

**Addendum to the cost of
vision loss and blindness
in Canada**

The impact of COVID-19

Canadian Council of the Blind
August 2021

Acknowledgement

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Glossary

| Acronym | Full name |
|----------------|---|
| AMD | Age related macular degeneration |
| CCB | Canadian Council of the Blind |
| CIHI | Canadian Institute for Health Information |
| COVID-19 | Coronavirus disease 2019 |
| UK | United Kingdom |
| VEGF | Vascular endothelial growth factor |
| VL | Vision loss |

Executive summary

Background

The emergence and expansion of the COVID-19 (coronavirus disease 2019) pandemic has had an enormous impact on health systems and care around the globe. This extends to ophthalmic surgeries and services in Canada, which saw a reduction in 2020.

Data from the Canadian Institute for Health Information (CIHI) showed that there were 335,000 fewer surgeries of all types between March and June of 2020, compared to the same period in 2019.¹ This amounts to a 47% decrease in all surgeries across Canada, including surgeries for cataracts, glaucoma, retinal diseases, and other diseases with the potential to lead to vision loss.

Recognizing the likely implications of this reduction for Canadian patients and society, this report estimates the change in costs for vision loss and blindness (collectively referred to as “VL” throughout this report) and the impact of both delayed and missed treatments due to the pandemic. To successfully prepare for ophthalmic care needs in Canada in the coming months and years, it is essential to better understand the broader clinical, health system, and economic impacts of the pandemic.

The estimated costs in the report reflect the impact of COVID-19 from March to December of 2020, highlighting aggregated, pan-Canadian effects resulting from:

- A reduction in the utilization of health services in 2020, which led to a reduction in costs overall. These are quantified for inpatient hospitalizations, day surgeries, pharmaceutical claims, as well as ophthalmologist and optometrist visits.
- Delays in the provision of specialist care and surgical interventions, including those for cataract surgery as well as anti-vascular endothelial growth factor (VEGF) injections for age-related macular degeneration (AMD), diabetic retinopathy, and other eye conditions.

- A reduction in routine follow up visits and prescriptions for patients, including a reduction in anti-glaucoma medications and supplements to reduce the progression of AMD.
- A reduction in new diagnoses and referrals to eye specialists.

Findings

Reductions across these various ophthalmic services reduced the overall cost of VL to the healthcare system by \$730 million in 2020.

It is important to recognize, however, that this reduction may have serious and ongoing implications in the coming years, for major eye conditions such as cataract, glaucoma, AMD, and diabetic retinopathy.

This report presents evidence that provides a sense of what these impacts may look like. For instance, an estimated 1,437 people lost vision due to delayed eye examinations and treatments in 2020. Given the average annual cost of VL is \$27,250 per person, delayed examinations and treatments mean that the incremental costs of VL may be \$39.1 million higher each year compared to pre-pandemic costs. Canadian ophthalmologists have reported that the overall quality of care for their patients has been negatively impacted in a number of ways, but mainly as a result of increased wait times for sight-saving procedures, suggesting these findings are likely true.²

The backlog of services is likely to continue to impose significant costs for individuals living with sight-threatening eye conditions. In part, these costs will increase due to an increased risk of falls while patients wait for services, but also because they have a reduced quality of life while waiting. The additional economic cost of VL due to COVID-19 is estimated to be \$1.4 billion between 2021 and 2023.

The key findings are summarized as follows:

- The additional wait time (due to the underutilization of health services in 2020) for eye surgeries is expected to impose incremental costs of \$1.3 billion between 2021 and 2023. Of these costs, there is a \$253 million increase in

healthcare costs, productivity losses and other financial costs, and a \$1.05 billion cost from reduced wellbeing.ⁱ

- The cost of not receiving care is expected to impose incremental costs of \$71.8 million between 2021 and 2023.
- The cost of delayed care is expected to impose incremental costs of \$45.7 million between 2021 and 2023.
- The cost of VL to the Canadian health system declined by \$730 million in 2020 due to underutilization (a 47% decrease in surgeries, for instance).
- It is estimated that 1,437 patients have lost vision as a result of COVID-19. Of these, 879 patients lost vision due to delayed eye exams and 558 due to reduced interventions.
- Wait times for ophthalmic surgeries increased by 31 days as a result of the pandemic, with 143,000 necessary eye surgeries missed or delayed in 2020.
- It is expected it will take two years to clear the additional backlog of ophthalmic surgeries caused by the pandemic.

COVID-19 continues to challenge the Canadian healthcare system, resulting in impacts for thousands of patients. The full extent of reduced ophthalmic care is still unclear. Continued data collection, analysis and research are necessary to assess the longer-term impact of the pandemic on the eye health of Canadians. As the pandemic continues to unfold and the disruption to care persists, further challenges lie ahead for Canadians living with VL. It is only by studying the implications of COVID-19 on VL that it will be possible to inform and design appropriate measures to manage the pandemic's effects on eye health over the next several years.

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ⁱ These costs are captured in the underutilization annual cost of VL (\$559.4 million)

1 Introduction

1.1 Purpose and scope of this report

The Canadian Council of the Blind (CCB) engaged Deloitte Access Economics to estimate: (1) the annual social and economic cost of VL in 2019, and (2) to estimate the potential impact of COVID-19 on VL in 2020 through 2023. The former analysis has been published in the report *'The cost of vision loss and blindness in Canada'*. In that report, the total cost of VL was estimated to be \$32.9 billion in 2019. This consisted of a total financial cost of \$15.6 billion and a lost well being cost of \$17.4 billion.³

This report is an addendum to *'The cost of vision loss and blindness in Canada'* full report, which highlights the impact of COVID-19 on the VL community, drawing on analysis of previously unpublished data sources on the utilization of health services throughout 2020. These data sources have been combined with literature on the impact of a delay on patient outcomes to estimate the impact not only on cost in 2020 but also future expected outcomes due to the COVID-19 pandemic.

The report estimates the change in healthcare system costs of VL and the impact of delayed and/or missed treatments resulting from COVID-19. The estimated costs in the report reflect the impact of COVID-19 from March to December 2020. This report presents aggregated pan-Canadian impacts.

1.2 Impact of COVID-19

The spread of the coronavirus disease 2019 (COVID-19) pandemic has led to major disruptions of routine hospital surgical procedures and services globally. Epidemiological modelling has estimated over 28 million surgical procedures were postponed or cancelled worldwide in the immediate months following the first wave of the COVID-19 pandemic.⁴ The decision to cancel elective and non-urgent surgeries has been in the interest of patient safety, preserving personal protective equipment supplies and redeploying medical staff and facilities to treat surges of patients with COVID-19.

