



SUMMARY REPORT



The Cost of Vision Loss and Blindness in Canada

The Canadian Council of the Blind

Keith D. Gordon, Ph.D. M.Sc. (Epid.)

"Recognizing the complex nature of VL and blindness and its profound effects on individuals, families, and communities, the Canadian Council of the Blind (CCB) engaged Deloitte Access Economics to develop a contemporary estimate of the social and economic cost of VL in 2019.

This report outlines the healthcare system, productivity, and wellbeing impacts of VL, and makes recommendations aimed at curtailing the personal and social costs associated with impaired sight."

The Cost of Vision Loss and Blindness in Canada Report
Deloitte Access Economics
May 2021



COST OF VISION LOSS AND BLINDNESS IN CANADA

Acknowledgement

The attached Summary Report on the Cost of Vision Loss and Blindness in Canada draws on the latest evidence both within Canada and internationally to highlight the significant cost associated with vision loss (VL).

The Canadian Council of the Blind (CCB) engaged Deloitte Access Economics in December 2020 to provide a contemporary estimate of the annual social and economic cost of VL and blindness in Canada. In support of this report, the CCB partnered with Fighting Blindness Canada and key partners the Canadian Association of Optometrists and the Canadian Ophthalmological Society.



To fund this report, the CCB engaged with several of Canada's corporate supporters and a number of Canada's leading research-based pharmaceutical companies. No corporate or pharmaceutical entities have had any control over the development of this report.

We would like to recognize the significant sources of data received from VL stakeholders, our vision health population, and health policy researchers, in particular: Dr. Yaping Jin (University of Toronto), Dr. Ellen Freeman (University of Ottawa), and Dr. Walter Wittich (University of Montreal).



COST OF VISION LOSS AND BLINDNESS IN CANADA

Table of Contents

A. Glossary	7
B. Introduction	8
C. Executive Summary	10
D. Methods	13
E. Results	14
The prevalence of VL in Canada	14
Prevalence of VL by severity	15
Prevalence of VL by province/territory	16
Prevalence of VL by major cause	17
Deaths associated with VL	24
Projected prevalence of VL	24
The cost of VL in Canada 2019	25
Health care system costs	26
Cost of falls	29
Productivity costs	29



Other financial costs associated with VL	32
Loss of well-being	33
Direct health costs of VL compared with other major conditions	34
F. Conclusions	35
G. Appreciation	37
H. Research Leads	38
I. Endnotes	40



Figures

Figure 1: Prevalence of VL in Canada by Age	14
Figure 2: Prevalence of VL in Canada by Severity	16
Figure 3: Prevalence of VL by Province and Territory	17
Figure 4: Prevalence of VL by Major Cause	18
Figure 5: Prevalence of VL Due to AMD in Canada	19
Figure 6: Prevalence of VL Due to Cataracts in Canada	20
Figure 7: Prevalence of VL Due to Diabetic Retinopathy in Canada	21
Figure 8: Prevalence of VL Due to Glaucoma in Canada	22
Figure 9: Prevalence of VL Due to “Other Causes” in Canada	23
Figure 10: Projected Prevalence of VL in Canada, 2019-50	24
Figure 11: Financial Costs of VL 2019	26
Figure 12: Direct Health Care System Costs of VL in Canada	27
Figure 13: Direct Health Care System Costs of VL by Payer	27
Figure 14: Productivity Costs Due to VL	30
Figure 15: Productivity Costs Due to VL by Bearer	31
Figure 16: Productivity Costs per Person with VL by Severity of VL	31
Figure 17: Other Financial and Economic Costs	32
Figure 18: Other Financial Costs Due to VL by Bearer	33
Figure 19: Loss of Well-Being by Age	34
Figure 20: Loss of Well-Being per Person with VL by Severity of VL	34



Tables

Table 1: Direct Health Costs by Component and Province/Territory 28



A. Glossary

Acronym	Full Name
AMD	Age-related macular degeneration
Anti-VEGF	Anti-vascular endothelial growth factor
BCVA	Best corrected visual acuity
CAO	Canadian Association of Optometrists
CCB	Canadian Council of the Blind
CDC	Centers for Disease Control and Prevention
CNIB	Canadian National Institute for the Blind
COS	Canadian Ophthalmological Society
DAE	Deloitte Access Economics
DALY	Disability-adjusted life years
DR	Diabetic retinopathy
FBC	Fighting Blindness Canada
GAP	Global Action Plan
NHANES	National Health and Nutrition Examination Survey
RE	Refractive error
VL	Vision loss
WHA	World Health Assembly
WHO	World Health Organization



B. Introduction

Vision loss (VL) has wide-ranging implications for the individuals, communities, and societies that are impacted by it. At the individual level, it affects work, income, self-esteem, dignity, family relationships, the ability to drive, leisure activities, community involvement, and the activities of daily living. People who lose their vision may not enjoy full access to the same rights and benefits that other Canadians enjoy, and they may experience social isolation and stigma. And while VL itself may not be fatal, it can precipitate other serious health impacts. Seniors with VL face twice the risk of falls, four times the risk of hip fractures, and a greater risk of incurring medication errors. They are admitted to nursing homes an average of three years before they would be otherwise.ⁱ Statistically, VL increases an elderly person's risk of premature death,ⁱⁱ and of course, as these complications scale up to the level of provincial and national populations, the impact on health systems and economies can be devastating.

To plan effectively for the provision of services for people with VL and to fully understand its economic impacts, it is essential that we have current, accurate estimates on the cost of VL in Canada and its individual provinces and territories, including a detailed analysis of the individual components of these costs. In 2009, the CNIB commissioned a study of the cost of VL in Canada in collaboration with the Canadian Ophthalmological Society (COS).^{iii,iv} The resulting report, using 2007 data, estimated that there were 816,951 people in Canada with VL at the time. It was estimated that the overall cost of VL to the Canadian economy was \$15.8 billion. This was made up of \$8.6 billion in direct health care system expenditures and \$7.2 billion in indirect expenditures, mostly from productivity losses due to unemployment and underemployment. Since 2007, there has been a significant aging of the Canadian population, while at the same time Canada has experienced a new wave of immigration. The major risk factors associated with major eye diseases are age, ethnicity, and genetics. For these reasons, it can be expected that the prevalence of eye diseases will have changed since 2007, perhaps even significantly. Costs associated with health care delivery and other societal factors will also



have changed over this period and with new and innovative treatments for eye conditions emerging to considerably alter the vision care landscape as well. For these and other reasons, it became crucial that a new and accurate estimate of the cost of VL be developed for 2019/2020, both for Canada and its provinces and territories.

Recognizing the complex nature of VL and its profound effects on the individuals, families, and communities touched by it and in order to develop an up-to-date estimate of the prevalence and cost of VL in Canada, the Canadian Council of the Blind (CCB) commissioned Deloitte Access Economics (DAE) (a world-renowned consultancy with expertise in disease prevalence and health economics) to conduct an updated assessment of the prevalence and cost of VL in Canada using contemporary data from 2019. To achieve the stated goals, the CCB partnered with Fighting Blindness Canada (FBC) and key partners the Canadian Association of Optometrists, (CAO) and the Canadian Ophthalmological Society (COS).



