

# Multiple Sclerosis

Brain Health in Ontario Project



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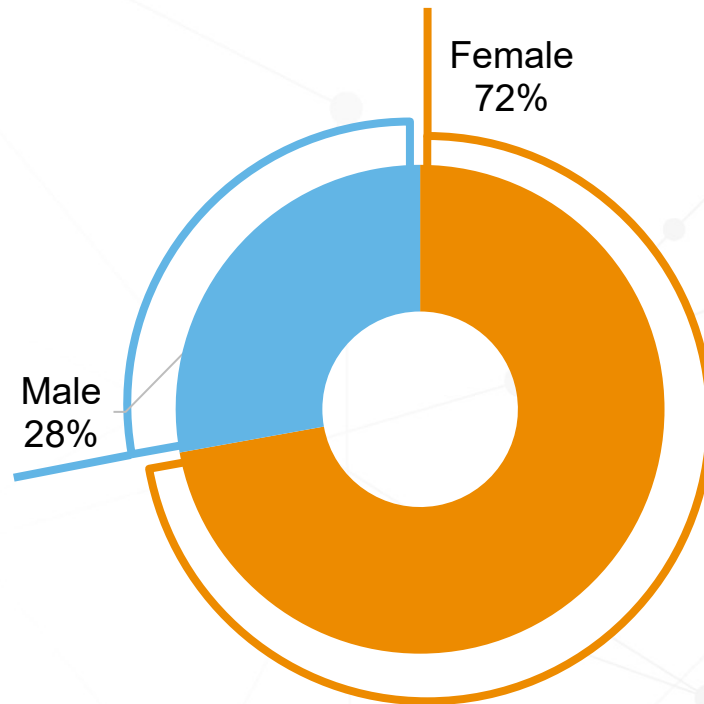
WELCOME TO BRAIN CENTRAL



# Multiple Sclerosis

- Multiple sclerosis is considered to be an immune-mediated disease of the central nervous system. The disease affects the protective covering of the nerve (myelin) and damages the nerve fibers (axons). The result may be a wide variety of symptoms, depending on what parts of the central nervous system are affected.
- The cause of multiple sclerosis remains unknown. However, it is considered to be a complex disease in which one or more environmental factors act together in a genetically susceptible individual to cause disease. The genetic factors most consistently associated with multiple sclerosis involve the HLA allele. Environmental factors of particular interest include Epstein-Barr virus infection, vitamin D insufficiency, smoking and obesity.
- Multiple sclerosis is the most common non-traumatic cause of disability in young adults. Most affected individuals present with symptoms between the ages of 20 and 40 years. Women are affected nearly three times as often as men. The disease is variable from one person to another, and the ability to predict outcomes is limited.
- Most patients experience a constellation of symptoms, including weakness, sensory symptoms, bowel and bladder dysfunction, fatigue, spasticity, pain and cognitive impairment.
- Treatment involves treatment of acute relapses, use of disease-modifying therapies and chronic symptom management. While there have been major advancements in disease-modifying medications that reduce the risk of relapses and delay progression in relapsing forms of multiple sclerosis, there are currently no approved disease-modifying therapies for primary progressive multiple sclerosis.
- Multiple sclerosis adversely affects employment and social relationships, and burdens the affected individual, his or her family, the health care system and society. Quality of life is lower in persons with multiple sclerosis compared to the general population and persons with other chronic diseases.

