,456	NA

Source: Government of Canada First Nations Details. Available at: <https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng>

Notes: NA – Data not available.

Table 3-8 shows the status of the labour force of locations in the LSA, in comparison to Ontario. Unemployment rates range from 11% (i.e., township of King) to 12.7% (i.e., Regional Municipality of York). The Regional Municipality of York is the only location with a higher unemployment rate than Ontario (i.e., 12.2%).

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Participation Rate ¹ (%)	62.9	69.4	63.9	66.6	68.6	62.8
Employment Rate (%)	55.5	61.6	55.8	59.2	60.7	55.1
Unemployment Rate (%)	11.8	11.4	12.7	11	11.5	12.2

Table 3-8: Labour Force Status, 25% Sample Data²

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
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Source: Statistics Canada 2021 Census

Notes:

1 - Participation rate: The share of the working-age population that is working or looking for work.

2 - A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-9 below, also shows labour force status, but for the First Nations in the LSA. Beausoleil First Nation has the highest percentage of unemployment (i.e., 17.5%), while Hiawatha First Nation has the lowest (i.e., 6.1%).

Table 3-9: First Nations Labour Force Status, 2016 Census of Population

	Alderville First Nation	Beausoleil First Nation	Chippewas of Georgina Island First Nation	Chippewas of Rama First Nation	Curve Lake First Nation	Hiawatha First Nation	Mississaugas of Scugog Island First Nation
Participation Rate ¹ (%)	58.5	57.0	61.9	64.2	50.0	52.4	54.2
Employment Rate (%)	52.4	47.0	59.5	53.7	43.8	49.2	50.0
Unemployment Rate (%)	8.3	17.5	NA	17.4	12.5	6.1	15.4

Source: Government of Canada First Nations Details. Available at: <https://fnp-ppn.aadnc-aandc.gc.ca/fnp/Main/Search/SearchFN.aspx?lang=eng>

Notes: NA – Data not available.

1) Participation rate: The share of the working-age population that is working or looking for work.

Table 3-10 shows the division of labour force by occupation, according to the National Occupational Classification (Canada's national system for describing occupations), of locations in the LSA, in comparison to Ontario.

Table 3-10: Labour Force by Occupation (> 15 years old) National Occupational Classification, 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Legislative and senior management occupations (%)	1.1	0.8	1.7	4.1	1.9	1.3
Business, finance, and administration occupations (%)	14.7	16.6	22.0	22.6	20.0	17.9
Natural and applied sciences and related occupations (%)	5.8	7.0	12.2	7.5	8.7	9.3
Health occupations (%)	7.6	5.5	6.2	4.7	5.8	7.3
Occupations in education, law and social, community and government services (%)	11.3	9.4	10.4	11.5	11.8	11.8

Table 3-10: Labour Force by Occupation (> 15 years old) National Occupational Classification, 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Occupations in art, culture, recreation, and sport (%)	2.4	2.6	3.0	2.3	3.1	3.1
Sales and service occupations (%)	25.3	24.0	23.5	20.6	22.1	23.5
Trades, transport and equipment operators and related occupations (%)	21.1	22.9	12.9	17.5	17.7	15.9
Natural resources, agriculture, and related production occupations (%)	2.5	2.9	1.1	4.5	2.8	2.0
Occupations in manufacturing and utilities (%)	6.0	6.1	3.8	2.5	3.9	5.0

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

3.2.3. Affordable Housing

Having access to safe and affordable housing is one of the most important determinants of health and can have a cascading impacts on other health determinants, and one's physical, mental and social wellbeing. Table 3-11 shows housing status and Table 3-12 shows indicators of affordable housing for municipalities in the LSA, in comparison to Ontario. All municipalities in the LSA report higher percentages of the population who own homes and lower rates of renters, when compared to Ontario (i.e., 68.4% & 31.4%, respectively). The municipality with the highest percentage of owners and the lowest percentage of renters is the Township of King (i.e., 88.2% & 11.8%, respectively). Additionally, the municipality with the lowest percentage of owners and highest percentage of renters is Simcoe County (i.e., 77.9% & 22%, respectively).

When compared to Ontario (i.e., 75.8%), all the locations in the LSA have lower percentages of households spending less than 30% of income on shelter costs, ranging from 69.5% (Regional Municipality of York) to 77.1% (Simcoe County). Simcoe County is the only municipality within the LSA that has a lower percentage of households spending 30% or more on shelter costs (i.e., 22.9%), when compared to Ontario (i.e., 24.2%). The location that has the highest percentage of households spending 30% or more on shelter costs is the Regional Municipality of York (i.e., 30.5%).

Table 3-11: Housing Status, 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Owner (%)	77.9	83.5	82.2	88.2	84.2	68.4
Renter (%)	22	16.5	17.8	11.8	15.8	31.4
Dwelling Provided by Local Government, First	0.1	0	0	0	0	0.2

Table 3-11: Housing Status, 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Nation, or Indian band (%)						

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-12: Affordable Housing, 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Regional Municipality of York	Township of King	East Gwillimbury	Ontario
Spending less than 30% of income on shelter costs (%)	77.1	73.3	69.5	73.4	73.2	75.8
Spending 30% or more of income on shelter costs (%)	22.9	26.7	30.5	26.6	26.8	24.2

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

3.2.4. Burden of Disease and Mental Health

Physical and mental health issues and illnesses have a significant impact on how people live their lives. As such, it is crucial to understand the prevalence and incidence of chronic diseases as well as other health indicators in local communities, as this can help local governments and organisations define priorities for community health and manage health disparities. Indigenous individuals, families, communities, and nations who face inequities in the social determinants of health are more likely to bear an additional burden of illness and face difficulties in accessing resources (e.g., health and emergency response services) that could alleviate these concerns (Loppie and Wien, 2022).

Burden of disease and mental health statistics are shown for the local health unit, as per Statistics Canada (2022b). The health units that represent the LSA, and as described by Statistics Canada, include the Simcoe Muskoka District Health Unit and the York Regional Health Unit (aka York Region Public Health), and are compared to Ontario in this section. For First Nations, this information is available at the level of First Nations in Ontario.