In March 2020, all Canadian provinces and territories prepared for the surge of COVID-19 patients expected to require hospital care, which included the cancellation of planned surgeries and procedures. Early data from the CIHI revealed 335,000 fewer surgeries were performed in the period from March to June 2020, compared to the same period in the previous year.¹ This is equivalent to a 47% decrease in all surgeries performed across Canada, including ophthalmic surgeries such as cataract. There were also fewer urgent surgeries performed.⁵

It should be noted that the impact of COVID-19 on elective surgeries varies considerably across provinces. For example, in Ontario, elective surgeries and non-emergency care were cancelled in mid-March 2020 with hospitals gradually resuming elective surgeries in late May 2020. However, in response to growing hospitalization rates in the third wave of the pandemic, elective surgeries and non-emergency diagnostic procedures were again restricted in April 2021. Similarly, in the first months of the COVID-19 pandemic, British Columbia cancelled elective surgeries and non-emergency care from mid-March 2020 to May 2020. However, British Columbia recommenced elective surgeries in mid-May 2020, and as of March 2021, 95% of surgeries that were postponed during the first wave of the pandemic have been completed.⁶

Hospital care is not the only service to be impacted by the COVID-19 pandemic, with a similar pattern being observed for other medical services such as physician care and optometrist care. Across Canadian provinces, the volume of patient visits to physicians dropped in the range between 13% and 33% from March to June 2020 compared to the same period in 2019.⁷ It was estimated forced closure of optometry clinics in mid-March coupled with strict physical distancing and reduced patient capacity when clinics reopen would result in approximately two million comprehensive eye examinations missed in Ontario alone.⁸

Cancellation of scheduled ophthalmic elective surgeries and procedures and the implications of lock downs enforced throughout Canada may have a substantial impact on patients and the healthcare system. The accumulation of a large backlog of ophthalmic surgeries and procedures from the

impact of each wave of the pandemic will take additional time and resources to clear, resulting in a cost to the Canadian healthcare system in coming years. A study of non-emergency ophthalmic surgeries in Ontario estimated approximately 3,500 additional surgeries will be required per month to clear the backlog caused by the pandemic by March 2023.⁹

Most importantly, delayed ophthalmic care may lead to worsening quality of life and irreversible vision impairment. The impacts of delayed ophthalmic care on the health and patient outcomes varies by eye condition. For example, a delay in providing timely cataract surgery is likely to lead to increased costs from a risk in falls^{10,11} and may also lead to increased cost of treatment during surgery.¹² In patients with AMD, a delay in diagnosis and/or treatment (injection of anti-VEGF therapy) of the condition may lead to irreversible VL.¹³ For diabetic retinopathy, receiving timely diagnosis of the condition is important to prevent the progression to the proliferative form.¹⁴ While glaucoma is slow progressing, prognosis is generally good if patients are compliant with treatment to prevent further damage of the optic nerve.¹⁵

1.3 Structure of the report

This report is structured in the following way:

- **Chapter 2** provides an overview of the methodology used to estimate the change in service utilization and impact on patient outcomes.
- **Chapter 3** summarizes estimates of the change in service utilization (including inpatient hospitalizations, outpatient services, pharmaceuticals, vision care) and impact on patient outcomes (for cataract, AMD, diabetic retinopathy and glaucoma).
- **Chapter 4** discusses the findings and the possible implications for the Canadian healthcare system and society.

2 Methodology

This chapter provides an overview of the methodology adopted in this report to quantify the impact of COVID-19 on VL.

The public health response to contain the rapid spread of the COVID-19 virus was to enforce social lock downs across Canada to slow down the COVID-19 outbreak. The lock downs impacted the ability for people to access services, with many services closing during the lock down period. As a consequence, it is expected that ophthalmic services utilization decreased in 2020 and as such, the total cost for ophthalmic care in Canada would also decrease in the same year.

The impact of lock downs and decreased service utilization in 2020 will mean that there will be an increased demand for ophthalmic services in subsequent years. This is primarily driven by the backlog of procedures which were unable to be performed due to cancellations and delays. Increased demand for ophthalmic services in subsequent years will attribute additional costs to the healthcare system as more resources and staff time are required to address the backlog of procedures.

Patients who miss treatment or receive delayed treatment are likely to experience some impact to their vision health. Lock downs resulted in patients with scheduled procedures waiting longer to receive this care.

For patients who did not receive an eye examination, it was assumed that cases which otherwise would have been an urgent referral (i.e. requiring care within 1-2 months) may have been at risk of permanent VL from their condition. Data on referral urgency has been drawn from international evidence on referrals from optometrists to tertiary care centers.

For patients who either cancelled an appointment with their ophthalmologist or had their appointment cancelled, it was assumed there is a risk of progressing to VL due to delayed treatment. Evidence from literature was used to inform the risk of progression given treatment compared to no treatment for

the period of the delay for anti-VEGF injections. For glaucoma surgeries, it was assumed that each patient is at risk of progression immediately as a result of the cancelled procedures.

The extended wait time to their procedure is likely to have a cost impact on patients, as they live with their condition for a longer period of time. The cost of delayed care is calculated by applying the additional days with disease (additional wait time) with the daily cost to each cost category (treatment, preventable healthcare system, productivity losses, informal carer costs, other costs, efficiency losses and loss of wellbeing).