# Demographics: Sex distribution

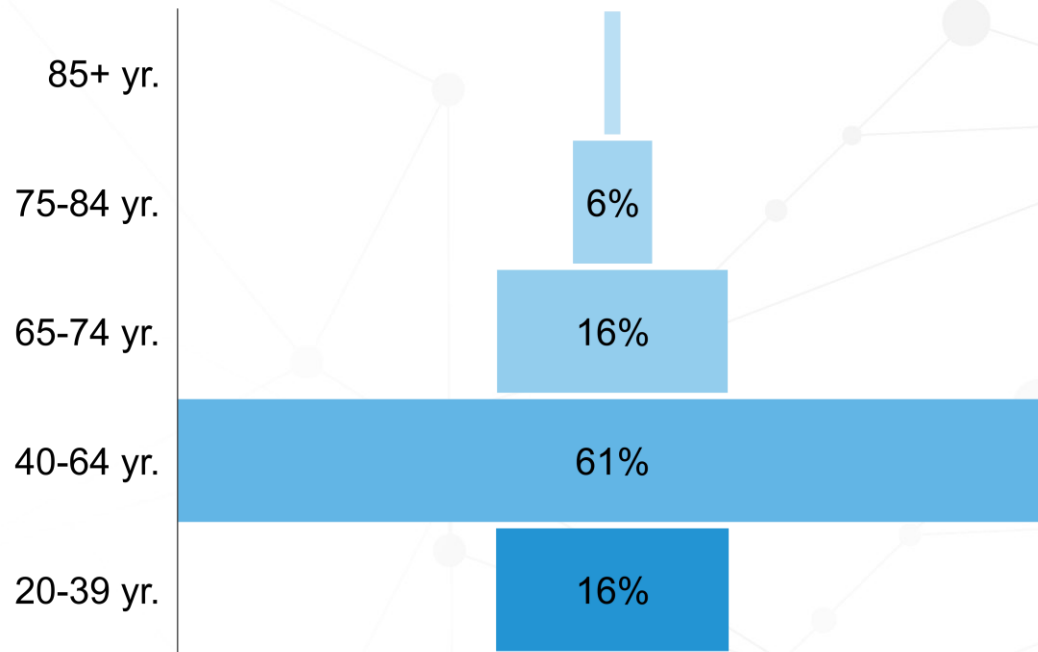


On April 1, 2019 females accounted for 72% of the 31,470 Ontarians identified with multiple sclerosis.

\*Note, years represent the fiscal year. For example, 2019 is from April 1, 2019 to March 31, 2020.



# Demographics: Age distribution

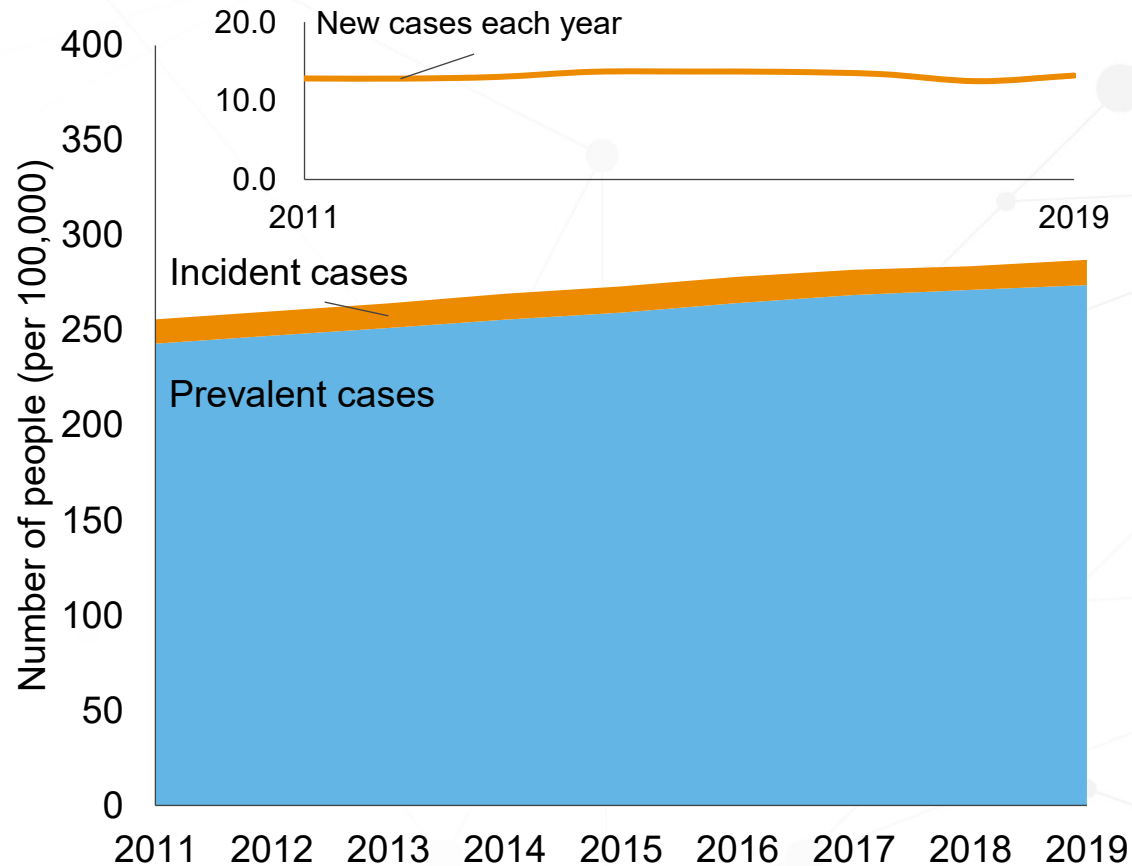


On April 1, 2019 the majority of people with multiple sclerosis were between the ages of 40 and 64 years, with 77% of people being under the age of 65. The mean age of a person with multiple sclerosis was  $54 \pm 14$  years.

