Peel Region
working with you

Brampton Mobility Plan HEAT Analysis

Key Messages

Evidence suggests that investing in active transportation infrastructure supports an increase in physical activity and improves road safety, which can prevent premature mortality and have significant societal and economic value.

A health economic assessment[1] was conducted by Peel Public Health to estimate[2] the potential health impacts and economic value[3] of three alternatives within the Brampton Mobility Plan, which aims to increase active transportation mode share and improve road safety.

The results[4] of the health economic assessment suggest:

- The ***Bold Moves scenario*** is considered the most preferred alternative where the achievement of its mode share targets resulted in an estimated 3.7-4 premature deaths prevented per year and an associated economic value of $24.4M-$25.8M per year.
- The ***Brampton Plan scenario*** is considered a preferred alternative where the achievement of its mode share targets resulted in an estimated 3.5-3.7 premature deaths prevented per year and an associated economic value of $22.5M-$23.7M per year.
- The ***As-Is scenario***, which reflects no further investments to active transportation infrastructure and assumes no change to mode share or walking/cycling fatality rates, did not result in any premature deaths prevented. Instead, the analysis resulted in an overall negative economic value associated with additional premature mortality.

[1] The analysis uses the World Health Organization's "Health Economic Assessment Tool for Walking and Cycling" which is an evidence-based tool, representing international standards with input from an expert panel.
[2] The analysis is limited to assessing mortality/fatality impacts of physical activity and crash risk among Brampton residents (age 20-64/74) and is based on several assumptions.
[3] The economic value is based on a Canadian specific "Value of Statistical Life" estimate from 2007.
[4] Disclaimer: HEAT does not calculate risk reductions for individual persons but an average across the population under study.

Background

The City of Brampton is updating its Master Transportation Plan. The revised Brampton Mobility Plan (BMP) will guide the City's investment in transportation infrastructure to support future growth to the 2051 horizon, working towards the City's vision of being "a mosaic of safe integrated transportation choices and new modes, contributing to civic sustainability, and emphasizing walking, cycling, and transit". One of the BMP's guiding principles is to protect public health and safety by enhancing the well-being of the community and improving road safety. These objectives align with public health efforts to reduce chronic disease, prevent injury, and enhance health equity. In line with this, evidence suggests that improvements to active transportation (AT) infrastructure and access to a connected AT network can contribute to an increase in physical activity and reduce injuries/fatalities for vulnerable road users.

Purpose

A health economic assessment was conducted by the Peel Public Health - Built Environment Team to compare three proposed alternatives within the BMP in terms of health outcomes and associated economic value based on a value of statistical life. The mode share targets associated with each alternative were used to compare health impacts (premature mortality) of walking and cycling in terms of physical activity and crash risk.

Description of Analysis

The analysis was conducted using the World Health Organization's Health Economic Assessment Tool (HEAT) for Walking and Cycling, a web-based tool used to estimate health and societal economic impacts of increased walking and cycling. Overall, the HEAT applies a comparative risk assessment approach, where the difference in premature mortality is calculated between a reference case and comparison case. These effects are quantified as relative risks (RR), comparing the risk among people who walk or cycle with the risk among people who do not. The HEAT analysis focused on physical activity and crash risk outcomes in alignment with the BMP's aim to increase AT and improve road safety.

The general parameters of the analysis were limited to mortality outcomes related to physical activity and crash risk for transportation-related walking and cycling among adults (ages 20-74 for walking, ages 20-64 for cycling) residing in Brampton. The three BMP scenarios being compared were:

- ***As-Is:*** This scenario provides a baseline for comparison.
- ***Brampton Plan***: This scenario represents the City's new official plan that recognized limited opportunities to expand the road network and places more emphasis on sustainable modes such as transit, walking and cycling.
- ***Bold Moves:*** This scenario represents significant investment in higher order transit, complete streets, active transportation, and emerging mobility technologies.

A total of 18 simulations were completed, using the mode share targets associated with each of the three scenarios. For each scenario, a sensitivity analysis was completed for three road safety and two population growth estimates.