C. Executive Summary

A visual acuity measurement of 20/20 is often associated with “perfect” vision, a kind of universal benchmark for unimpaired sight. But a significant number of Canadians live with vision that is not adequately captured by that standard.

This report outlines some of the economic, health system, and policy implications of VL, and makes recommendations aimed at curtailing the personal and social costs associated with impaired sight.

Key Findings:

- 1. Based on data from 2019, our research finds that there are an estimated 1.2 million Canadians living with VL, representing 3.2% of the total population. 4.1% of this group is comprised of individuals who are blind.**

These estimates utilize data involving best corrected visual acuity (BCVA) measurements, where acuity is measured with a standard chart after the best refractive correction is achieved through glasses, contacts, or other corrective measure.^v For this study, VL is defined by a BCVA measurement of 20/40 or worse in the better-seeing eye.

- 2. More than 8.0 million Canadians are living with an eye disease that may lead to blindness.**

Many people with potentially sight-threatening eye diseases may not be aware that they have the condition, which argues for the need for regular eye examinations to facilitate early diagnosis and treatment.



3. Our research also estimates that the total cost of VL in Canada in 2019 was \$32.9 billion. This consists of a total financial cost of \$15.6 billion, and a lost well-being cost of \$17.4 billion.

As this number suggests, VL has an enormous impact on individuals and communities. The so-called “burdens” of VL are varied and severe, encompassing social marginalization, employment barriers, strain on families and caregivers, and a host of other issues. And since vision is one of the key senses, impairment can affect many day-to-day enjoyments. This report focuses on financial cost as a way of underscoring the gravity, diversity, and complexity of VL in Canada.

4. Direct health system costs amounted to \$9.5 billion.

This number includes costs associated with hospitals and day surgeries, pharmaceuticals, eyewear, and services provided by ophthalmologists, optometrists, and opticians.

5. Productivity losses amounted to \$4.3 billion.

These costs are due to reduced workforce participation, reduced productivity at work, additional time off work, loss of future earnings due to premature mortality, and loss of caregivers’ income.

6. Other financial and economic costs were \$1.8 billion.

These costs include out-of-pocket expenses on formal aged and disability care, aids, equipment, home modifications, and efficiency losses associated with the transfer of resources within the economy (e.g. additional government payments to people with VL).

7. The financial and economic cost of VL was estimated to be \$10,666 per person with VL.

This represents 21% of the average Canadian’s wages. The costs of mild VL were \$9,577 per person, moderate VL was \$12,108 per person, and severe VL was \$14,736 per person.



8. Based on trends in population growth and aging, the cost of VL in Canada will grow from \$32.9 billion in 2019 to \$56 billion (in 2019 dollars) in 2050

9. Canadians with VL and their families disproportionately share the burden of VL.

In addition to the \$17.4 billion in losses of well-being, they share \$4.3 billion in losses due to reduced productivity and out-of-pocket expenses.

10. We estimate that VL and blindness were associated with 1,292 deaths in Canada in 2019.

These deaths may have occurred due to factors such as isolation and increased risk of falls.

11. Largely in line with overall population demographics, the costs of VL were greatest in Ontario (\$13.0 billion) followed by Quebec (\$7.6 billion), British Columbia (\$4.5 billion), and Alberta (\$3.5 billion).

12. We estimate the direct health system costs of falls due to VL to be \$105.3 million.

13. This report shows the significant cost of VL for Canadian individuals, families, communities, and governments.

The findings from our study indicate that the total overall burden due to living with VL in Canada is 44,076 disability-adjusted life years (DALYs), which is greater than the burden of several other prominent conditions including eating disorders, malignant skin melanoma, and upper respiratory infections in Canada.^{vi}



D. Methods

This study uses established prevalence data to estimate the occurrence of major eye diseases that cause VL in Canada. These numbers are in turn used to estimate the cost of VL in Canada by using Canadian expenditures.



E. Results

The Prevalence of VL in Canada

The prevalence of VL and blindness in Canada is estimated to be 1.2 million people in 2019, or 3.2% of the Canadian population. This represents a 46.8% increase over the past 12 years since the previous study. There are three main reasons for the increased prevalence of VL in Canada:

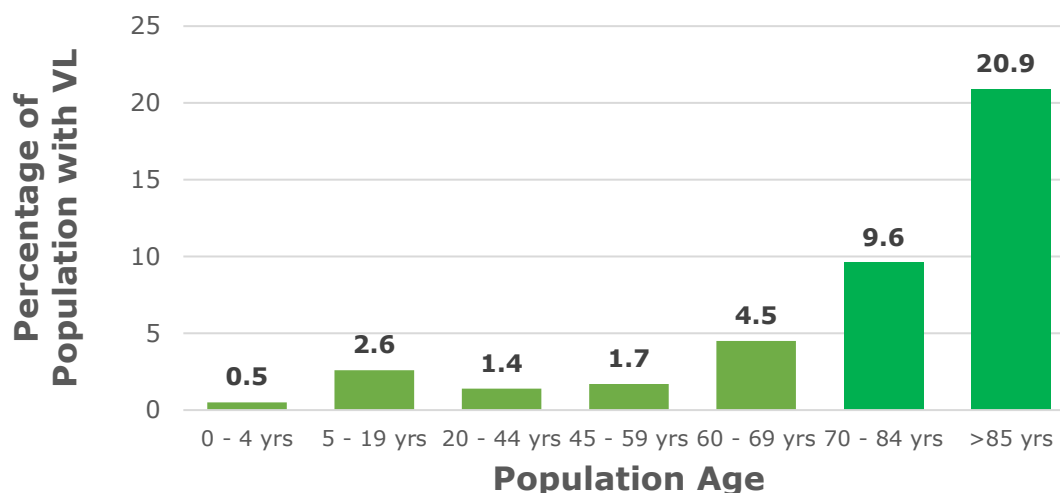
i. The aging of the Canadian population

Over the past decade, the number of people over the age of 60 has increased from fewer than one in five in 2007 to approximately one in four (24.2%) in 2019.^{vii}

The most prevalent eye diseases associated with VL are also associated with aging. As a result, we can expect to see a correlative increase in the prevalence of VL alongside an increase in the number of senior Canadians.

The prevalence of VL was disaggregated by age and is shown in Figure 1.

Figure 1: Prevalence of VL in Canada by Age



- ii. An increase in the prevalence of eye conditions such as myopia in younger age groups

Several studies have reported an increase in the prevalence of corrected myopia in children.^{viii,ix} A recent Canadian study also showed an inverse association between myopia and the amount of time spent outdoors in a school age population.^x It has also been estimated that approximately 10% of all pre-school children have vision deficiencies.^{xi} Many of these deficiencies could be diagnosed early and subsequent VL could be prevented through comprehensive eye examinations and treatment early in the child's life.

- iii. An increase in the Canadian population

From 2007 to 2019, the Canadian population increased by 14.3%.