\*Note, years represent the fiscal year. For example, 2019 is from April 1, 2019 to March 31, 2020.



# Prevalence and incidence over time



Incidence is the number of people newly diagnosed with a disorder within a given time period while prevalence is the number of people existing with the disorder at a given time.

The incidence and prevalence of Ontarians with multiple sclerosis are depicted in orange and blue, respectively. Between 2011 and 2019, incidence changed from 12.84 to 13.21 per 100,000 people and prevalence increased from 243.03 to 273.86 per 100,000 people.

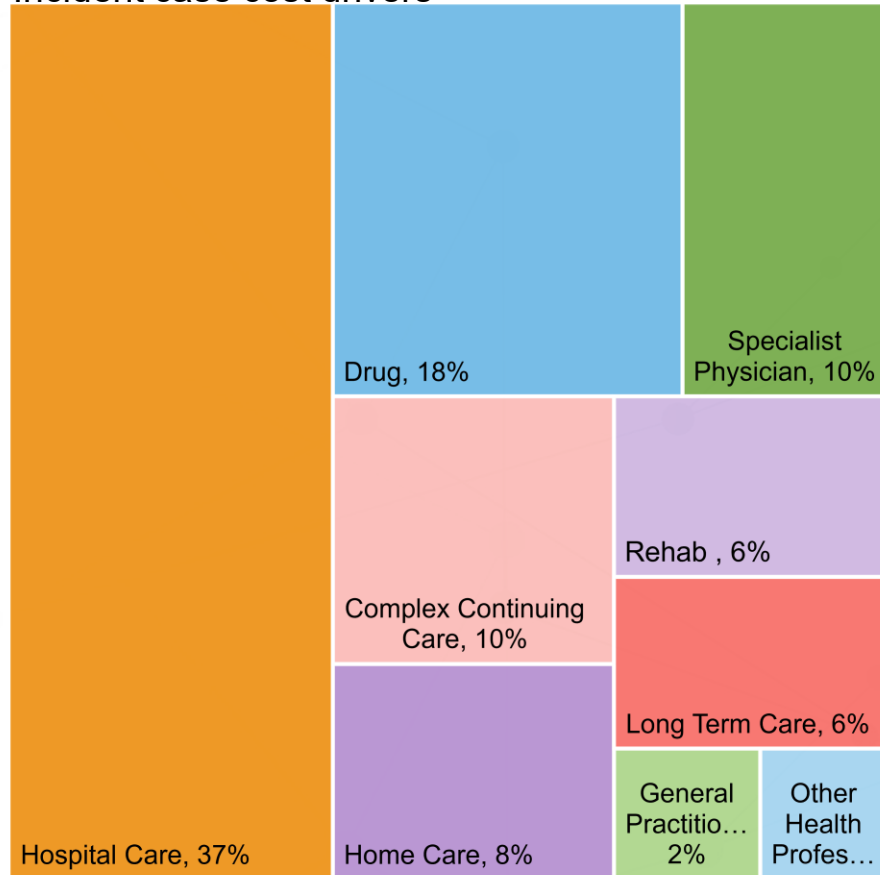
In total, the number of people with multiple sclerosis increased from 24,843 in 2011 to 31,470 people in 2019.