Table 3-13 shows indicators related to burden of disease within the populations of locations in the LSA, in comparison to Ontario. York Region Public Health has lower percentage of the population experiencing arthritis (i.e., 16.2%), diabetes (i.e., 7.7%), asthma (i.e., 5%), COPD (i.e., 1.7%), and mood disorders (i.e., 5.9%), when compared to Simcoe Muskoka District Health Unit and Ontario. The Simcoe Muskoka District Health Unit has a higher percentage of the populations experiencing arthritis (i.e., 21.7%), diabetes (i.e., 8.2%), COPD (i.e., 5%), high blood pressure (i.e., 20.3%), and mood disorders (i.e., 12.5%), when compared to Ontario.

Chronic diseases have a disproportionately high impact on Indigenous peoples in Ontario (PHO, 2019). As seen in Table 3-13, First Nations in Ontario have the highest burden of disease for all disorders,

arthritis (i.e., 26.1%), diabetes (i.e., 23.4%), asthma (12.6%), high blood pressure (i.e., 22.9%) when compared to all other locations. The only exception is the percentage of the population experiencing mood disorders, which is the highest in Simcoe Muskoka District Health Unit (i.e., 12.5%).

Table 3-13: Burden of Disease (Percent of the Population)

	Simcoe Muskoka District Health Unit¹	York Regional Health Unit¹	Ontario First Nations²	Ontario¹
Arthritis (%)	21.7	16.2	26.1	19.1
Diabetes (%)	8.2	7.7	23.4	8
Asthma (%)	7.8	5	12.6	8
Chronic obstructive pulmonary disease (%)	5	1.7	NA	3.8
High blood pressure (%)	20.3	18	22.9	17.5
Mood disorder ³ (%)	12.5	5.9	7.6	9.5

Source: Statistics Canada 2021 Health Characteristics; Ontario First Nations Regional Health Survey Phase III

Notes: NA – Data not available.

- 1) Statistics from 2019-2020 Data: Census Profile 2021.
- 2) Statistics from 2015-2017: Ontario First Nations Regional Health Survey Phase III.
- 3) Population aged 12 and over who reported that they have been diagnosed by a health professional as having a mood disorder, such as depression, bipolar disorder, mania or dysthymia.

Table 3-14 contains both childhood and adult obesity rates for locations in the LSA, in comparison to Ontario. While the Simcoe Muskoka District Health Unit has a lower percentage of adults self-reporting as being overweight (i.e., 34.8%), compared to Ontario (i.e., 35.4), York Region Public Health has a higher percentage (i.e., 36.3%). The reverse is true for rates of obesity in adults, where York Region Public Health has self-reported obesity rates (i.e., 23.1%) lower than Ontario (i.e., 28.1%), and the Simcoe Muskoka District Health Unit obesity rate is higher (i.e., 35.8%). First Nations in Ontario have the highest rates of adults self-reporting as obese (i.e., 43%).

Table 3-14: Childhood and Adult Obesity (Percent of the Population)

	Simcoe Muskoka District Health Unit¹	York Regional Health Unit¹	Ontario First Nations²	Ontario¹
Body mass index, adjusted self-reported, adult, overweight (%)	34.8	36.3	36	35.4
Body mass index, adjusted self-reported, adult, obese (%)	35.8	23.1	43	28.1
Body mass index, self-reported, youth (12 to 17 years old), overweight or obese (%)	F	16.4	32 ³ & 14 ⁴	22

Source: Statistics Canada 2021 Health Characteristics; Ontario First Nations Regional Health Survey Phase III

Notes: F – too unrealistic to be published

- 1) Statistics from 2019-2020 Data: Census Profile 2021.
- 2) Statistics from 2015-2017: Ontario First Nations Regional Health Survey Phase III.
- 3) 32% of youth reported to be overweight.
- 4) 14% of youth reported to be obese.

Table 3-15 shows indicators of perceived health and mental health status of the populations of locations in the LSA, compared to Ontario. York Region Public Health has the highest percent of the population self-reporting very good or excellent perceived health (i.e., 65.1%), while Simcoe Muskoka District Health Unit has the highest percentage of the population self-reporting poor or fair perceived health (i.e., 13.2%). Similarly, York Region Public Health also has the highest percentage the population self-reporting very good or excellent perceived mental health, and Simcoe Muskoka District Health Unit has

the highest percentage self-reporting poor or fair perceived mental health (i.e., 10.9%). The Ontario First Nations report the lowest percentage of overall mental health described as excellent or very good (i.e., 47%) as shown in Table 3-16, when compared to all other locations, including Ontario.

Table 3-15: Perceived Health and Mental Health (Percent of the Population)

	Simcoe Muskoka District Health Unit	York Regional Health Unit	Ontario
Perceived health, very good or excellent (%)	60.3	65.1	61.8
Perceived health, fair or poor (%)	13.2	8.7	11.1
Perceived mental health, very good or excellent (%)	63.4	65.9	64.7
Perceived mental health, fair or poor (%)	10.9	8.5	9.8
Perceived life stress, most days quite a bit or extremely stressful (%)	24.5	22.3	20.9

Source: Statistics Canada 2021 Health Characteristics

Notes: Statistics from 2019-2020 Data: Census Profile 2021.

Table 3-16: Perceived Mental Health (Percent of the Population)

	Ontario First Nations
Described overall mental health as excellent or very good (%)	47.2
Described overall mental health as good or fair (%)	51.2
Described overall mental health as poor (%)	1.6

Source: Ontario First Nations Regional Health Survey Phase III

Table 3-17 below, shows the sense of belonging to community among the locations in the LSA, in comparison to Ontario. First Nations in Ontario have the highest percentage of the population self-reporting a sense of belonging to their community (i.e., 83.4%), and the lowest percentage being in the York Region Public Health (i.e., 69.6%).