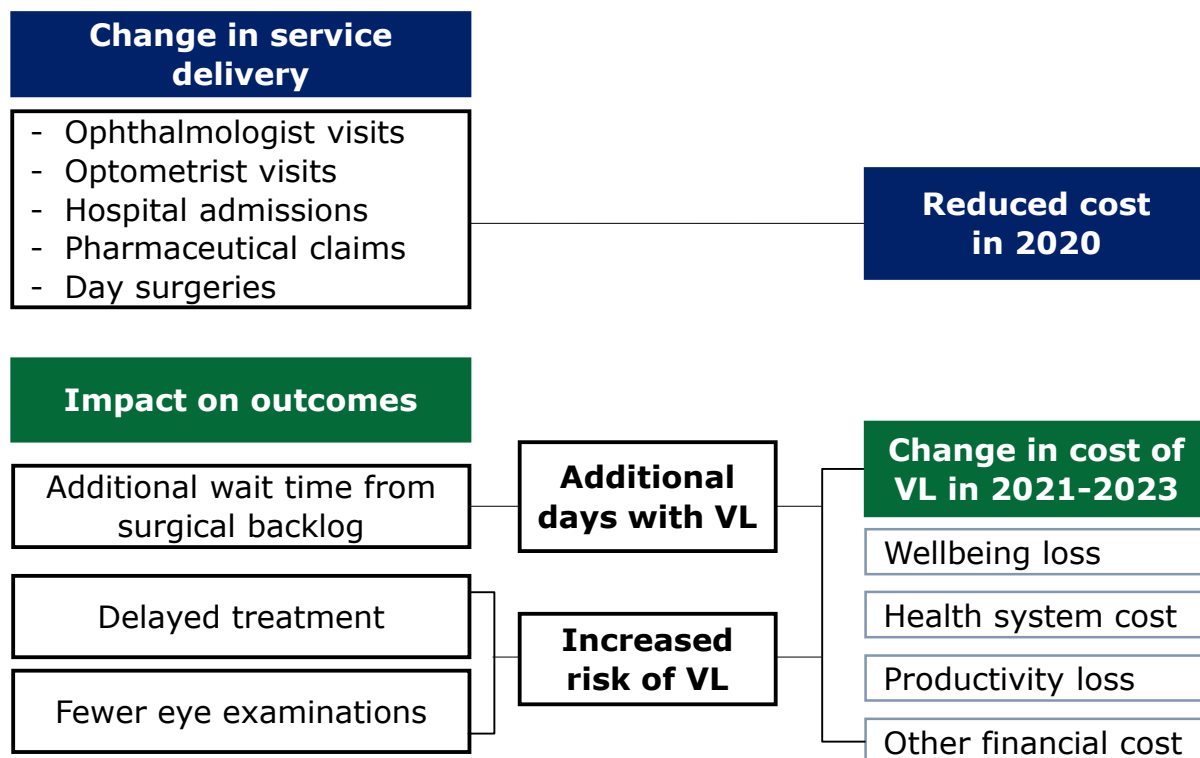
The change in costs attributed to cataract during COVID-19 is driven by the change in wait time for surgery. The estimated number of cataract surgeries missed during the first wave of lock down is determined by using data from CIHI. This was used to estimate the number of people waiting for cataract surgery in each quarter. The difference in wait time pre- and post-COVID-19 was used to determine the difference in wait time between the two periods and multiplied by the difference in average daily costs. The costs attributed to cataract includes costs due to increased risk of falls during the wait period and the decrease in quality of life due to worse outcomes. A similar approach is applied to other ophthalmic surgeries which were delayed due to the pandemic.

Data on the change in wait times for ophthalmic surgeries was obtained from Felfeli et al (2021).⁹ Data on the changes in eye care services were obtained through special request from IQVIA and also CIHI, along with information sourced through desktop research.

Stakeholder consultations with several optometrists and ophthalmologists were conducted to gather information on the impact of the COVID-19 and subsequent lock downs on eye care services, to discuss the impacts on patient outcomes. These consultations were used to inform some assumptions and logic used in the modelling.

A high-level overview of the modelling pathway for the impact of COVID-19 on the healthcare system and patient outcomes is shown in Figure 2.1.

Figure 2.1: Overview of modelling pathway for the impact of COVID-19 on the healthcare system and patient outcomes



Source: Deloitte Access Economics.

3 Findings

This chapter details the costs incurred due to COVID-19 on VL in Canada in 2020, detailing the impact of COVID-19 on ophthalmic service utilization and patient outcomes due to delayed and/or missed treatments.

3.1 Impact on service utilization

During the first lock down between March and June 2020, most ophthalmic services were halted or experienced a substantial reduction. Consultations with stakeholders suggested the impact of subsequent lock downs were not as severe, as many services were able to continue to operate, albeit with a reduced capacity due to additional health and safety measures.

The reduction in utilization of ophthalmic services reduced healthcare system costs of VL by an estimated \$730 million in 2020, as summarized in Sections 3.1.1 to 3.1.4.

Table 3.1: Impacts of the reduction in service utilization on the healthcare system in 2020 (\$m)

| Cost component | Reduction in healthcare system costs (\$m) |
|-------------------------------|---|
| Inpatient hospitalizations | 1.5 |
| Outpatient services | |
| <i>Cataract day surgeries</i> | <i>161</i> |
| <i>Other surgeries</i> | <i>126</i> |
| <i>Ophthalmologist visits</i> | <i>99</i> |
| Pharmaceuticals | 137 |
| <i>Anti-VEGFs</i> | <i>116</i> |
| <i>Other ophthalmic drugs</i> | <i>21</i> |
| Vision care from optometrists | 206 |
| Total | 730 |

Source: Deloitte Access Economics analysis based on CIHI special data request and IQVIA PharmaStat database.

The reduction in services was comparable across age groups as might be expected, although it is worth noting that almost three quarters of the services delivered in 2020 were provided to people aged 65 years or older.¹⁶ This means older Canadians are more impacted by change in service delivery, along with facing a higher risk from the pandemic itself.

3.1.1 Inpatient hospitalizations

Although hospitals and emergency departments could continue operation during the lock down, the pandemic induced significant changes in day-to-day life, resulting in a small decline in hospitalization in 2020 compared to the same period in 2019.

Service utilization data provided by CIHI shows that there was a more substantial reduction in services delivered between April to June 2020 which recovered in July to September 2020 compared to the same period in 2019. Overall, the number of hospitalizations for ophthalmic procedures between April to December 2020 was 8% lower compared to 2019 (Table 3.2).

Table 3.2: Number of inpatient hospitalizations, April 2019 to December 2020

| Condition | Apr-Dec 2019 | Apr-Dec 2020 | Change |
|---|---------------------|---------------------|---------------|
| Cataract, aphakia or lens dislocation | 739 | 784 | 6% |
| Glaucoma | 1,145 | 1,211 | 6% |
| Disorders of refraction and accommodation | 1,363 | 1,223 | -10% |
| Other retinal disorders | 1,712 | 1,455 | -15% |
| Other | 1,351 | 1,154 | -15% |
| Total | 6,310 | 5,827 | -8% |

Source: CIHI special data request.

When the change in services is multiplied by the average unit cost of services¹⁷ hospitalization costs between April and December 2020 \$1.5 million lower than in 2019.

3.1.2 Outpatient service

As elective surgeries were restricted during the lock down between March and June 2020, the number of ophthalmic day surgeries declined significantly, by 36% in 2020 compared to the same period in 2019.