Prevalence of VL by Severity

The range of VL experienced by people with a seeing disability can vary from a mild disability to blindness. This study uses the following definitions of VL to obtain an estimate of the number of people with VL who fall into each category.

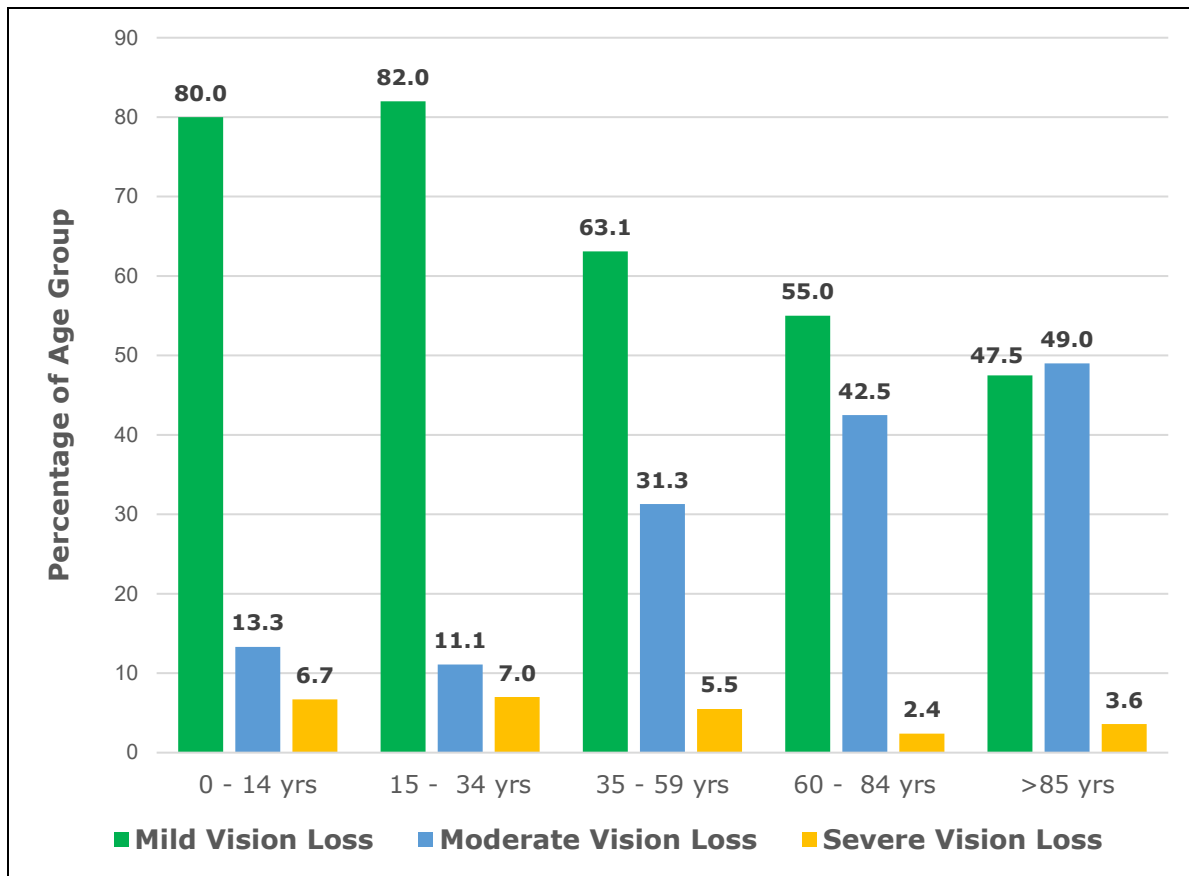
- Blindness, or severe VL, is defined as BCVA of 20/200 or worse ($\leq 6/60$) in the better-seeing eye
- Moderate VL is defined as BCVA worse than 20/60 ($< 6/18$) but better than or equal to 20/200 (6/60) in the better-seeing eye
- Mild VL is defined as BCVA worse than 20/40 ($< 6/12$) but better than or equal to 20/60 (6/18) in the better-seeing eye

Of the 1.2 million people with VL in Canada in 2019, 738,400 (61.3%) had mild VL, 417,600 (34.6%) had moderate VL, and 49,500 (4.1%) were blind.

The percentage of the population in each age group that has mild or severe VL decreases with age, while there is an increase in the percentage of people with moderate VL (Figure 2).