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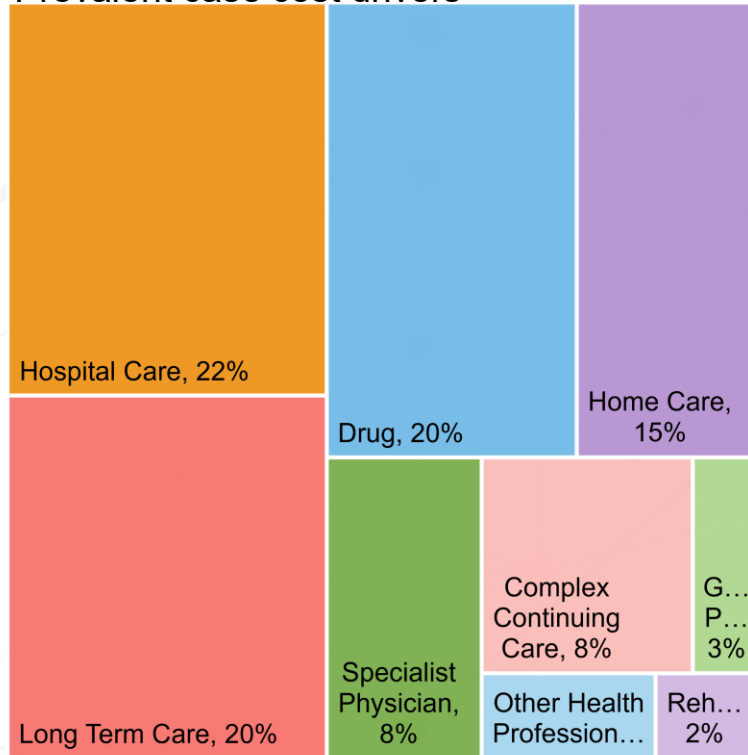


# Cost Drivers: Incident vs. prevalent

Incident case cost drivers



Prevalent case cost drivers



- General Practitioner
- Specialist Physician
- Other Health Professional
- Hospital Care
- Drug
- Rehab
- Home Care
- Complex Continuing Care
- Long Term Care

\*Cost drivers examined include: Hospital care, home care, general practitioner, specialist physician, other health professional, drug cost, rehab, complex continuing care, and long term care.



# Cost Drivers: Incident vs. prevalent

In 2019, the average total cost to the health system for an Ontarian with multiple sclerosis was 1.3X more for an incident case than a prevalent case. Cost relationship is indicated by total box size. The largest cost driver of incident cases was attributable to hospital care (37%), while hospital care (22%) and long term care (20%) had the highest costs for prevalent cases.

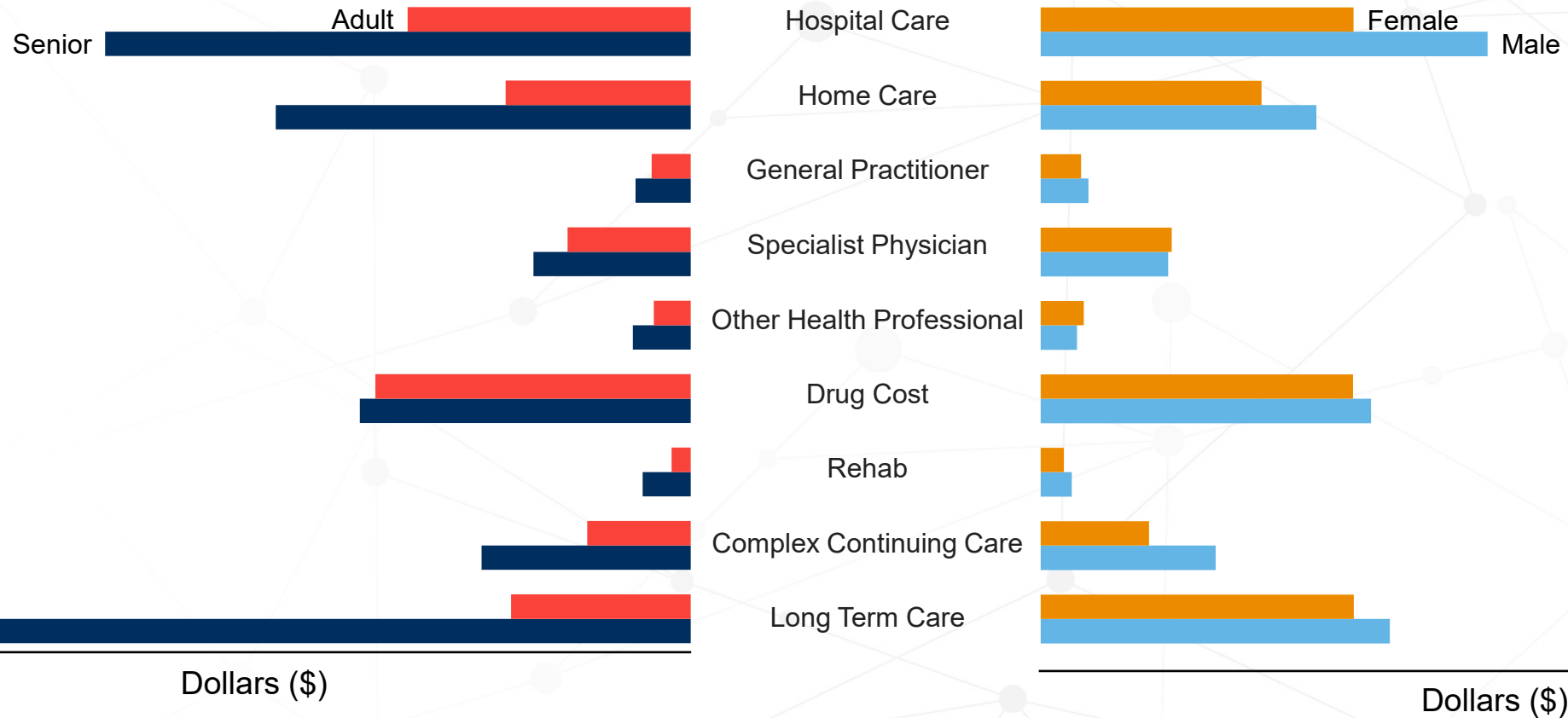
The average total health care costs for a person with multiple sclerosis (prevalent case) for 1 year are 5X higher for adults and 2X higher for seniors compared to the average Ontarian.