Table 3.3: Number of day surgeries performed April to December of 2019 and 2020

| Condition | Apr-Dec 2019 | Apr-Dec 2020 | Change |
|---|---------------------|---------------------|---------------|
| Cataract, aphakia or lens dislocation | 165,479 | 109,854 | -34% |
| Glaucoma | 17,063 | 9,444 | -45% |
| Disorders of refraction and accommodation | 8,182 | 3,598 | -56% |
| Other retinal disorders | 8,393 | 5,220 | -38% |
| Other | 5,003 | 3,096 | -38% |
| Total* | 204,120 | 131,212 | -36% |

Source: CIHI special data request. Note: * procedures related data were only available for Ontario, Alberta, Nova Scotia, Prince Edward Island and Manitoba. Consequently, the total provided in the table is lower than the number of services performed across Canada.

When restrictions in most provinces were lifted in June 2020, the number of day surgeries picked up in later quarters of 2020. Yet, the reduction in services persisted for some conditions, including glaucoma and retinal disorders. For example, the number of glaucoma procedures performed between October and December 2020 was 18% lower

compared to the same period in 2019, and the number of surgeries for retina disorders was 14% lower.

In 2019, there were 541,115 ophthalmic same day procedures performed, equivalent to 135,279 per quarter.¹⁸ The 36% reduction occurred over a 9 month period, which when this is multiplied by the number of procedures (by diagnosis type) over the same period in 2019, an estimated 143,071 fewer services were provided.ⁱⁱ When this is multiplied by the unit costs of each procedure,¹⁹ healthcare system costs in 2020 were reduced by an estimated \$386 million due to the pandemic. This means \$129 million will be required every year to clear the backlog over a three-year period between 2021 and 2023, which is before health price inflation or any cost premiums to provide an increased volume of services are considered.

The reduction in outpatient services is reflected in an online survey of ophthalmologists conducted by Ipsos in January 2021. This survey found that most ophthalmologists (76% of survey responses) had seen fewer patients as a result of the pandemic. Prior to the lock down, 49% of ophthalmologists received 500-1,000 patients per month. After the lock down, most ophthalmologists saw fewer than 500 patients per month. At the same time, 73% of ophthalmologists reported an increase in wait time for retina care, and 20% reported an increase by a few months.²⁰

Consultations with industry stakeholders reinforced this finding, with stakeholders reporting that the recovery in service utilization after the lock down ended continued to be restricted by additional health and safety measures such as capacity constraints.

ⁱⁱ The 36% reduction observed within the CIHI data has a slightly different distribution to the services reported by the Fraser Institute for 2020 across all of Canada. As such, the diagnosis specific reductions were used as the basis of the analysis (i.e. 34% for cataract, 45% for glaucoma, etc. as shown in Table 3.3). When weighted by the diagnoses, the estimated reduction across all day surgeries is 35.3% rather than 36%.

3.1.3 Vision care

As with elective surgeries, vision care services such as visits to an optometrist were also largely restricted during the first lock down between March and June 2020 and capacity constraints persisted beyond June 2020.

Analysis of Statistics Canada's Canadian Community Health Survey in 2016 showed 43.8% of Canadians visited an eye specialist (including both ophthalmologists and optometrists) within the last year. For those who saw an eye specialist, they visited 1.39 times on average.²¹ When these are multiplied by the current Canadian population in 2019,²² it was estimated that there are almost 23.0 million services. When the visits to ophthalmologists are removed from this (7.1 million based on services provided in 2019²³), there were an estimated 15.9 million visits to optometrists each year prior to the pandemic.

The period of the initial lock down lasted for 2.2 months on average across Canada. Services have been further restricted beyond the initial lock down, and in addition, people have been hesitant to see health professionals. Given a cancellation of services lasting 2.2 months, at least 2.9 million services were not delivered in 2020 compared to the 2019 level. This represents about 18% of services delivered in 2019.

At an average cost of approximately \$72 per service (\$71.56),ⁱⁱⁱ health expenditure on vision care in 2020 was reduced by an estimated \$205.6 million. It is noted this excludes any other reductions in vision care, for example, any expenditure on eyewear or contact lenses.

ⁱⁱⁱ As shown in Deloitte Access Economics' report, *The cost of vision loss and blindness in Canada*, expenditure on vision care was \$5.49 billion in 2019. Data from Statista suggests expenditure on eyewear and lenses in Canada was \$4.36 billion in 2019 (see <<https://www.statista.com/outlook/cmo/eyewear/canada?currency=CAD>> and <<https://www.statista.com/outlook/cmo/eyewear/contact-lenses/canada?currency=CAD>>). The expenditure on eyewear and lenses was subtracted from total vision care expenditure to estimate expenditure on visits to optometrists, which was \$1.14 billion. Given there were 15.9 million services, this suggests a cost per service of \$72.

3.1.4 Pharmaceutical claims

Restrictions to ophthalmologist services during the pandemic, coupled with patient hesitancy to see specialists and receive treatments, led to a decline in the number of pharmaceutical claims.

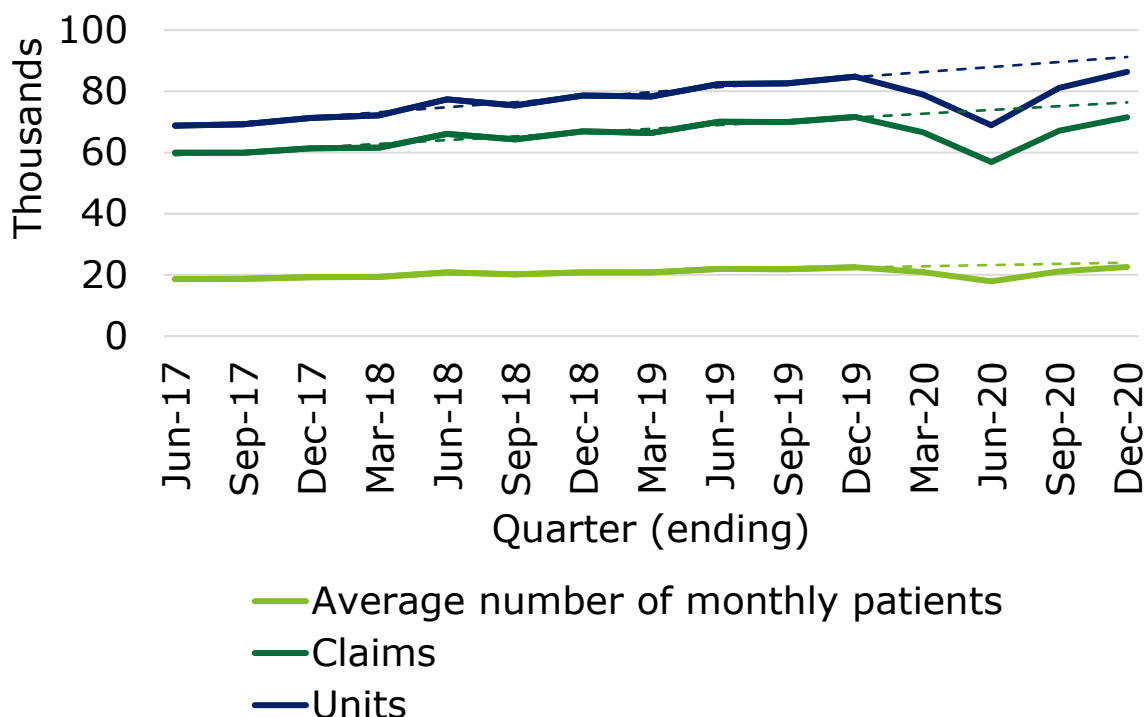
The data available indicates that the reduction in claims throughout the period from March 2020 to December 2020 meant that on average, approximately 2,900 fewer individuals received services each month (see Chart 3.1).^{iv}