Figure 2: Prevalence of VL in Canada by Severity

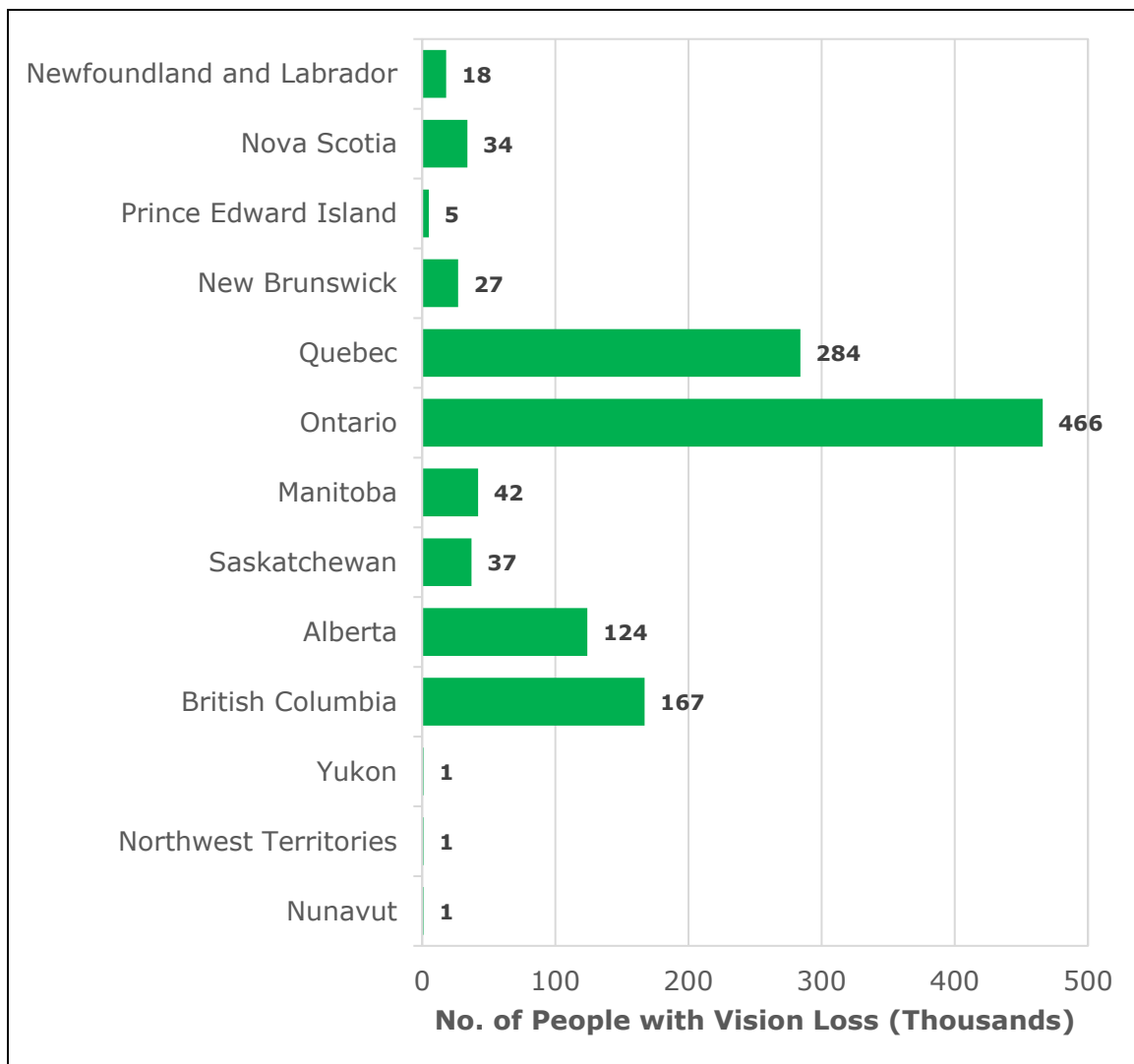


Prevalence of VL by Province/Territory

The prevalence of VL estimated for each province and territory, shown in Figure 3, was largely in line with populations for each province and territory.



Figure 3: Prevalence of VL by Province and Territory

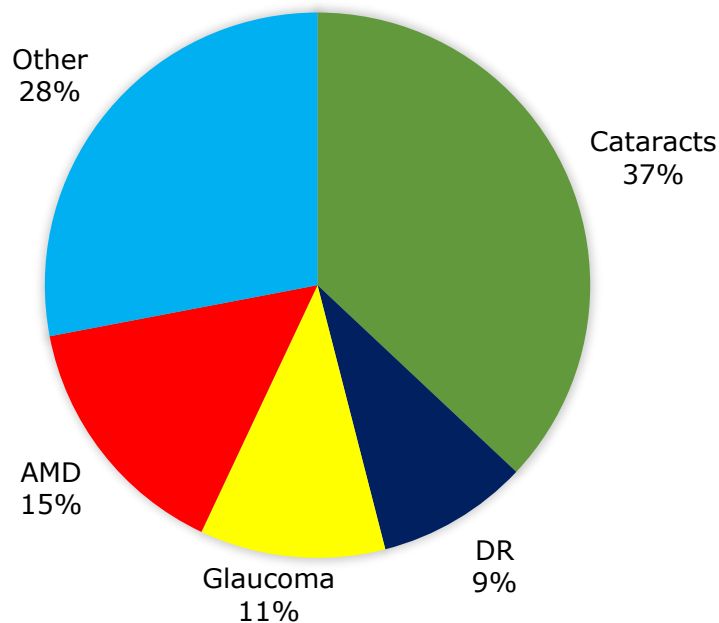


Prevalence of VL by Major Cause

VL in Canada is associated with five major causes: age-related macular degeneration (AMD), cataracts, glaucoma, diabetic retinopathy (DR), as well as a host of other conditions that we have grouped under “other causes.” A full description of these causes is discussed under “other causes of VL” below. The prevalence of these five conditions is shown in Figure 4.



Figure 4: Prevalence of VL by Major Cause



i. Age-related macular degeneration^{xii}

AMD is a disabling eye condition that causes the gradual decline of central vision. It affects a central area of the retina known as the macula, which is responsible for the sharp, central vision required for everyday activities such as reading, watching television, driving, and facial recognition. Although AMD does not usually lead to complete blindness (peripheral vision is maintained), loss of central vision can severely impact a person's independence and quality of life.

AMD is a complex disease and is associated with several different risk factors, most notably increased age, race (Caucasian), family history, and genetics. Smoking is a major modifiable risk factor associated with AMD.

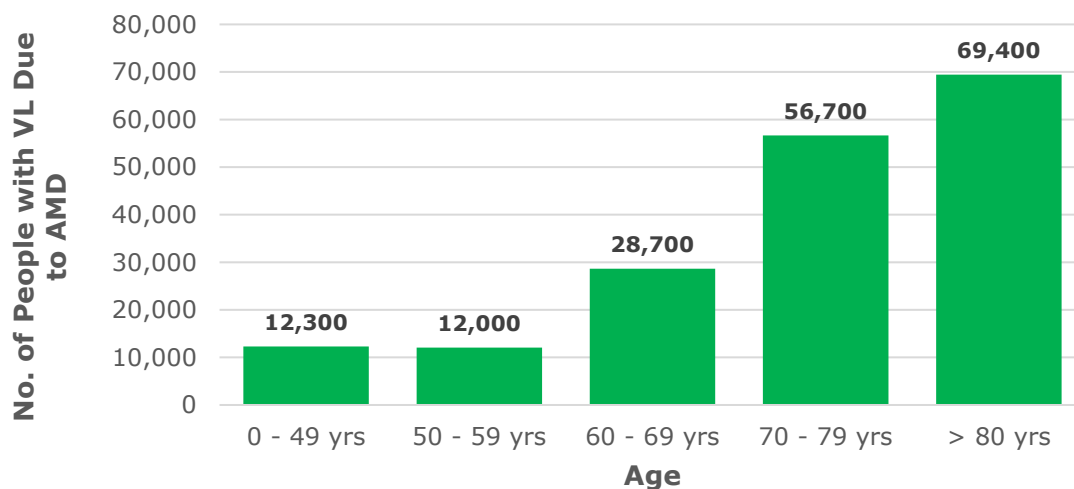
There are two types of AMD: dry AMD and wet AMD. While there are no approved treatments for dry AMD, a special formulation of vitamins has been shown to reduce the progression of the disease in people with intermediate dry AMD. Wet AMD can lead to VL very rapidly. There are three available treatments (called anti-vascular endothelial growth factor



or anti-VEGF medications) for wet AMD that have been shown to be effective in slowing VL due to wet AMD and, in some cases, actually improving vision. These medications, the first of which was introduced in Canada in 2007, have had a significant impact in terms of reducing VL for people with AMD.

It is estimated that 2.5 million Canadians are living with AMD.