Mode Share Scenarios

Change in physical activity was estimated by comparing the baseline walking and cycling mode share (2016) to the 2051 mode share targets for each alternative. Since BMP mode share targets were based on AM peak period mode share and reflected the entire population, relative data from 2016 was used to convert to estimate age-standardized rates and total trips over a 24-hour period (see Table 1). This assumes that the relative relationship between 2016 AM peak trips and total trips over 24 hours can be applied to 2050, and that age distribution in 2050 will be the same as in 2016. Data from 2016 suggest that walking and cycling mode share is lower among adults compared to children and seniors, and across a 24hr period compared to AM peak period.

Table 1. BMP Alternative Scenarios and Mode Share Conversions

	Baseline – Target Walking Mode Share		Baseline – Target Cycling Mode Share	
Scenario	Entire Population, AM Peak Period	Ages 20-74, 24hr period	Entire Population, AM peak period	Ages 20-64, 24hr period
1. As-Is	7.53% - 7.53%	2.06% - 2.06%	0.56% - 0.56%	0.24%- 0.24%
2. Brampton Plan	7.53% - 8%	2.06% - 2.19%	0.56% - 3%	0.24%- 1.27%
3. Bold Moves	7.53% - 8.5%	2.06% - 2.32%	0.56% - 4%	0.24%- 1.69%

Sensitivity Analysis

Population Growth Projections

A sensitivity analysis was conducted for each scenario using general and high growth population growth projections for 2051. The general population growth forecasts are a conservative estimate, whereas the high growth forecasts used in the BMP are for capacity planning.

Crash Risk

A sensitivity analysis was conducted for each scenario to determine a range of results depending on potential changes to crash risk over time. A 50% reduction in exposure-based walking and cycling fatality rates is reasonable and in line with current road safety trends.

- High fatality rate = fatality rates remain the same as 2016 rates
- Moderate fatality rate = a 50% reduction in the 2016 fatality rates
- Low fatality rate = fatality rate of 0 assuming Vision Zero objectives are met

Data Inputs

Brampton-specific data inputs were included wherever possible (see Table 2). In general, the most recent Transportation Tomorrow Survey (TTS, 2016) provided baseline travel data and the BMP outlined future mode share targets.

Table 2. HEAT (Version 5.3.0) Data Inputs & Assumptions

Category	Option Selected			
User Interface Options	Flexible User Interface			
Active Travel Modes	Walking, Cycling			
Geographic Level	City (Brampton)			
Local Traffic Conditions	Global urban average			
General Adjustments & Active Travel Characteristics	Proportion excluded: 0 Temporal and spatial adjustment: 0 Take-up time for AT demand: 10 years Substitution of physical activity: 0			
Other Default Values (not customizable)	Build up period: 5 years Relative Risk (RR) for mortality (bike) 0.90 Relative Risk (RR) for mortality (walking) 0.89			
Category	**Option Selected**	**Data Inputs**	**Source**	**Assumptions & Other Notes**
One or Two Cases	Two Cases	Reference Year: 2016 Comparison Year: 2050 Total Years: 34		HEAT is currently limited to assessments up to the year 2050
Impacts to Consider	Physical Activity Crash Risk			Air pollution and carbon emission components excluded
Reference Case: Walking and Cycling Data Data Source: Unit: Age range of the assessment population:	Population Survey Mode share Walking: 20-74 Cycling: 20-64	**Trips per person/day all modes** Age 20-74: 2.08 Age 20-64 = 2.17 **Walking:** Avg trip length: 0.9km Mode Share: 2.06% **Cycling:** Avg Trip Length:3.6km Mode Share: 0.24%	TTS, 2016	TTS Trip data reflects walking and cycling for transportation and not for recreational purposes
Comparison Case: Walking and Cycling Data Data Source: Unit: Age range of the assessment population:	Hypothetical Mode share Walking: 20-74 Cycling: 20-64	**1, AS IS Scenario** Walking: 2.06% Cycling: 0.24% **2. Brampton Plan Scenario** Walking: 2.19% Cycling:1.27% **3. Bold Moves Scenario** Walking: 2.32% Cycling: 1.69%	Estimated based on BMP mode share targets	Assumes: • population distribution remains the same in comparison case as it was in reference case • mode share targets are achieved • TTS mode share and trip sampling data is reflective of the Brampton population • trips per day for all modes and trip distance doesn't change over time
Population size for reference case Population size for comparison case		**2016 Total:** 538,640 Age 20-74 (75.43%) = 406,295 Age 20-64 (67.63%) = 364,282 **2050 (sensitivity analysis)** Age 20-74 (75.43%) = 743,029-814,642 Age 20-64 (67.63%) = 666,238-730,450	Census, 2016 Brampton GeoHub, 2016 & BMP	Assumes: • population distribution remains the same 2016-2050 • 2051 population growth forecasts can be used as a proxy for 2050 2050 population range reflects general – high growth population forecasts
All cause mortality rates for reference & comparison	Default	Walking: 386 Cycling: 225	WHO	Assumes mortality rate remains the same in reference and comparison case
Fatality rates for crashes (traffic crashes involving pedestrians and cyclists)		**Walking Fatality rate** 2016:76.9 /100M km 2050 Sensitivity Analysis: AS IS = 76.9/100M km Moderate=38.5/100M km Low = 0 /100M km	OMD, 2014-2016	Avg fatality rate based on rolling average 2014-2016 for baseline Sensitivity analysis estimates a possible range in crash risk rates from high (as-is), moderate (50% reduction), low (vision zero) fatality