Table 3-17: Sense of Belonging to the Community (Percent of the Population)

	Simcoe Muskoka District Health Unit¹	York Regional Health Unit¹	Ontario First Nations²	Ontario¹
Sense of belonging to local community (%)	72.8	69.6	83.4	71.3

Source: Statistics Canada 2021 Health Characteristics; Ontario First Nations Regional Health Survey Phase III

Notes:

- 1) Statistics from 2019-2020 Data: Census Profile 2021. Population aged 12 and over who reported their sense of belonging to their local community as being very strong or somewhat strong.
- 2) Statistics from 2015-2017: Ontario First Nations Regional Health Survey Phase III. Adult population with a strong sense of belonging.

3.2.5. Walkability Score & Transit Score

Walkability, easy and equitable access to transit options, and well-connected, safe and age-friendly bicycle lanes provide communities with options for using active transportation to access services, have higher levels of physical activity, and for recreation. In the context of transportation projects and infrastructure, ensuring that communities have safe active transportation elements is vital.

Walkscore.com allows for the review of an address, neighbourhood, or city's walkability score, transit score, and bike score, which are ranked on a 100-point system. Walkability, transit, and bike score rating systems are explained in Table 3-18 to Table 3-20, below.

Table 3-18: Walk Score Rating System

Walk Score Rating	Walk Score Designation	Walk Score Explanation
90 to 100	Walker’s Paradise	Daily errands do not require a car
70 to 89	Very Walkable	Most errands can be accomplished on foot
50 to 69	Somewhat Walkable	Some errands can be accomplished on foot
25 to 49	Car Dependent	Most errands require a car
0 to 24	Car Dependent	Almost all errands require a car

Source: Walkscore.com

Table 3-19: Transit Score Rating System

Transit Score Rating	Transit Score Designation	Transit Score Explanation
90 to 100	Rider’s Paradise	World class public transportation
70 to 89	Excellent Transit	Transit is convenient for most trips
50 to 69	Good Transit	Many nearby public transportation options
25 to 49	Some Transit	A few nearby public transportation options
0 to 24	Minimal Transit	It is possible to get on a bus

Source: Walkscore.com

Table 3-20: Bike Score Rating System

Bike Score Rating	Bike Score Designation	Bike Score Explanation
90 to 100	Biker’s Paradise	Daily errands can be accomplished on a bike
70 to 89	Very Bikeable	Biking is convenient for most trips
50 to 69	Bikeable	Some bike infrastructure
0 to 49	Somewhat Bikeable	Minimal bike infrastructure

Source: Walkscore.com

Table 3-21, below, shows the scores for Bradford West Gwillimbury and Township of King, which are the only locations in the LSA with listed walk, transit, or bike scores on walkscore.com.

Table 3-21: Walkability, Transit, and Bike Scores (Scores out of 100)

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	Township of King ¹	East Gwillimbury	Ontario
Walkability Score	NA	13	NA	8	NA	NA
Transit Score	NA	13	NA	NA	NA	NA
Bike Score	NA	26	NA	22	NA	NA

Source: Walkscore.com

Notes: NA – Data not available.

1) Walk score and bike score shown for King City

3.2.6. Transportation and Commuting

Understanding a community’s transportation needs and modalities is critical when planning new transportation infrastructure. Mode shift for communities to more active and sustainable methods of transportation is part of Ontario’s transportation plan for the Greater Golden Horseshoe (MTO, 2022b) and is also desirable from a public health perspective.

Table 3-22 below shows the different modes of transportation that are utilized by the locations in the LSA, in comparison to Ontario. Cars, trucks, or vans are the most utilized mode of transportation for all of the locations in the LSA and are used by a higher percentage of the population when compared to Ontario. Similarly, public transit use in the LSA is lower than in the province as a whole. Within the LSA, Simcoe County has the highest percent of the sample population who walk.

Table 3-22: Main Mode of Transportation Used to Commute by the Employed Labour Force (Ages 15 Years or Greater), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	Township of King	East Gwillimbury	Ontario
Car, Truck, or Van (%)	92.5	93.7	88.8	93.9	92.8	83.6
Public transit (%)	1.8	2.1	6.1	1.4	2.5	8.6
Walked (%)	3.4	2.3	2.5	2.8	2.1	4.6
Bicycle (%)	0.5	0.4	0.3	0.1	0.2	0.8
Other Method (%)	1.8	1.4	2.3	1.8	2.4	2.4

Source: Statistics Canada 2021 Census

Notes:

- 1 A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-23 and Table 3-24 provide insight into commuting durations and times in the LSA. Locations in the LSA have commute times typically between 15 to 44 minutes. Simcoe County has the highest percent of the population with the shortest commute times: 31.4% of the sample population commute for less than 15 minutes.

Table 3-23: Commuting Duration for Employed Labour Force (Ages 15 Years or Greater), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	King	East Gwillimbury	Ontario
Less than 15 minutes (%)	31.4	21.5	19.8	15.2	19.1	28.3
15 to 29 minutes (%)	26.8	20.9	31.7	31.2	28.5	33.7
30 to 44 minutes (%)	16.5	27.9	26.6	29.5	23.1	20.6
45 to 59 minutes (%)	10.2	14.4	10.9	12.8	15.5	8.3
60 minutes and over (%)	15.1	15.4	11	11.3	13.8	9.1

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-24: Time Leaving for Work for the Employed Labour Force (Ages 15 Years or Greater), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	King	East Gwillimbury	Ontario
Between 5 a.m. and 5:59 a.m. (%)	11	13	6	7	10	8
Between 6 a.m. and 6:59 a.m. (%)	19	20	14	17	18	18
Between 7 a.m. and 7:59 a.m. (%)	24	23	22	25	25	24
Between 8 a.m. and 8:59 a.m. (%)	19	17	24	23	20	21
Between 9 a.m. and 11:59 a.m. (%)	11	12	21	18	13	14
Between 12 p.m. and 4:59 a.m. (%)	16	15	13	10	14	17

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-25 shows the commuting destinations of the employed labour force in locations in the LSA, compared to Ontario. Residents in Simcoe County have the highest percentage of commutes (i.e., 42%) within the census subdivision of their residence and Bradford West Gwillimbury has the highest percentage of residents who commute outside their census division of residence (i.e., 63%).