Figure 5: Prevalence of VL Due to AMD in Canada



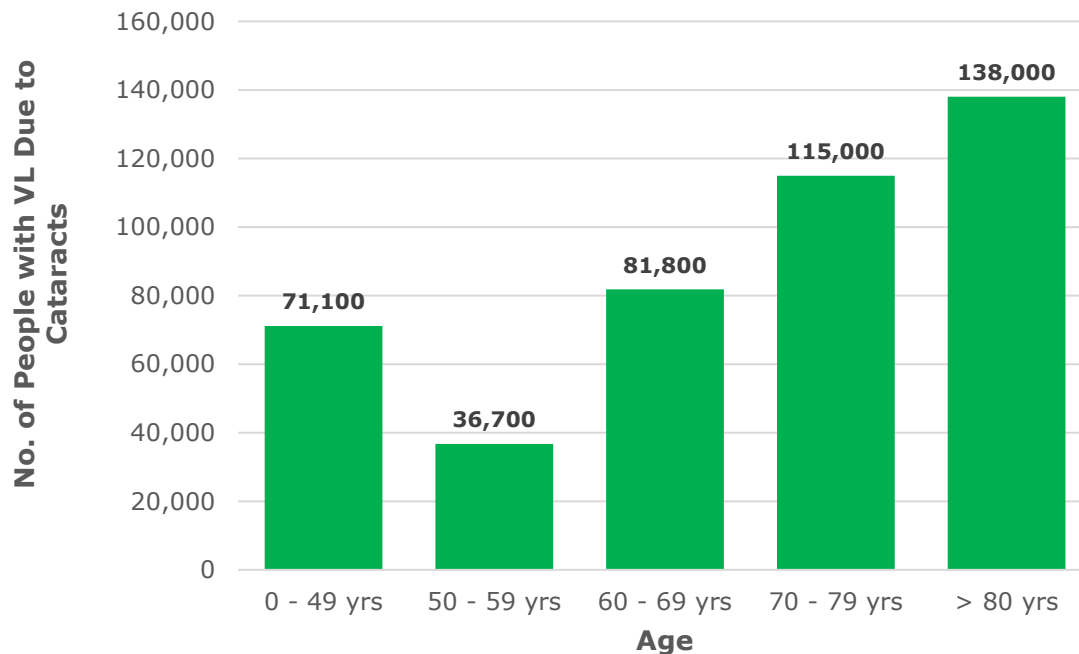
ii. Cataracts

Cataracts occur when the natural lens within one's eye becomes opaque. As we age, our lenses harden naturally and may also turn cloudy. This may result in light being blocked from reaching the retina at the back of the eye, thereby interfering with vision. The effect is the same as if one were looking through a dirty window or car windscreen. Cataracts may occur in one eye or in both. Fortunately, cataracts can be removed and vision can be restored. The formation of cataracts is associated with increased age and a family history of cataracts. Smoking is a risk factor for cataract formation, as is excessive exposure to sunlight and excessive alcohol consumption. Certain medications and eye injuries may also cause cataracts.

It is estimated that 3.7 million Canadians are living with cataracts.



Figure 6: Prevalence of VL Due to Cataracts in Canada



iii. Diabetic retinopathy

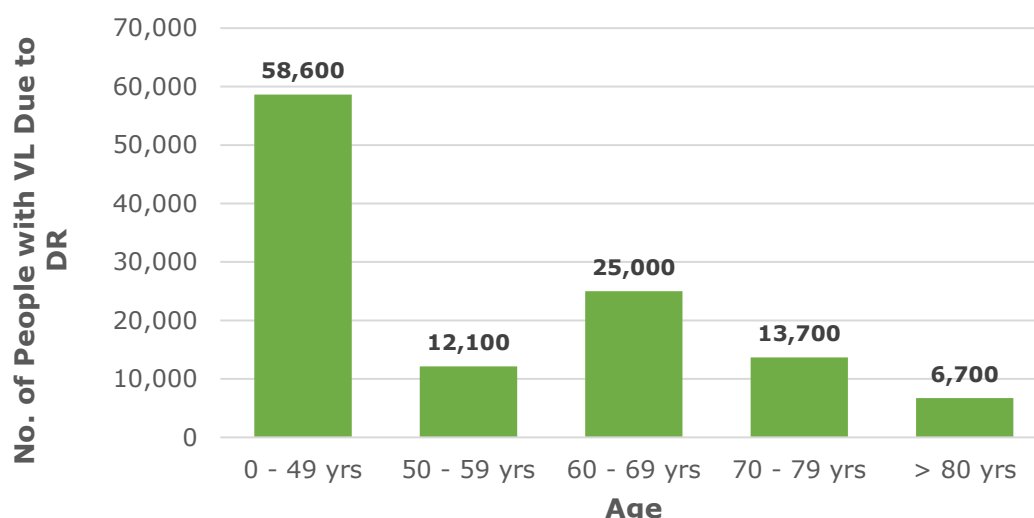
DR is a condition that occurs within the eye when elevated glucose levels in the blood due to diabetes cause blood vessels within the retina to swell and leak. This leakage can cause VL. Sometimes, new blood vessels may grow into the retina, which can cause further VL.

Everyone with diabetes is at risk of developing DR. The risk increases the longer the person has the disease. Almost everyone with type 1 diabetes and most people with type 2 diabetes will develop some symptoms of DR within 20 years of their first diagnosis of diabetes. The risk of developing DR can be lessened if one controls one's blood sugar levels. Other risk factors for DR include smoking, high blood pressure, high blood lipids, and obesity. Early diagnosis and treatment of DR can minimize any VL. Depending on the stage of the disease, DR may be treated with injections of medications into the eye or by laser or surgical procedures.

It is estimated that 1.0 million Canadians are living with DR.



Figure 7: Prevalence of VL Due to Diabetic Retinopathy in Canada



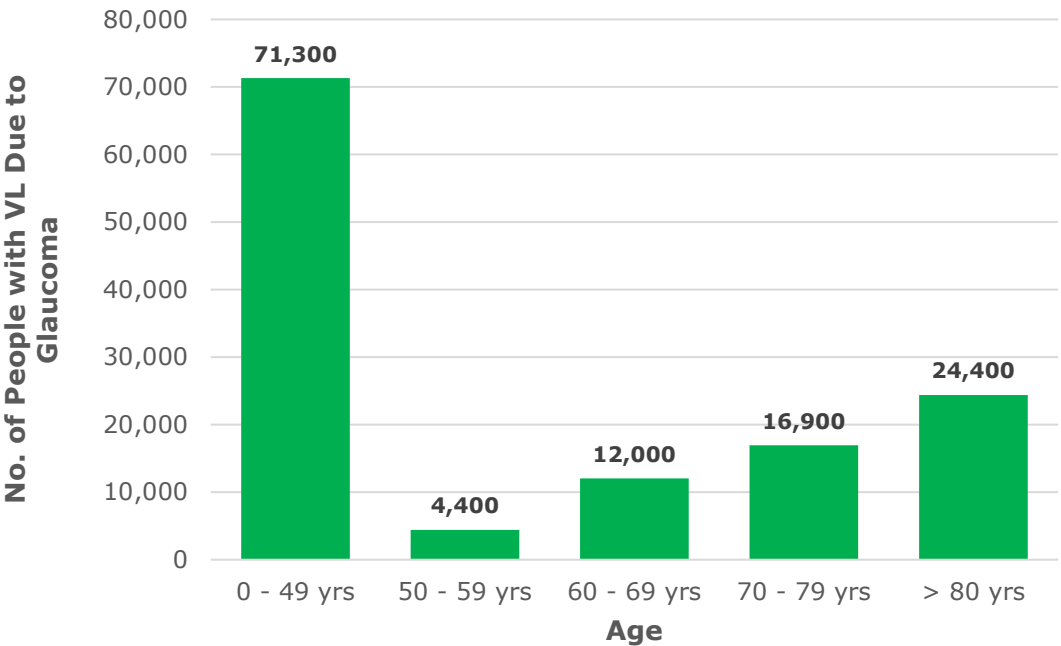
iv. Glaucoma

Glaucoma is a group of diseases that can cause VL due to damage to the optic nerve, which is the nerve at the back of the eye that transmits the impulse of sight to the brain. Loss of vision due to glaucoma usually occurs quite gradually, and affects one's peripheral vision first, gradually narrowing the field of vision to a narrow, central tunnel. This means that one can do tasks requiring central vision while having lost a significant amount of one's vision. Because VL occurs gradually and does occur peripherally first, it is possible to lose a fair amount of one's vision without being aware that this has happened, which is why glaucoma is often referred to as the "silent thief of sight." For this reason, it is essential that people at risk for glaucoma have regular eye examinations. People with a family history of glaucoma, or who are Black, are at a higher risk of developing glaucoma. Glaucoma is also associated with increased age and high myopia. The main treatable risk factor for glaucoma is high pressure within the eye, which can be lowered, and the risk of VL moderated, through eye drops, laser treatment, or surgery.