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\*Cost drivers examined include: Hospital care, home care, general practitioner, specialist physician, other health professional, drug cost, rehab, complex continuing care, and long term care.



# Cost Drivers vary by age and sex for prevalent cases



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# Cost Drivers vary by age and sex for prevalent cases

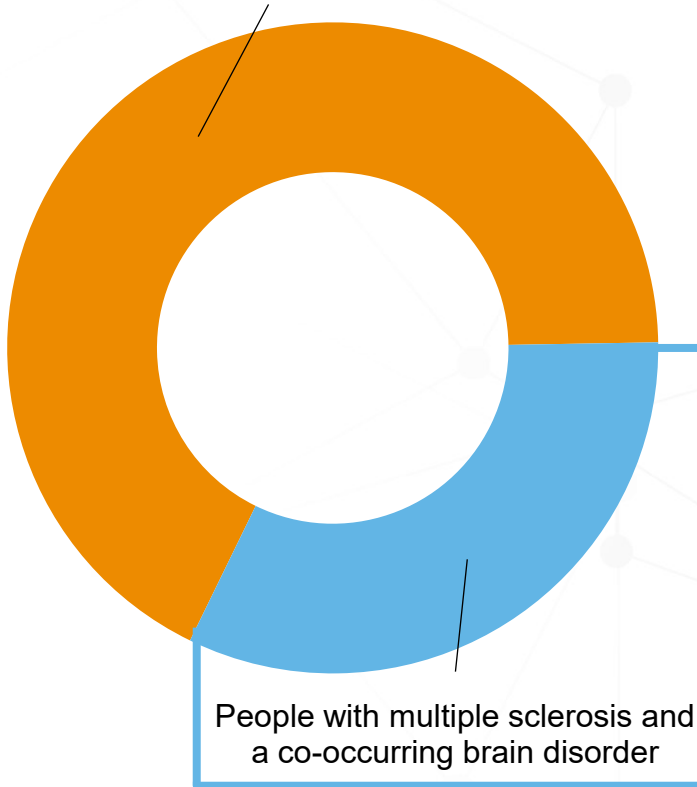
Overall, health care costs (in Canadian dollars, 2019) for people with multiple sclerosis are higher for senior (65+ years) population compared to adults (20 - 64 years) and are also higher for males than females. The cost drivers, those services that drive health care costs, vary depending on age and sex. Amongst adults, drugs and hospital care account for the largest cost drivers at 25% and 22% of all costs respectively, while in seniors long term care and hospital care account for the largest cost drivers at 30% and 22% respectively. Hospital care is the largest cost driver in males representing 25% health care costs while long term care and hospital care drive female costs at 21% each.