Table 3-25: Commuting Destination for the Employed Labour Force (Ages 15 Years or Greater), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	King	East Gwillimbury	Ontario
Commute within census subdivision of residence (%)	42	29	37	19	20	59
Commute to a different census subdivision within census division of residence (%)	34	8	24	42	55	17
Commute to a different census subdivision and census division within province or territory of residence (%)	24	63	39	39	25	24
Commute to a different province or territory (%)	0.2	0.2	0.2	0.2	0.2	1

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

Table 3-26 shows the work environments of the employed labour force in the LSA, compared to Ontario. Locations in the LSA primarily work in a usual place of work, followed by working at home.

Table 3-26: Place of Work for the Employed Labour Force (Ages 15 Years or Greater), 25% of Sample Data¹

	Simcoe County	Bradford West Gwillimbury	Region Municipality of York	King	East Gwillimbury	Ontario
Worked at home (%)	21	22	36	34	32	30
Worked outside Canada (%)	0.2	0.2	1	0.3	0.3	1
No fixed workplace address (%)	16	18	11	14	14	12
Usual place of work (%)	63	60	52	51	54	58

Source: Statistics Canada 2021 Census

Notes:

- 1) A sample of approximately 25% of Canadian households receive a long-form questionnaire. All other households receive a short-form questionnaire.

3.3. Determinants of Health to be Assessed in the Broader HHI Study

In the Scoping Phase, the Project Team identifies the determinants of health to be assessed in the Assessment Phase following engagement with key stakeholders and Indigenous communities. Since engagement was not conducted specifically for the HHI Scoping Study, the Project Team reviewed all comments received from other engagement with stakeholders and Indigenous communities and included their feedback when determining the proposed scope of the HHI Study.

The main potential health impacts related to the Project to be assessed in the HHI Study include the following and are discussed in further detail in Section 3.5.5:

- Air quality and climate change
- Noise levels and vibrations
- Addition of active transportation elements and levels of physical activity
- Mental health and wellbeing
- Employment
- Social cohesion

- Traffic congestion and delay
- Traffic-related safety
- Neighbourhood resources
- Access to local healthy food sources

Selection rationale and background is provided in Section 3.5.5, of the HHI Scoping Report.

3.4. Engagement with Stakeholders and Indigenous Communities and Input into the HHI Study

The inclusion of feedback from Indigenous communities, the public and other stakeholders when deciding the scope of an HHI Study ensures the adequate representation of potential environmental and health impacts during the course of the study. As mentioned above in Section 3.3, although engagement was not conducted specifically as part of this HHI Scoping Phase, all feedback provided for the Project related to human health from the public and Indigenous communities was reviewed and included in identifying the determinants of health to be assessed in the HHI Study.

3.5. Sensitive Receptors

3.5.1. Identification of Sensitive Populations

The Study Area extends from Highway 400 between 8th Line and 9th Line in Bradford West Gwillimbury, travelling easterly to Highway 404 between Holborn Road and Queensville Sideroad in East Gwillimbury. As noted in the Final Air Quality Impact Assessment Report (AECOM, 2023a), the Study Area is broader than the Right of Way (ROW) for the proposed alignments of the Bradford Bypass intentionally to capture air quality impacts and effects from diverting traffic loads from the Town of Bradford West Gwillimbury and the surrounding area onto the Bypass, north of the Town of Bradford West Gwillimbury. It also includes a 500-metre buffer to capture air quality impacts from major highway and roads within and close to the edge of the Study Area.

For typical risk assessments of stationary emission sources, relying on predicted ambient air concentrations at the maximum point of impingement from that emission source to evaluate human health risks, particularly chronic risks, is considered a very conservative (i.e., protective) approach. Unfortunately, this approach is not appropriate when considering multiple emissions sources (i.e., gasoline and diesel vehicles) moving along a transportation corridor. This requires complex air dispersion modelling to evaluate regional emission impacts of vehicles travelling on the corridor to individuals living, working or playing in the surrounding Study Area. To address this within the standard risk assessment paradigm, the most appropriate approach would be to evaluate exposures from modelled air concentrations for each chemical of concern and potential health risks at several specific selected receptor locations within the Study Area. As these modelled concentrations include the contributions of emissions from a variety of sources within and outside (i.e., contribution of background sources) of the Study Area, they provide a more accurate reflection of cumulative exposures experienced by residents located in a general area of the Study Area represented by a specific receptor location.

It is not possible to consider exposures to every person (human receptor) at all locations within the Study Area. On the other hand, it is important that the assessment is sufficiently comprehensive to ensure that overall risks have been adequately addressed. The Study Area is composed of a mixture of residential, commercial/industrial, and community land uses. Therefore, several receptor locations

representative of residential, commercial, and community use receptor locations for a broad section of the Study Area were selected for the quantitative evaluation. Potential exposures and health risks for the assessed chemicals were based on air dispersion modelling conducted by the Air Quality Team for large number of discrete receptor locations throughout the Study Area (AECOM, 2023a), including:

- 162 sensitive receptor locations representing permanent locations of residence, such as detached housing, apartments, and condominiums;
- 14 critical receptor locations representing particularly sensitive locations such as health care facilities, educational institutions (schools), childcare facilities (daycares), and nursing/long-term care facilities; and,
- 9 receptors locations termed “Possible Future Sensitive Receptor” represent locations within the Study Area where future land development could include residential, industrial, parkland or community use purposes.

Ground-level air concentrations for each of the chemicals of concern will be modelled by the Air Quality team with these values used to represent chemicals exposures as part of the SLHHRA, if conducted.