When the trend in anti-VEGF injections prior to 2020 is compared to the actual number of injections delivered in 2020-21, a noticeable decline is observed from March 2020. Up until December 2020, as many as 69,800 fewer claims were processed than expected (Table 3.4). In April to June 2020, the average number of patients being treated monthly (in each quarter) was 5,400 lower than compared to the expected level given past trends, with this declining to around 2,000 fewer patients per month on average by the end of December 2020 (Chart 3.1).^v

^{iv} It is possible that patients still receive treatments but with a longer time interval between treatments. The available data does not provide sufficient granularity to determine where treatment time intervals have been extended beyond a period of one month.

^v There are some limitations in using these data: for example, data are incomplete for a few provinces including British Columbia, Alberta and Manitoba as the data do not reflect the specific retina programs available in those provinces. Similarly, Beovu was commercially available as of May 2020, but comparative data prior to the pandemic were not available so this has been excluded. Finally, data were not complete for all drug programs over the period considered. Where data were not available for the full period up until end-December 2020, these programs were removed from the analysis.

Chart 3.1: Anti-VEGF injections between March 2017 and December 2020



Source: Deloitte Access Economics analysis of IQVIA RxDynamics database. Dotted lines show the expected trend in units, claims and average number of patients treated per month with anti-VEGF injections if historic growth trends continued from the end of the December 2019 quarter. The difference between the expected services provided and the actual services provided (solid lines) are assumed to be due to the COVID-19 pandemic.

Slightly more than half (52%) of the reduction in claims was for patients receiving treatment for wet AMD, while 37% was for central retinal vein occlusion, 15% was for diabetic macular edema and there was actually a slightly increase in claims for other uses during the pandemic (3% gain).

A similar approach was used to assess the change in claims and costs of all ophthalmological pharmaceuticals as for anti-VEGF injections. Average quarterly growth was obtained for each item in Table 3.4 between April 2017 and December 2019. It was assumed this growth would have continued throughout 2020 in the absence of COVID-19 and this was multiplied by the claims in December 2019 to inform the

expected claims in each quarter thereafter until December 2020. The expected claims and costs were then compared to the actual number of claims and the difference between the two was taken to represent the impact of COVID-19.

The results indicate there was a substantial reduction in claims for several ophthalmological pharmaceuticals including for anti-infectives, ophthalmological corticosteroids, and miotics and antiglaucoma preparations. The reduction is expected given the cancellation of elective surgeries meant treatment for inflammation following a surgery would not have been required. However, reductions were also seen for products used to treat dry eye, conjunctivitis, uveitis and other inflammation.

From January 2020 to December 2020, total claims were almost 11% lower than expected given growth in recent years. In dollar terms, total expenditure on ophthalmological preparations could have been expected to be \$136.9 million higher over the same period, largely driven by reductions in claims for anti-VEGF treatments (\$115.6 million).

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Table 3.4: Claims for all ophthalmological preparations, January 2020 to December 2020

| Ophthalmological product | Claims in Dec-19 ('000s) | Average quarterly growth (%) | Expected claims in 2020 ('000s) | Claims in 2020 ('000s) | Difference in claims ('000s) | Estimated cost impact (\$m) |
|--|---------------------------------|-------------------------------------|--|-------------------------------|-------------------------------------|------------------------------------|
| Eye tonics and eye vitamins | 6.3 | 0.7 | 25.5 | 22.4 | 3.1 | 0.01 |
| Miotics and antiglaucoma preparations | 1,154.7 | 1.2 | 4,754.5 | 4,570.0 | 184.6 | 8.95 |
| Ocular anti-neovascularization products | 123.7 | 2.8 | 530.0 | 460.2 | 69.8 | 115.64 |
| Ophthalmic non-steroidal anti-inflammatories | 64.0 | 0.7 | 260.5 | 206.2 | 54.3 | 1.23 |
| Ophthalmological anti-infectives | 262.2 | -0.1 | 1,047.4 | 749.9 | 297.5 | 4.34 |
| Ophthalmological anti-inflammatory/anti-infective combinations | 97.3 | 0.9 | 398.3 | 321.1 | 77.2 | 1.11 |
| Ophthalmological corticosteroids | 271.8 | 0.3 | 1,095.3 | 875.7 | 219.6 | 4.20 |
| Other | 163.9 | 0.6 | 664.8 | 630.4 | 34.4 | 1.44 |
| Total | 2,143.9 | - | 8,776.4 | 7,836.0 | 940.4 | 136.91 |

Source: Deloitte Access Economics analysis of IQVIA PharmaStat database.

3.2 Impact on patient outcomes

The data suggest COVID-19 had a substantial impact on patient outcomes in 2020 and it is expected this will continue for many years due to the delay in eye care provision for many. As hypothesized in chapter 2, data showing the potential impact on patient outcomes is presented throughout this chapter. There are three main paths through which this has occurred, including:

- The delay in the provision of specialist care and surgical interventions, such as cataract surgery or anti-VEGF injections for AMD, diabetic retinopathy or central retinal vein occlusion.
- The reduction in routine follow up care for patients, which included a reduction in prescriptions for certain medications, notably anti-glaucoma medications and also supplements to prevent the progression of AMD.
- The reduction in new diagnoses and reduced referrals to eye specialists.

The impacts are not uniform across eye conditions and some of these effects will likely lead to enduring consequences and worse vision health in Canada for years to come. Despite what is now known about the impacts, further data collection and evidence generation is required to uncover the true extent of the impact of COVID-19 on VL in Canada.