		Cycling Fatality rate 2016: 27.41 / 100M km 2050 Sensitivity Analysis: As-Is = 27.41 /100M km Moderate=13.7/100M km Low = 0 /100M km		Fatality rate reflects an exposure-based fatality rate (# fatality by mode per 100M km travelled)
Other:	Local currency	VSL: $6.5million CAD Discount rate: 2.85% Inflation rate: 2.91%	Gov. of Canada, 2007 Bank of Canada, 2024	The Value of statistical life (VSL) is derived from the method called "willingness to pay" assessment and represents the average societal economic value of reduced premature mortality

Results

In general, findings from this analysis suggest overall population-level health benefits increase with higher walking and cycling moder share, if walking and cycling fatality rates are reduced by 50% or greater (moderate fatality rate from the sensitivity analysis). Both health and economic benefits increase considerably with improvements to road safety beyond a 50% reduction in fatalities and towards Vision Zero. Without improvements to current walking and cycling fatality rates, the analysis suggests there could be a net negative economic value associated with premature deaths. The range of results across all scenarios and sensitivity analyses are presented below in Table 3.

Table 3. Results including Sensitivity Analysis (HEAT version 5.3 - conducted Nov. 14, 2024)

Fatality Rates:	**High Fatality Rate**		**Moderate Fatality Rate**		**Low Fatality Rate**	
Population Growth Projections:	General	High Growth	General	High Growth	General	High Growth
Scenario 1: As-Is (Change in physical activity = represents 0 mins per person /day)						
Premature deaths prevented /yr Economic value/yr	**-1.2** **-$7.63M**	**-1.4** **-$9.25M**	2.9 $18.6M	3 $19.5M	6.9 $44.8M	7.4 $48.2M
Scenario 2: Brampton Plan (Change in physical activity = represents 0.4 mins per person /day)						
Premature deaths prevented /yr Economic value/yr	-3.1 -$20.3M	-3.5 -$22.7	**3.5** **$22.5M**	**3.7** **$23.7M**	10 $65.2M	11 $70.6M
Scenario 3: Bold Moves (Change in physical activity = represents 0.5 mins per person /day)						
Premature deaths prevented /yr Economic value/yr	-4 -$26M	-4.5 -$29.4M	**3.7** **$24.4M**	**4** **$25.8M**	11 $74.7M	12 $81M
Note - **bolded** results represent the specific alternative scenarios from a health and safety perspective compared in table 4. Disclaimer – HEAT does not calculate risk reductions for individual persons but an average across the population under study.						

The following three specific scenarios were chosen to represent the alternatives for comparison in the BMP evaluation (see Table 4). The *As-Is* alternative with no change to walking/cycling mode share or fatality rates represents a baseline for comparison. Taking a conservative approach, the general population growth projections and the moderate fatality rate were chosen as the specific *Brampton Plan* and *Bold Moves* alternatives for comparison. Although, evidence suggests higher investments in safe AT infrastructure (as proposed in the *Bold Moves* scenario) could result in additional road safety improvements for vulnerable road users. Overall, the *Brampton Plan* and *Bold Moves* were the top two preferred alternatives. Whereas the *As-Is* alternative was least preferred.