3.5.2. Potential Exposure

As noted above, an Air Quality Impact Assessment (AECOM, 2023a) of the proposed Project has been completed. If conducted, an SLHHRA, which is a component of the Assessment Phase of the HHI Study, would be undertaken using widely accepted risk assessment methodologies and guidance documents published and endorsed by regulatory agencies including the Ontario MECP (MOE, 2005; 2011), Health Canada (2010; 2012) and the United States Environmental Protection Agency (US EPA, 2005) to evaluate whether emissions arising from the proposed Project might adversely impact health of individuals living, working or playing in the surrounding communities due to any changes in air quality.

The primary outcome of an SLHHRA is risk characterization. This involves the estimation, description, and evaluation of risk associated with exposure to Contaminants of Concern (COCs) by comparing the estimated airborne exposure to the appropriate regulatory benchmark for that specific chemical. Risk characterization involves the comparison of estimated exposures (identified in the exposure assessment) with regulatory benchmarks or toxicity reference values (TRVs, identified during the hazard/toxicity assessment) to identify potential human health risks. This comparison is typically expressed as a Concentration Ratio (CR) for non-carcinogenic chemicals and is calculated by dividing the predicted exposure by the regulatory benchmark/TRV. In the case of direct acting non-threshold carcinogenic chemicals, potential risks are expressed as incremental lifetime cancer risks (ILCRs) and represents the incremental risk of an individual within a given population developing cancer over his or her lifetime due to exposures from a specific carcinogenic chemical of concern.

Separate assessments would be completed for short term (acute) and long term (chronic) durations because the health outcomes produced by some COCs depend on the duration of exposure. It is important to distinguish between the health outcomes that might result from acute exposures vs. effects that may occur following chronic exposures.

In recognition of the influence of these exposure variables, risk estimates would be segregated into:

- Acute inhalation (1-hour and 24-hour durations, or 8-hour durations in the case of carbon monoxide); and,
- Chronic inhalation (annual average durations).

Resulting predictions of risks can be shown both in comparison to existing background conditions (i.e., in absence of the proposed infrastructure) and cumulatively (assuming the contribution of the proposed infrastructure is added to existing background conditions).

3.5.3. Potential Contaminants of Concern

For the SLHHRA (if conducted), the primary sources of air quality impacts within the Study Area are the vehicle emissions within the transportation corridor – both the existing road infrastructure and the proposed Bradford Bypass infrastructure being considered. Based on the recommendations outlined in both the MTO Air Quality Guideline and the draft MTO HHI Guide (MTO, 2022a), Table 3-27 provides a list of air contaminants that will be evaluated in the Air Quality Impact Assessment and carried forward for assessment in the SLHHRA, if conducted. The table also specifies the various acute and chronic time durations to be evaluated within the assessment.

Table 3-27: Preliminary List of Contaminants of Concern (COCs) to be Included in the Air Quality Assessment						
COC	10-min	½-hour	1-hour	8-hour	24-hour	Annual Average
Criteria Air Contaminants						
CO	-	-	X	X	-	-
NO ₂	-	-	X	-	X	X
PM _{2.5}	-	-	-	-	X	X
PM ₁₀	-	-	-	-	X	-
SO ₂	X	-	X	-	-	X
Volatile Organic Contaminants						
Acetaldehyde	-	X	-	-	X	-
Acrolein	-	-	X	-	X	-
Butadiene (1,3-)	-	-	-	-	X	X
Benzene	-	-	-	-	X	X
Benzo(a)pyrene	-	-	-	-	X	X
Formaldehyde	-	-	-	-	X	-

3.5.4. Human Health Impacts – Air Quality

Based on the nature of the proposed infrastructure, the primary potential human health impact is related to the inhalation of vapour or particulate-based contaminants emitted from vehicles travelling on the existing road infrastructure or using the proposed Bradford Bypass infrastructure. Emissions from these vehicles can travel via air to the surrounding communities and potentially impact people living, working or playing within the Study Area. If conducted, an SLHHRA would assess potential health risks based on inhalation of ground-level air concentrations of the key COCs based on detailed air dispersion modelling conducted as part of the Final Air Quality Impact Assessment (AECOM, 2023a). The main pathway for transportation-related pollution to get into the environment is through emission to the atmosphere. While there is the potential for particulate deposition to occur to nearby soils and potentially surface water bodies, based on modelling completed in previous projects, this has been shown to have a negligible impact with a very localized dispersal range (typically within 100 to 200 metres from the active corridor). As such, transportation-based risk assessments typically primarily focus on the inhalation exposure pathway, and qualitatively discuss other potential pathways such as impacts to local lands and water.

Figure 3-13 provides the preliminary human health conceptual model which will guide an SLHHRA evaluation of inhalation risks related to the proposed Project.

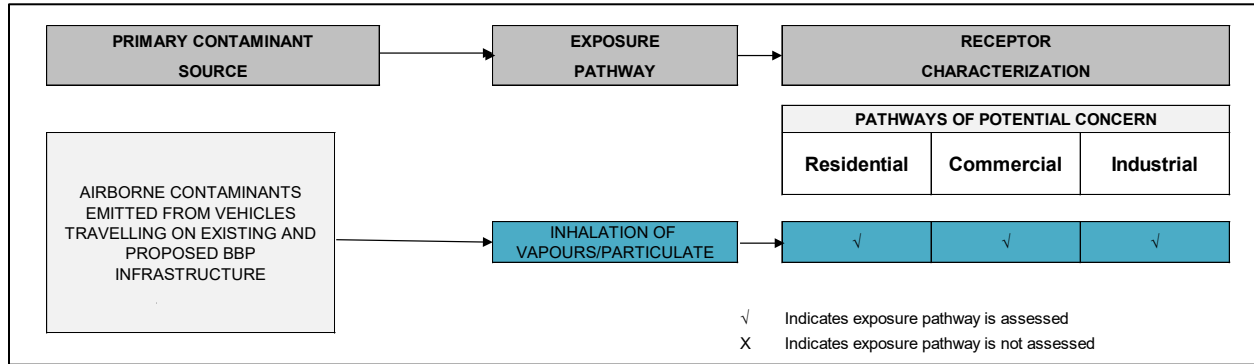


Figure 3-13: Preliminary Human Health Conceptual Model

3.5.5. Broader Potential Human Health Implications

Section 3.3 outlines the social determinants to be considered in the HHI Study. During the Scoping Phase the HHI Scoping Report provides high-level:

- overview of relevant determinants of health to be assessed in the HHI Study;
- results from different studies conducted during the project specific assessment of environmental impacts; and,
- overview of potential human health implications, where possible, at a high-level, to stakeholders and Indigenous communities.