It is estimated that 728,000 Canadians are living with glaucoma.



Figure 8: Prevalence of VL Due to Glaucoma in Canada



v. Other causes of VL

Other major causes of VL in Canada, aside from those mentioned previously, include uncorrectable refractive error (RE), corneal diseases (with dry eyes being among the key contributing factors), disorders of the visual pathway, cornea/conjunctiva, and trauma to the eye. It is acknowledged, however, that there are other eye conditions, such as inherited retinal disorders, corneal opacity, and trachoma, which can lead to VL, although their prevalence is less frequent in the Canadian population.

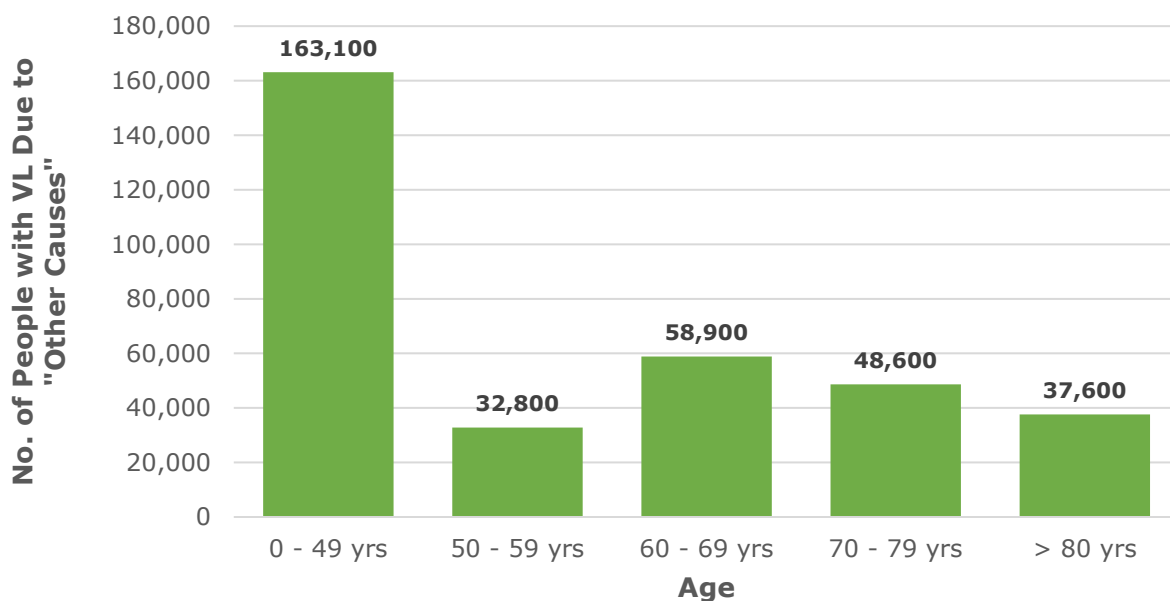


A brief description of each condition follows:

- Uncorrectable RE – refers to situations where despite having best correction (i.e., glasses/lenses), a person’s eyesight is still worse than 20/40
- Dry eyes – a type of corneal disease where tears are not able to provide adequate lubrication for the eyes, which, if left untreated, can lead to eye inflammation, abrasion of the corneal surface, and corneal ulcers
- Disorders of the visual pathway – VL due to damage to the visual pathway that impact somewhere between the optic nerve and visual cortex
- Cornea/conjunctiva – the most common disorder of the conjunctiva, wherein the membrane that lines the eyelid, sclera, and edge of the cornea develops inflammation, which may be caused by an infection, allergic reactions, chemical or foreign bodies in the eye, or overexposure to sunlight.
- Trauma to the eye – physical or chemical wound to the eye or eye socket leading to VL

Due to the differing nature of each condition, treatments for these conditions vary significantly.

Figure 9: Prevalence of VL Due to “Other Causes” in Canada



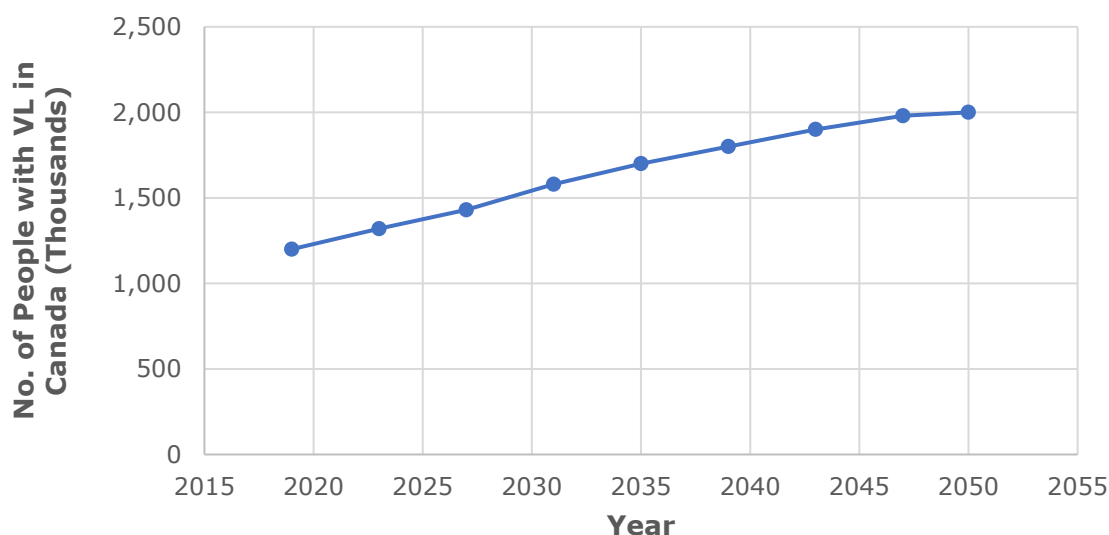
Deaths Associated with VL

Importantly, it was estimated that VL and blindness were likely associated with 1,292 deaths in Canada in 2019. These deaths may have occurred due to factors such as increased risk of falls, and isolation experienced by those with VL.