Table 4. Comparison of BMP Alternatives

Alternatives	Description & Assumptions	Evaluation

As-Is	This scenario provides a baseline for comparison. • no change in walking/cycling mode share or fatality rates	◯ **Least Preferred** No premature deaths prevented, and a **negative economic value** associated with premature mortality.
Brampton Plan	This scenario represents direction from the City's new official plan that recognized limited opportunities to expand the road network and places more emphasis on sustainable modes such as transit, walking and cycling. • moderate increases in walking and cycling mode share, aligning with an overall 35% sustainable mode share target. • moderate improvements to road safety, a 50% reduction in walking/cycling fatalities.	◯ **Preferred** Physical activity benefits would outweigh crash risk and result in the overall prevention of premature deaths (3.5-3.7 per year), along with a **positive economic value** of $22.5M-$23.7M per year. These results could be greater with further improvements to road safety.
Bold Moves	This scenario represents significant investment in higher order transit, complete streets, active transportation, and emerging mobility technologies. • moderate increases in walking and cycling mode share, aligning with an overall 45% sustainable mode share target. • moderate improvements to road safety, a 50% reduction in walking/cycling fatalities.	◯ **Most Preferred** Physical activity benefits would outweigh crash risk and result in the greatest overall prevention of premature deaths (3.7-4 per year), along with a **positive economic value** of $24.4M-$25.8M per year. These results could be greater with further improvements to road safety.

Limitations

HEAT-Specific Limitations:
• VSL does not assign a value to the life of one particular person but refers to an average value of a "statistical life".
• Applicable to adults only (ages 20-74 for walking, 20-64 for cycling).
• Focuses on all-cause mortality; excludes morbidity, changes to traffic conditions, crash injuries, or other physical activities.
• Results may be confounded by factors like leisure activities, transportation choices, and environmental conditions.
• Offers population-level estimates; does not adjust for individual's walking/cycling intensity.
• Active transportation take-up time is limited to 10 years.
• HEAT provides an approximation of the order of magnitude of the impacts.
TTS Data Limitations:
• Relies on self-reported data (e.g., TTS mode share data for Brampton).
• Only 50% of households were surveyed, limiting overall participation.
• Survey administered spring and fall and captures a 24-hour period, which may/may not reflect long-term travel habits and have potential seasonal biases.
Simulation-Specific Limitations:
• BMP mode share data was adjusted to better reflect adult populations (ages 20-74 for walking and ages 20-64 for cycling), though variations in travel across age groups may affect results.
• Simulation focused on the impacts of physical activity and crash risk for walkers and cyclists; carbon emissions and air pollution components were not included.
• Analysis was limited to physical activity and crash risk components. Air pollution and carbon emissions components were excluded. However, when air pollution is excluded, the RR in HEAT is adjusted to reflect the small amounts of air pollution present in the studies used to determine RR.

Summary

Evidence suggests that investing in active transportation infrastructure supports an increase in physical activity and improves road safety, which can prevent premature mortality and have significant societal and economic value.

A health economic assessment[5] was conducted by Peel Public Health to estimate[6] the potential health impacts and economic value[7] of three alternatives within the Brampton Mobility Plan, which aims to increase active transportation mode share and improve road safety.

The results[8] of the health economic assessment suggest:

- The ***Bold Moves scenario*** is considered the most preferred alternative where the achievement of its mode share targets resulted in an estimated 3.7-4 premature deaths prevented per year and an associated economic value of $24.4M-$25.8M per year.
- The ***Brampton Plan scenario*** is considered a preferred alternative where the achievement of its mode share targets resulted in an estimated 3.5-3.7 premature deaths prevented per year and an associated economic value of $22.5M-$23.7M per year.
- The ***As-Is scenario***, which reflects no further investments to active transportation infrastructure and assumes no change to mode share or walking/cycling fatality rates, did not result in any premature deaths prevented. Instead, the analysis resulted in an overall negative economic value associated with additional premature mortality.

[5] The analysis uses the World Health Organization's "Health Economic Assessment Tool for Walking and Cycling" which is an evidence-based tool, representing international standards with input from an expert panel.

[6] The analysis is limited to assessing mortality/fatality impacts of physical activity and crash risk among Brampton residents (age 20-64/74) and is based on several assumptions.

[7] The economic value is based on a Canadian specific "Value of Statistical Life" estimate from 2007.

[8] Disclaimer: HEAT does not calculate risk reductions for individual persons but an average across the population under study.