The detailed assessment of potential human health impacts due to the proposed Project is undertaken during the Assessment Phase of an HHI Study (not in this report). Here, in the HHI Scoping Report, the health linkages for potential impacts are identified, and where available, high-level results from specific studies (i.e., air quality impact assessment, noise assessment, and traffic) and the Environmental Conditions Report (AECOM, 2022) are noted.

3.5.5.1. Air quality and climate change

Health Linkages

Transportation in urban settings is known to be associated with a large burden of global disease and premature mortality (Khreis et al., 2017). Air pollution and a reduction in air quality can be related to traffic and has been shown to cause 184,000 deaths globally each year, including deaths from ischemic heart disease, stroke, lower respiratory infections, chronic obstructive pulmonary disease, and lung cancer (Bhalla et al., 2014).

There is data regarding both positive and negative impacts of highway expansion and the alleviation of traffic congestion. A positive outcome related to reduced traffic congestion through expansion is a reduction in greenhouse gas emissions due lessened congestion and shorter travel times (Handy & Boarnet, 2014). The caveat to the reduction in greenhouse gas emissions through reduced traffic congestion, is that additional capacity can promote more vehicles to use the travel corridor. This is known as ‘induced demand’ (Handy & Boarnet, 2014; Duranton and Turner, 2011). Simply put, expansion of transportation infrastructure may increase travel volumes (Handy & Boarnet, 2014; Duranton and Turner, 2011).

Transportation expansion projects can also have impacts on climate change, whether it be related to creating heat islands or rising temperatures due to greenhouse gas emissions from vehicles (Zhang et al., 2013; Gago et al., 2013 & Estrada et al., 2017).

High-Level Potential Project Implications

Transportation expansion projects, as discussed above, have been shown to have both negative and positive impacts on air quality and climate change.

Although a SLHRA of air quality impacts has not yet been conducted, the Final Air Quality Impact Assessment Report indicates that during:

- Operating Conditions: Increased traffic vehicular emissions will lead to increased NO₂, CO, SO₂, particulate matter, and VOC impact levels at nearby receptors (AECOM, 2023a). Proposed mitigations during Operating Conditions include (AECOM, 2023a):
 - Implementation of vegetation within the Study Area to decrease ground level dispersion of particulates;
 - Implementation of High Occupancy Vehicle lanes on the Bradford Bypass to promote the use of carpooling;
 - Carpool lots; and
 - Continued promotion of increased electric vehicle purchase and infrastructure within Ontario.
- Construction Conditions: Vehicular operation will lead to air pollution and emissions (i.e., diesel combustion, particulates), and surface particulate disruption will lead to odour and visible dust causing public annoyance at sensitive receptors (AECOM, 2023a). Proposed mitigations during Construction Operations incorporates the prior commencement of a detailed Construction Air Quality Management Plan which includes (AECOM, 2023a):
 - Defining the Project’s air quality impact zone and identifying all sensitive receptors;
 - Assessing the requirement for continuous monitoring during project construction;
 - Providing mitigation measures and identifying requirements for implementation of these measures;
 - Including explicit commitment to implementation of applicable best practices;
 - If applicable, including a commitment to follow guidelines on hot mix asphalt outlined in the Ontario Hot Mix Producers Association’s Environmental Practices Guide: Ontario Hot Mix Asphalt Plants, Fifth edition (Ontario Hot Mix Producers Association, 2015); and
 - Developing a Communication Protocol and a Complaints Protocol in accordance with Project Agreement.

Overall, as per the Final Air Quality Assessment Report, the addition of the proposed infrastructure will have a lower impact on the sensitive and critical receptors within the Study Area in comparison to Existing Conditions for most contaminants and a varied impact in comparison to Future No-Build Conditions, depending on where a receptor is located along the route (AECOM, 2023a). A variance in traffic conditions is anticipated resulting in the varied impact, including (AECOM, 2023a):

- 18% traffic decrease along Highway 400 North;
- 32% volume increase along Highway 404 North; and
- Both increases and decreases in traffic volumes on the on-ramps, off-ramps, and arterial roads.

Most criteria air contaminants are expected to be below both applicable provincial and federal air quality criteria with the implementation of Build Conditions (AECOM, 2023a). The Build Conditions of the Bradford Bypass Project is expected to only contribute a small fraction of the overall concentration of criteria air contaminants compared to existing background levels (AECOM, 2023a).

3.5.5.2. Noise levels and vibrations

Health Linkages

Noise is typically defined as any unpleasant or unwanted sound, and as such noise pollution is “the noise beyond the permissible limits” (Singh et al., 2017). The WHO has reported that “noise is an underestimated threat that can cause a number of short- and long-term health problems” (WHO, 2010).

Noise pollution caused by vehicular traffic is known to be associated with adverse effects to human health and is a rising hazard due to rapid urbanization and growth of traffic loads (Khreis et al., 2017, Singh et al., 2017).

High-Level Potential Project Implications

The Noise Assessment shows that noise attenuation devices at two locations, are feasible for the Bradford Bypass Project (AECOM, 2023b). The two proposed locations for the noise attenuation devices can be found in the Final Noise Impact Assessment Report’s Figure 11 and Figure 12 (AECOM, 2023b). Additionally, the Noise Assessment showed noise mitigation investigation is required along the Bradford Bypass ROW for multiple locations (AECOM, 2023b). It is noted in the Noise Impact Assessment Report, some pre-existing developer-built noise barriers are currently providing noise attenuation in select areas along the ROW (AECOM, 2023b).