The potential impacts between 2021 and 2023 have been modelled based on changes in care received for cataract, glaucoma, AMD and diabetic retinopathy in 2020. The modelling suggests costs of VL will be \$559.4 million higher each year between 2021 and 2023 due to the pandemic. Further detail is provided in the sections 3.2.1 to 3.2.3.

Table 3.5: Estimated impact on the annual cost of VL, 2021 to 2023

| Measure | Annual cost (\$m) |
|---------------------------------------|--------------------------|
| Delayed identification of eye disease | 23.9 |
| Reduced interventions provided | 15.2 |
| Impact of increased wait times | 520.2 |
| Difference | 559.4 |

Source: Deloitte Access Economics analysis.

3.2.1 Delay in identification of eye disease

During 2020, there were several driving factors reducing the number of vision care services which were provided. In part, there was a preference of Canadians to stay home rather than to seek care for their comprehensive eye examinations. In addition, there were capacity constraints imposed following the initial lock down, which were put in place to reduce the spread of the virus. The initial lock down meant that close to 3 million fewer optometry services were provided (section 3.1.3). Consequently, an important diagnostic and referral pathway no longer occurred for a period of time.

The reduction in eye examinations due to COVID-19 will mean a reduction in the number of new cases being diagnosed, but there could also be existing cases of eye disease that progressed during this period and went unnoticed.

There is little data on the clinical outcomes associated with the reduction in services, not only in Canada, but also internationally. To attempt to understand the possible impact of the delay in identification, data from Specsavers in Australia has been used.^{vi}

^{vi} Specsavers accounts for approximately 40-50% of services provided in Australia and the United Kingdom (UK), and so is likely to be representative of the broader impact in eye examinations in those markets. The period of lock down in Melbourne, Australia and in the UK was similar to the lock down period considered for the purposes of this report.

Specsavers has provided regular analysis of the services they provide since 2018. In their Eye Health State of the Nation report, they have shown that four conditions – glaucoma, diabetes, retina, and other – are referred to ophthalmologists in 5.8% of all visits.²⁴ If these data are indicative of referral patterns in Canada, this suggests that in a usual year, as many as 76,500 referrals occur monthly in Canada, or across a five month period between March to July 2020, more than 382,000 referrals were expected. Further data from Specsavers (both in Australia and the UK) shows there was a two-third reduction in referrals over a comparable time period.^{25,26} Of these referrals, 25% are for glaucoma, 5% for diabetic retinopathy, 22% for conditions of the retina (excluding diabetic retinopathy) and 44% are for other conditions.^{24, 27,}

Each of these cases are at an increased risk of developing VL, since in the absence of COVID-19, they would have been referred to an ophthalmologist for review and treatment.

For example, of glaucoma referrals, 9% were urgent (requiring care within 1-2 months from referrals),²⁷ and 50% of referrals are for new diagnoses of disease.²⁶ Further, current data from Specsavers showed that 67% of these cases remained undiagnosed at the end of 2020.^{25,vii} Putting these numbers together, 1,968 missed referrals for glaucoma likely required urgent care which was not identified in a timely manner and may still yet to be identified and treated.

Data suggests that with treatment 5% of glaucoma cases might progress to worse visual outcomes within one year, but this increases to 7.8% without treatment²⁸ – meaning 57 additional people likely developed VL from glaucoma in 2020 (Table 3.6).

Similarly, there were 11,575 missed referrals for diabetic retinopathy – some of which would have required urgent care. With treatment 2.1% will progress to worse visual outcomes, which increases to 3.8% without treatment (Table 3.6).²⁹ This

^{vii} There was an increase in the proportion of referrals which were urgent after services resumed, which may indicate that a greater proportion of these cases were diagnosed in the later part of 2020.

suggests an additional 199 people likely developed VL from diabetic retinopathy due to missed referrals during the pandemic.

There were also 56,372 missed referrals for retina conditions (excluding diabetic retinopathy). Of these, 12.7% would have been for new onset wet AMD requiring treatment,²⁴ equivalent to 7,159 people (Table 3.6). Modelling analysis by Thomas et al (2020)³⁰ suggests that a 3 month delay in commencing treatment would mean an additional 9% progress to VL, equivalent to 623 people.

Combined, across these three conditions, an estimated 879 people likely developed VL due to delayed eye examinations in 2020. At an average cost of \$27,250 per person,³ the annual cost in subsequent years is estimated to be \$23.9 million.

Table 3.6: Estimated impact of delayed identification of eye disease in 2020

| Measure | AMD | Diabetic retinopathy | Glaucoma |
|-------------------------------------|------------|-----------------------------|-----------------|
| Estimated no. impacted | 7,159 | 11,575 | 1,968 |
| Probability of VL with treatment | 26.4% | 2.1% | 5.0% |
| Probability of VL without treatment | 35.1% | 3.8% | 7.8% |
| Difference | 623 | 199 | 57 |

Source: Deloitte Access Economics analysis.

3.2.2 Reduction in the number of interventions provided

As with the delay in identifying and diagnosing new vision threatening eye conditions, it is also possible to estimate the impact on outcomes given a reduction in the number of interventions provided (as in Table 3.7).

Based on data from CIHI,¹⁶ 7,619 fewer glaucoma surgeries were undertaken between April and December 2020. As noted already, data suggests that with treatment 5% of glaucoma cases might progress to worse visual outcomes within one

year, but this increases to 7.8% without treatment²⁸ – meaning 219 additional people likely developed VL from glaucoma.

When comparing to past trends in anti-VEGF treatments, analysis of the IQVIA RxDynamics database indicates 1,500 fewer patients received injections for AMD and 458 fewer patients received injections for diabetic retinopathy. With treatment 2.1% of diabetic retinopathy cases will progress to worse visual outcomes, which increases to 3.8% without treatment.²⁹ This suggests an additional 8 people likely developed VL from diabetic retinopathy due to missed treatments during the pandemic. Data provided in Teo et al (2020)³¹ suggests that a delay in anti-VEGF injections for AMD would mean an additional 22% progress to VL, equivalent to 331 people with AMD.

Table 3.7: Estimated impact of reduction in number of interventions in 2020

| Measure | AMD | Diabetic retinopathy | Glaucoma |
|-------------------------------------|------------|-----------------------------|-----------------|
| Estimated no. impacted | 1,500 | 458 | 7,619 |
| Probability of VL with treatment | 69.7% | 2.1% | 5.0% |
| Probability of VL without treatment | 91.8% | 3.8% | 7.8% |
| Difference | 331 | 8 | 219 |

Source: Deloitte AccessEconomics analysis.