Projected Prevalence of VL

The prevalence of VL in Canada was estimated until 2050 by applying the prevalence rate to the projected population by age and sex sourced from Statistics Canada (2019). Figure 10 shows the total projected prevalence of VL in Canada, from 2019 to 2050. Increases in prevalence are expected to be driven by population growth and changes to the age structure of the Canadian population. By 2050, there will be an estimated 2.0 million people with VL in Canada.

Figure 10: Projected Prevalence of VL in Canada, 2019-50



The Cost of VL in Canada 2019

The total cost of VL in Canada in 2019 is estimated at \$32.9 billion. This consists of the total financial cost of VL of \$15.6 billion and the cost of lost well-being of \$17.4 billion.

The cost of VL to the Canadian population, economy, and society extends beyond costs to the health care system. At the individual level, people living with VL are impacted financially due to fewer job opportunities, increased absences from work, and reduced productivity at work when they are not fully supported in their roles. The cost of VL also extends beyond those living with VL, to family, friends, and caregivers, as they provide care for a person living with VL. At the economic level, inefficiencies arise from government welfare transfers and financing of services (such as hospitals), which impose losses on society.

The total financial and economic cost of \$15.6 billion represents \$415 per Canadian and \$10,700 per Canadian with VL.

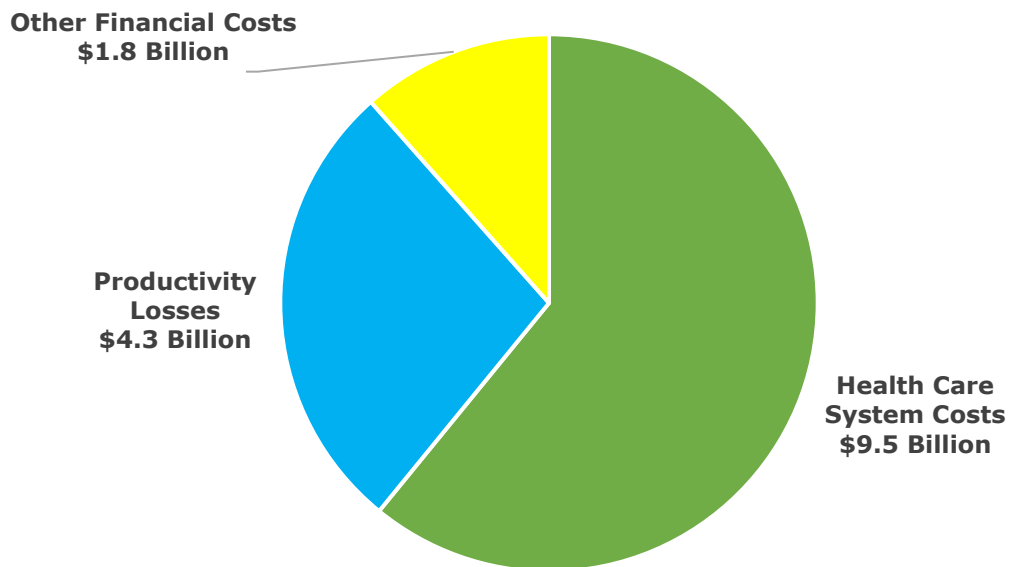
Based on trends in population growth and aging, the cost of VL in Canada will grow from \$32.9 billion in 2019 to \$56 billion (in 2019 dollars) in 2050

The total cost breaks down as follows (Figure 11):

- \$9.5 billion in health system costs, including the costs of hospitals and day surgeries, services provided by ophthalmologists, optometrists, or opticians, pharmaceuticals, eyewear, and other health system expenditures
- \$4.3 billion in productivity losses due to reduced workforce participation, reduced productivity at work, additional time off work, loss of future earnings due to premature mortality, and loss of caregivers' income
- \$1.8 billion in other financial and economic costs, including out-of-pocket expenses on formal aged and disability care, aids, equipment and home modifications, and efficiency losses associated with the transfer of resources within the economy (e.g. additional government payments to people with VL)



Figure 11: Financial Costs of VL 2019



Health Care System Costs

Vision care (optometrist and optician costs as well as the costs of eyewear) accounts for more than half of the direct health system costs due to VL (57.8%) (Figure 12), with outpatient services (ophthalmologist visits and surgeries) (20.2%) and pharmaceuticals (14.3%) accounting for most of the rest. Health system costs by province and territory are shown in Table 1. Individuals bear about two thirds of the cost of the health care system cost (65%), with governments paying the remaining third (35%) (Figure 13).



Figure 12: Direct Health Care System Costs of VL in Canada

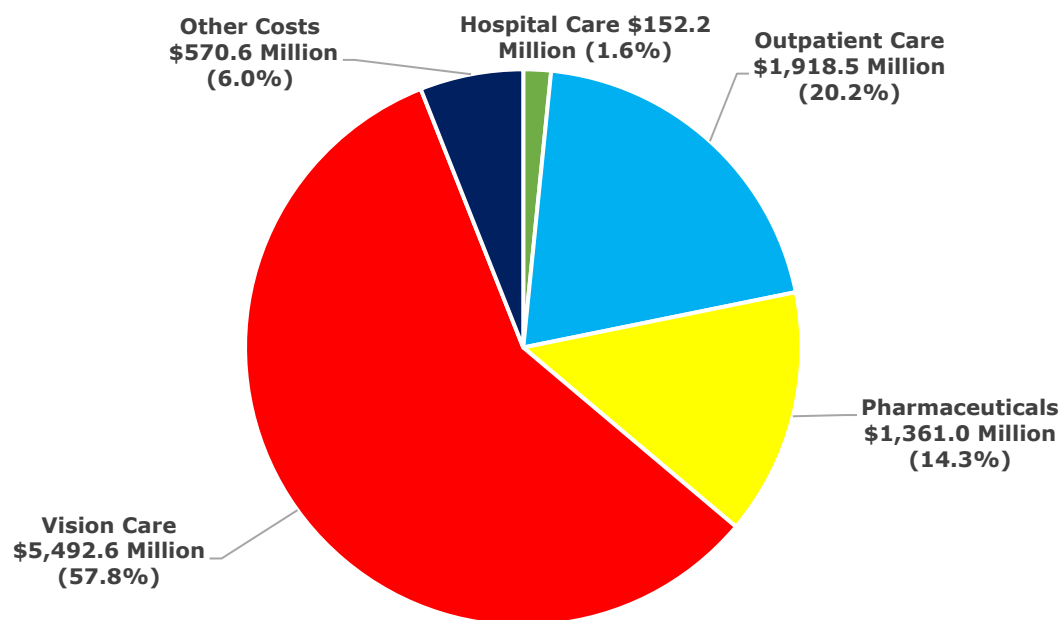
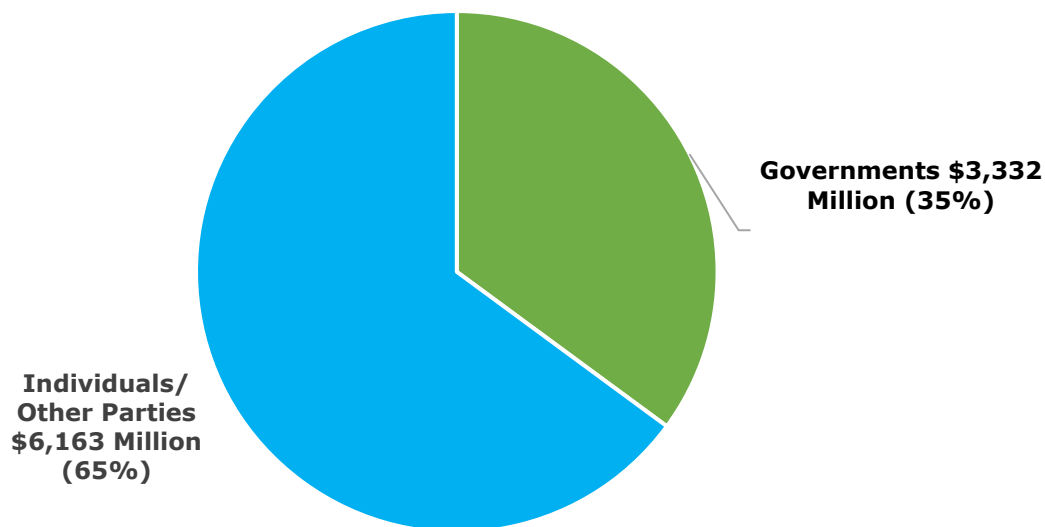