Additional proposed mitigations to combat noise throughout the duration of construction are identified in the Noise Impact Assessment Report and include (AECOM, 2023b):

- Abide by municipal noise control bylaws when possible;
- Reduce the amount of idling related to construction vehicles;
- Maintain construction equipment in good working order; and
- Create availability to address and investigate concerns that may arise in relation to construction noise.

3.5.5.3. Active transportation elements and levels of physical activity

Health Linkages

It is well known that active transportation methods or human-powered travel can improve public health and help to support healthy communities (Government of Canada, 2014). Participating in active transport such as walking, cycling, or skateboarding can reduce rates of chronic disease, improve mental health, reduce greenhouse gas emissions, and reduce traffic congestion (Government of Canada, 2014). The addition of public transit to highway infrastructure has shown benefits related to increased physical health, improved mental health, improved basic access to medical care, improved access to healthy foods, and can reduce financial stress due to public transportations affordability (Litman, 2012). Promoting healthy and active communities by facilitating active transportation and community connectivity is also part of the Provincial Policy Statement (2020).

High-Level Potential Project Implications

Although the proposed Project does not currently include plans for active transportation infrastructure (e.g., transit-only lanes), this may change in the future. Also, the proposed Bradford Bypass was classified as a proposed Provincial Highway by the Town of East Gwillimbury’s Official Plan, which also provides policies specific to the Bradford Bypass, relating to the provision of active transportation connections between Employment Areas and Community Areas on each side of the Bradford Bypass, while considering design elements (AECOM, 2022).

3.5.5.4. Mental health and wellbeing

Health Linkages

Highways that are associated with long travel times and high levels of congestion can impact travellers' mental health and wellbeing. Mental health and wellbeing can be linked negatively to high volume traffic situations as they are reported to be incredibly stressful (Hennessy & Wiesenthal, 1997). If highway expansion projects incorporate active transport and public transportation infrastructure into planning, it can alleviate mental health stressors for those who would choose to engage in alternative transportation methods (Litman, 2012).

3.5.5.5. Employment

Health Linkages

Health and wellbeing of individuals are greatly influenced by income and employment. And as previously stated, the Bradford Bypass will expand highway/transportation infrastructure in the area, potentially resulting in the creation of jobs to prepare for the population growth that is expected in the next 30 years.

High-Level Potential Project Implications

As per the Final Land Use Factors Study Report (AECOM, 2023d) for the proposed Project, the Bradford Bypass will also support areas within the LSA that are planned for residential and employment growth. Impacts of the proposed Project to health and wellbeing due to potential changes in employment (not known at this time) would be assessed during the Assessment Phase (if conducted).

3.5.5.6. Social cohesion

Health Linkages

Social cohesion refers to “the extent of connectedness and solidarity among groups in society” and is related to a sense of belonging in a community and relationships among community members (Manca, 2014). Putman (2000) has indicated that long commutes reduce community involvement. When travelers are spending increased time intervals commuting it results in less time for outside activities, such as extra curriculums or community engagement (Putman, 2000).

3.5.5.7. Traffic congestion and delay

Health Linkages

Traffic congestion is typically defined as “excess of vehicles on a portion of roadway at a particular time resulting in speeds that are slower and is referred to as spot-and-go traffic” (US Department of Transportation, 2020). Traffic congestion is often exacerbated by physical highway features such as physical bottle necks, in addition to traffic demand (US Department of Transportation, 2020). It is important for congestion and travel times to be considered by governments when planning transportation infrastructure as it can impact economies, where people choose to live, and reduce individuals' quality of life (US Department of Transportation, 2020).

High-Level Potential Project Implications

According to the Draft ‘Travel Demand Forecast and Future Conditions 2031 / 2041 Aimsun Microsimulation Model Analysis’, overall, the traffic operations analysis of the Bradford Bypass using the Aimsun microsimulation model indicates a well performing corridor with acceptable operations in both

the interim 2031 and ultimate 2041 Future Conditions along the mainline and at the ramp terminals under the recommended cross-sections and lane configurations (AECOM, 2023c). As such, based on a scenario with an increased posted speed limit of 110 km/hr, there will be slight increases in traffic volume demand along the corridor, but the corridor would still maintain acceptable operating speeds and performance of interchange ramps and intersection (AECOM, 2023c).

3.5.5.8. Traffic-related safety

Health Linkages

High volumes of vehicular traffic and the resulting congestion on roadways can have negative impacts on traffic management (Retallack & Ostendorf, 2019). In a literature review conducted by Retallack & Ostendorf (2019), it was reported that increased traffic density was related to fatal accidents. Highway expansions that incorporate high quality public transportation could positively influence the health of travelers due to its overall impact in travel activity, which includes reductions in traffic accidents (Litman, 2012).

High-Level Potential Project Implications

The Draft 'Travel Demand Forecast and Future Conditions 2031 / 2041 Aimsun Microsimulation Model Analysis' indicates a well performing corridor with acceptable operations in both the interim 2031 and ultimate 2041 Future Conditions along the mainline and at the ramp terminals under the recommended cross-sections and lane configurations (AECOM, 2023c).

3.5.5.9. Neighbourhood resources

Health Linkages

Effective highway infrastructure and reliable public transit can positively impact neighbourhood resources by increasing accessibility and the reliability of trucking and businesses. As indicated above in Section 3.5.5.7, traffic congestion can negatively impact businesses and in return, neighbourhood resources. Conversely, transportation infrastructure (especially affordable infrastructure such as public transit) that improves connectivity within and between neighbourhoods/communities, will improve access of residents to resources within those neighbourhoods and communities, and provide more choice in resources.

3.5.5.10. Access to local healthy food sources

Health Linkages

The availability of healthy foods (e.g., fresh fruits and vegetables, lean protein sources, etc.) and the ability to access those foods can influence individuals and households to lead a healthy and productive lifestyle (Pinstруп-Andersen & Pandya-Lorch, 2018). Having access to healthy and affordable foods is an indicator of health as it can be associated with food insecurity, and unhealthy eating habits which can lead to health issues (Wright et al. 2016). Areas or communities which are low-income or lack healthy food sources are often related to indicators of access (US Department of Agriculture, 2022). Access to healthy food sources can also be improved by having access to affordable and well-connected transportation infrastructure, such as public transit, active transportation, and multi-modal corridors. In addition, well-connected transportation corridors (such as highways) can also support local and regional food distribution systems (Rodrigue, 2020).