Combined, across these three conditions, an estimated 558 people may have lost vision due to delayed treatment in 2020. At an average cost of \$27,250 per person,³ the annual cost in subsequent years is estimated to be \$15.2 million.

3.2.3 The impact of increased wait times

Alongside the impact of delayed treatment and reduced diagnosis rates for vision threatening eye disease, there is an impact of increased wait times for surgeries on people with VL.

This largely applies to people with VL from cataract, as these represent the majority of elective surgeries provided.

Data on wait time for ophthalmic surgeries has shown the average wait time increased by 32 days for cataract between November 2019 and November 2020. This was comparable for some other conditions such as oculoplastics (34 days), but higher for strabismus (99 days). Some conditions such as glaucoma and cornea were less affected, at 3 additional days and 13 additional days respectively compared to November 2019.⁹ On average, across the conditions waiting for surgery in 2020, the wait time increased by 31 days.

Most of the surgeries impacted by the cancellation of elective surgeries were for cataracts (more than 70% of missed surgeries and close to 80% of surgeries on the waiting list).³² For this analysis, it has been assumed that anyone waiting for treatment has at least some symptoms of VL.

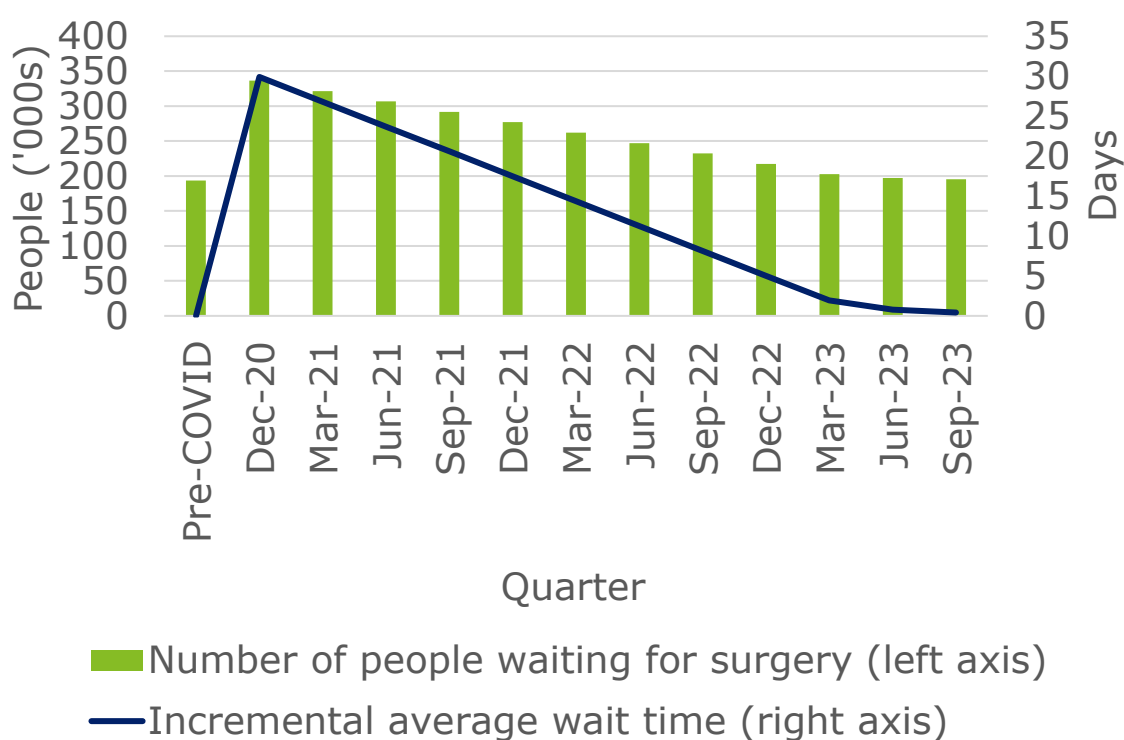
There are potential costs involved from delaying surgeries – for example, some with VL from cataract may be more likely to have a fall which could lead to a fracture and further costs within the healthcare system. They will be at higher risk of this until they have had their surgery and recovered. Further, the individual may also experience a lower quality of life until they have had surgery – for example, because they are unable to drive until the surgery occurs.

To quantify the potential costs of the increased wait times, the average cost of VL per person was converted to an average daily cost. On average, someone with VL will incur a daily cost of \$54 until they have their surgery.³ This daily cost excludes all healthcare system treatment costs except for those which may occur due to increased wait times (such as falls), and also excludes any loss of economic efficiency as a result of healthcare system treatment costs.

The increased wait time applies not only to those surgeries which were cancelled, but all existing surgeries that are cleared each period until the point in time at which the wait list is the same as it was prior to the pandemic. As noted in Section 3.1, this was estimated to occur over a period of three years, in 2023. For simplicity, it was assumed the wait time

proportionally decreases (from 31 days) in line with the reduction in the number of surgeries waiting for treatment – such that when 50% of the backlog has been removed (within about 1.5 years assuming an 11% increase in service volume each month) the incremental wait time would also be reduced by 50% (to 15.5 days). The relationship used in the model is shown in Chart 3.2.

Chart 3.2: Assumed relationship between the number of people waiting for ophthalmic surgery and the increased average wait time for services



Source: Deloitte Access Economics analysis.

The data presented in section 3.1 show there are 135,279 surgeries provided each quarter on average in a usual year. For this analysis, it was assumed that service volumes would be increased by 11% each quarter until the backlog is resolved,

meaning 150,159 surgeries are being provided each quarter from the start of January 2021 in the model.^{viii}

The modelling results indicate people waiting for ophthalmic surgery will have to wait an additional 24.1 million days in aggregate due to the backlog accumulated during COVID. Thus, the expected additional cost imposed by longer wait times was estimated to be \$1.3 billion including the loss of quality of life while waiting over 2.5 years, which is equivalent to \$520.2 million per year. Excluding quality of life, the increased wait time is still expected to result in financial costs of \$253.3 million, or approximately \$101.3 million per year between 2020 and 2023.

^{viii} For example, between January 2021 and March 2021, 150,159 surgeries had to wait an additional 31 days, or 4.5 million days in aggregate. Between April 2021 and June 2021, a further 150,159 surgeries were delivered, and in aggregate these waited 4 million days (150,159 multiplied by 28). This process was continued until the modelled wait times are comparable to pre-COVID levels.