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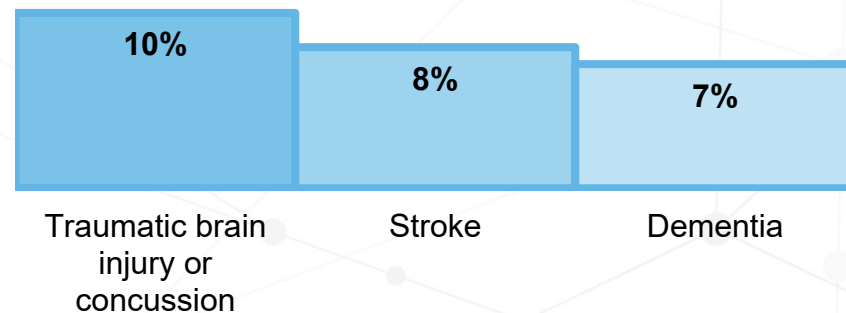
# Co-occurring brain disorders

People with multiple sclerosis alone



Of those individuals who were identified as having multiple sclerosis between 2011 and 2019, 32% (blue) were also identified as having one of the other 12 brain disorders studied using health administrative data. Traumatic brain injury or concussion was the top co-occurring brain disorder, with 10% of those with brain injury also having multiple sclerosis, followed by 8% having had a stroke, and 7% having dementia.

The most common co-occurring brain disorders are:

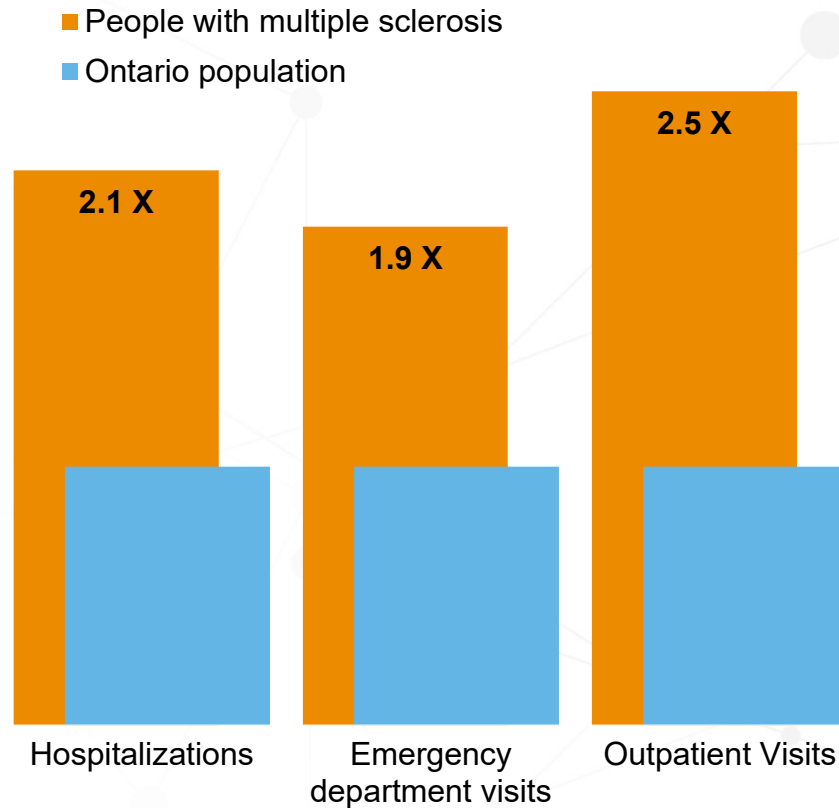


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\*Note, other brain disorders studied include: non-malignant brain tumour, benign brain tumour, dementia (incl. Alzheimer's disease), epilepsy, motor neuron disease, multiple sclerosis, parkinsonism, schizophrenia, spina bifida, spinal cord injury, stroke, and traumatic brain injury & concussion.



# Mental Health and addictions service use



Of those individuals who were identified as having multiple sclerosis in 2019, their visit rates for mental health and addictions related services were between 1.9X to 2.5X greater than the general Ontario population, depending on visit type.

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# Additional study information

Brain Disorder	Evidence Grade	Reference	Algorithm	ICD-09 (CM) codes	ICD-10 codes	OHIP Dx codes	ODB drugs name	OMHRS codes	Age Restriction
Multiple sclerosis	I	Validated algorithm	1 hospitalization record <u>or</u> 5 physician claim records in a 2-year period	340	G35	340	N/A	N/A	20 years and older

Brain health in Ontario project main page: [www.braininstitute.ca/BrainHealth](http://www.braininstitute.ca/BrainHealth)  
Methods and Considerations: [www.braininstitute.ca/brainhealth-methodology](http://www.braininstitute.ca/brainhealth-methodology)



# Publication information

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