3.6. Conclusions from the HHI Scoping Phase

The HHI Scoping Phase identified broad human health implications as a result of the Project, provided a high-level baseline health profile of the Study Area, and summarized information from the Air Quality Impact Assessment, Traffic and Noise Assessment Reports.

The Baseline Health Profile of the LSA suggests that:

- Overall the municipalities in the LSA have a lower percentage of visible minorities compared to Ontario (except Regional Municipality of York), and a lower percentage of First Nation peoples (except Simcoe County) compared to Ontario as a whole.
- For all the Indigenous communities included in this assessment with whom the Ministry has a Duty to Consult, there is a greater percentage of registered First Nations individuals residing off reserve rather than on their own or on other reserves.
- Compared to other municipalities, Simcoe County has a higher percentage of the population above 65 years of age, indicating a higher need for services and resources for this age group.
- Compared to Ontario as a whole, households within municipalities in the LSA have a higher median income. Additionally, when comparing to households within Indigenous communities whom the Ministry has a Duty to Consult, the municipalities in the LSA have considerably higher incomes.
- Overall, the municipalities within the LSA have lower unemployment rates and higher employment participation rates when compared to Ontario as a whole.
- The municipalities within the LSA generally have a higher percentage of individuals who own their homes, as opposed to renting when compared to Ontario. Although there is a higher number of homeowners, there is also a higher percentage of people spending greater than 30% or more of their income on shelter compared to Ontario as a whole.
- Information related to the overall burden of disease for Indigenous communities was available at the level of all First Nations in Ontario, and for municipalities it was available at the level of the regional health unit. This data indicates that First Nations in Ontario have the highest burden of disease for all illnesses including, arthritis, diabetes, asthma, and high blood pressure when compared to Simcoe Muskoka District Health Unit, York Regional Health Unit and Ontario as a whole. The only exception to this trend is for mood disorders², for which the percentage of the population experiencing mood disorders is the highest in the Simcoe Muskoka District Health Unit.
- Compared to Simcoe Muskoka District Health Unit, York Regional Health Unit and Ontario as a whole, Indigenous communities in Ontario have the highest rate of adults self-reporting as obese.
- When considering transportation, commuting and the use of public transit, the municipalities in the LSA have a higher percentage of people who utilize cars, trucks, or vans as their primary mode of transportation to commute, and a lower percentage of those who use public transit to commute when compared to Ontario as a whole.

Although an SLHHRA of potential human health impacts has not been conducted, the Final Air Quality Impact Assessment showed that the addition of the proposed infrastructure will have a lower impact on the sensitive and critical receptors within the Study Area in comparison to Existing Conditions for most contaminants, and a varied impact in comparison to Future No-Build Conditions, depending on where a

² Population aged 12 and over who reported that they have been diagnosed by a health professional as having a mood disorder, such as depression, bipolar disorder, mania or dysthymia (Statistics Canada, 2021).

receptor is located along the route (AECOM, 2023a). Regarding sensitive receptors and air quality, the Air Quality Impact Assessment also identified that:

- 160 sensitive receptor's locations have been identified (i.e., permanent residences), 20 critical receptor locations have been identified, and 11 "Possible Future sensitive Receptor" locations have been identified.

If conducted, potential contaminants of concern that would be carried forward into the SLHHRA for assessment include CO, NO₂, PM_{2.5}, PM₁₀, SO₂, Acetaldehyde, Acrolein, Butadiene (1,3-), Benzene, Benzo(a)pyrene, and Formaldehyde.

The 'Travel Demand Forecast and Future Conditions 2031 / 2041 Aimsun Microsimulation Model Analysis', concluded that overall, the traffic operations analysis of the Bradford Bypass using the Aimsun microsimulation model indicated a well performing corridor with acceptable operations in both the interim 2031 and ultimate 2041 Future Conditions along the mainline and at the ramp terminals under the recommended cross-sections and lane configurations (AECOM, 2023c). As such, based on a scenario with an increased posted speed limit of 110 km/hr, there would be slight increases in traffic volume demand along the corridor, but the corridor would still maintain acceptable operating speeds and performance of interchange ramps and intersection (AECOM, 2023c).

The Noise Impact Assessment Report proposed two locations for possible noise attenuation locations for the Bradford Bypass Project, and that noise mitigation investigation is required for various locations (AECOM, 2023b). The Noise Impact Assessment Report also proposed mitigations to combat noise throughout the duration of construction of the Project.

The main determinants of health scoped into the HHI Scoping Study for this Project, based on all feedback received on human health impacts are: air quality & climate change, noise levels & vibrations, addition of active transportation elements & physical activity, mental health & wellbeing, employment, social cohesion, traffic congestion & delay, traffic-related safety, neighbourhood resources, and access to local healthy food sources. During the Scoping Phase, a short synopsis for each of these determinants of health was provided, identifying the health linkages between these determinants of health and transportation infrastructure similar to the Project.

A key take away based on the scoping-level assessment conducted thus far is that as the population within the Study Area and within Ontario continues to grow, new transportation infrastructure will help move residents and Ontarians. To reduce congestion and mitigate impacts to air quality and climate change, an important aspect of this transportation infrastructure should be the inclusion of multi-modal corridors that prioritize public transit and safe active transportation along roadways and highways. Planning and allowing for multiple modes of transportation can provide multifaceted benefits to those residing within these areas and within the Greater Golden Horseshoe area.

To better understand the human health implications due to the Project as a next step, it is recommended for MTO to continue to consider the human health factors identified in this report and provide recommendations to enhance potential positive impacts and mitigate potential negative health impacts. Specifically, conducting an SLHHRA of potential air quality impacts is recommended in order to evaluate and characterize Project-related air quality impacts to health.

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