4 Discussion

COVID-19 resulted in the cancellation of thousands of elective surgeries,^{33, 34} and the reduction in referrals to ophthalmology services.³⁵ In Ontario alone, the backlog has been estimated to reach 114,490 surgeries, requiring \$82 million to clear in coming years.³⁶ Further, recent estimates suggest it will take close to two years to clear this backlog in Ontario and Alberta,^{37, 38} which are two of the most heavily affected provinces. This cost is substantial and may continue to climb as the number of COVID-19 cases in subsequent waves of the pandemic continues to increase.³⁹

The cost of these impacts on individuals living with VL and their families, government and broader community is significant. With the best available data in Canada, the findings in this report suggest the healthcare system cost of VL was \$730 million lower in 2020 than in 2019. Due to backlog of ophthalmic services incurred due to lock downs and the impact on health outcomes, the annualized increase in the cost of VL in subsequent years is estimated to be \$559 million between 2021 and 2023, above what would otherwise have happened.

It should be noted that our modelling assumes that given the decrease in ophthalmic service utilization in 2020, the costs attributed to these services are completely removed from the total healthcare system cost estimates. However, this may not always be true, particularly in a hospital setting, where costs may still be incurred although fees for service may not be received. This may come in the form of costs such as staff salary and overhead costs.⁴⁰

There may be further impacts on people with VL due to the pandemic as there are other services required by people living with VL which have not been considered. For example, consultations with stakeholders during the project indicated rehabilitation and habilitation services were provided remotely during the pandemic. In person services such as mobility assistance were also not provided. Similarly, assessment services provided to people with VL during this period to

determine the need for assistive technology, such as through the assistive aids program in Ontario, were also limited. This may have prevented people with VL, who depend on the assistance provided, from accessing everyday services such as healthcare.

Despite what has been uncovered through the research in this report and elsewhere,^{41,42} the full impact of COVID-19 on the Canadian healthcare system remains yet to be quantified and ongoing monitoring and research is required to fully understand the implications of delayed vision care. This is partly due to the lack of available and complete data, but also because the pandemic is ongoing, imposing subsequent lock downs and causing ongoing disruptions across the healthcare system.

It should be acknowledged that lower utilization of health services is not always associated with poorer health outcomes. For example, literature suggests that change in vision from baseline may not be worse with a treat and extend regime compared with monthly regime of anti-VEGF injections for AMD patients through to 24 months.⁴³ Similarly, however, this may not be true for a continued and long-term decline in service utilization and treatment nor for those with a progressive eye disease that did not receive treatment because of the pandemic.

Further, it is possible that some vision loss that occurred during the pandemic may be reversible. On one hand, consultations with several optometrists and ophthalmologists indicated once services resumed post-lock downs, patients did not necessarily present with worse vision compared to patients presenting pre-pandemic. In circumstances where they did, vision may have subsequently improved such as with the treat and extend regime for AMD mentioned previously. However, other stakeholders indicated some patients may have experienced a loss in their functional vision, leading to irreversible damage. The true impact of the pandemic on the incidence of VL may not be known for several years.

What is known is that the pandemic impacted on service utilization and service wait times. For example, Ipsos polling of

Canadian ophthalmologists reported patients were most impacted by decreases in monitoring of vision health and postponement of surgeries.⁴⁴ However, retinal injections had been less impacted by the pandemic. Furthermore, survey results from members of the Canadian Association of Optometrists indicated wait-time for comprehensive eye exam, glasses/lens fitting and glaucoma follow-up all increased during the period of March – July 2020 (51, 25 and 47 days, respectively) compared to the period prior to March 2020 (20, 2 and 19 days respectively).⁴⁵ Since August 2020, wait times for all three procedures have decreased, but have not yet reached pre-pandemic levels. The impact of wait times on ophthalmic procedures will require ongoing monitoring as some provinces go into subsequent lock downs as a response to prevent the spread of the pandemic.

Beyond what has been presented, there are impacts on individuals and the community which have not been considered in this report. For example:

- Survey data from the CCB indicated that members of the VL community were concerned about treatment for their eye condition and afraid that they may lose more vision due to the impacts of the COVID-19 pandemic.⁴⁶ This may have reduced individual's quality of life which may have been exacerbated with further lock downs across Canada.
- The pandemic caused additional impacts for certain eye conditions such as Charles Bonnet syndrome, where these people had worse symptoms including increased visual hallucinations.⁴⁷ Further, a Canadian study found that compared to the pre-COVID group of rhegmatogenous retinal detachment patients, the post-COVID group were more likely to present with generally more severe form of the condition, and worse baseline visual acuity.⁴⁸ However, functional outcomes at three months have been shown to be comparable between the two groups despite the delay.⁴⁹
- The pandemic may cause an increase in myopia in children, due to decreased time spent playing outdoors and consequently increased exposure to near vision activity including prolonged time spent on screens, reading or writing.⁵⁰ Survey data from CooperVision Canada and

Maru/Blue indicated that 59% of Canadian parents reported their children under 14 were spending more time doing activities that require their near vision compared to pre-pandemic times. The closure of schools and face-to-face learning has been replaced by online learning and activities which may contribute to eye strain and possibly resulting in myopia. As health authorities control the spread of the pandemic, it is encouraged that children increase the time spent outside to delay the onset of myopia in children.⁵¹

- People with disabilities are disproportionately impacted by COVID-19 and are at greater risk of morbidity and mortality. Given that VL primarily impacts older adults, the pandemic placed these people at increased risk of negative health outcomes, including worse mental health.⁵² Priority for people with disabilities for COVID-19 vaccinations should be ensured to minimize the additional risk of morbidity and mortality faced by this group.
- The pandemic caused closure of eye screening programs for subgroups of the population, such as kindergarten-aged children.⁵³ For example, the Ontario Eye See...Eye Learn program refers approximately 10-11% of children with uncorrected refractive error to optometrists for assessment.⁵⁴ The program was cancelled during the pandemic and has not re-established its services, which could result in thousands of children going through school with uncorrected refractive error. This impact is likely to extend beyond VL such as children experiencing a negative outcome on academic performance.⁵⁵

In summary, COVID-19 continues to challenge the Canadian healthcare system in several provinces. The full extent of the impact of cancelled and delayed ophthalmic care is still unclear. Continued data collection is required to assess the longer-term impact of the pandemic on the eye health of Canadians. Further challenges lie ahead for the Canadian healthcare system as it continues to address subsequent waves of the pandemic and ongoing disruptions to ophthalmic care services.

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