Figure 13: Direct Health Care System Costs of VL by Payer



**Table 1: Direct Health Costs by Component and Province/Territory
(\$ Million)**

Province/ Territory	Hospital Care	Outpatient Care	Pharmaceuticals	Vision Care	Other Costs	Total
British Columbia	18.8	324.6	19.3	841.1	77.0	1,280.8
Alberta	25.7	257.8	21.9	749.6	67.4	1,122.5
Saskatchewan	6.1	67.7	11.1	145.3	14.8	245.0
Manitoba	6.0	54.8	51.9	169.2	18.1	300.0
Ontario	51.8	634.6	813.7	2,228.2	237.7	3,966.0
Quebec	34.2	447.4	380.8	1,058.6	123.0	2,044.1
New Brunswick	2.7	43.3	17.5	95.6	10.2	169.3
Prince Edward Island	0.5	7.0	1.8	19.1	1.8	30.3
Nova Scotia	4.3	47.9	34.6	124.2	13.5	224.5
Newfoundland & Labrador	1.7	25.0	4.3	50.9	5.3	87.3
Northwest Territories	0.2	3.0	2.0	3.9	0.6	9.6
Nunavut	0.1	3.2	1.7	2.8	0.5	8.3
Yukon	0.2	2.3	0.3	4.1	0.4	7.3
Total Canada	152.2	1,918.5	1,361.0	5,492.6	570.6	9,495.0



Cost of Falls

The cost incurred by the Canadian health system in 2019 as a result of falls due to VL is estimated to be \$105.3 million. At least some of this cost can be prevented through falls reduction programs that incorporate vision rehabilitation, thereby reducing this huge burden to individuals and the health system.

Productivity Costs

VL can have a substantial impact on an individual's ability to participate in the workforce. This impact can be quantified through a reduced rate of employment, increased absences from work, and reduced productivity while at work.

Reduced employment is estimated to contribute \$3.2 billion to the overall productivity loss, while reduced productivity while at work accounts for \$381 million and increased absenteeism for \$319 million. The cost of care provided by a spouse, family member, or friend is estimated at \$291 million (Figure 14).

The largest share of the productivity cost is borne by individuals (61%), with governments bearing 22% of the productivity loss. Employers (12%) and family (5%) account for the rest (Figure 15).

Costs associated with productivity loss increase with the severity of VL, with severe VL accounting for 60% of the costs associated with productivity loss (Figure 16).



Figure 14: Productivity Costs Due to VL

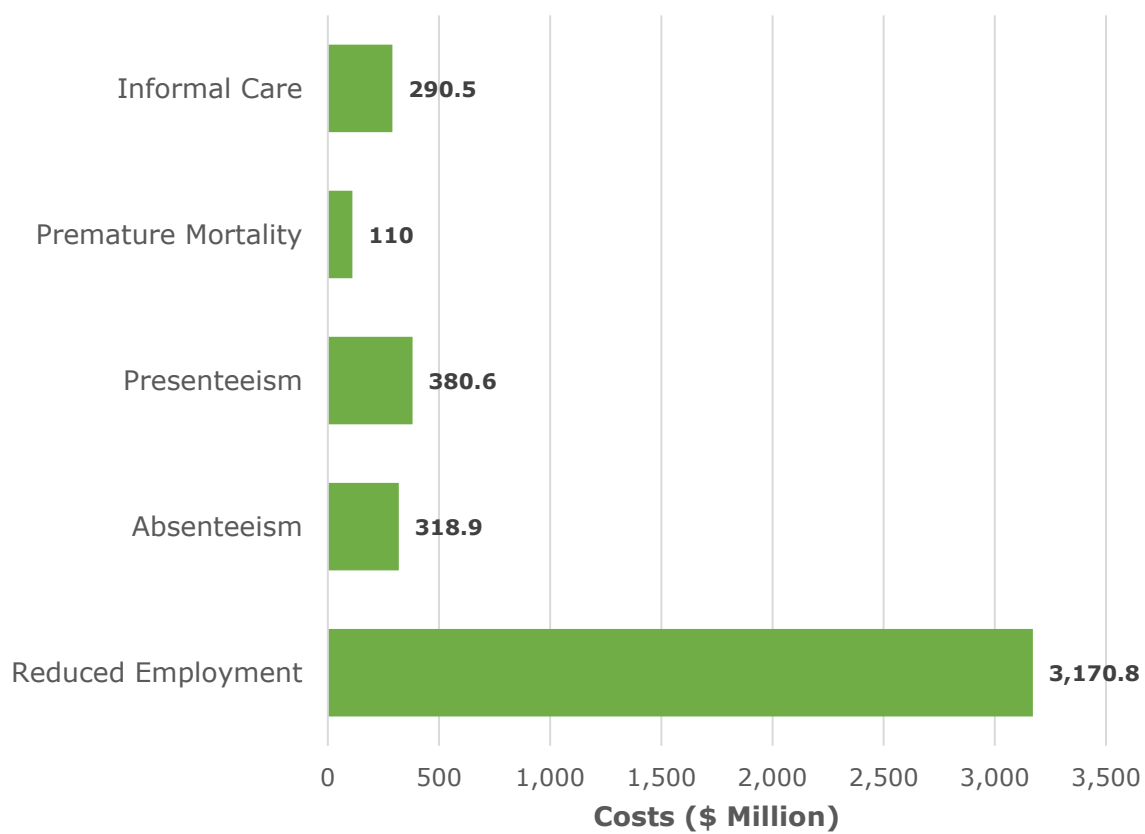


Figure 15: Productivity Costs Due to VL by Bearer

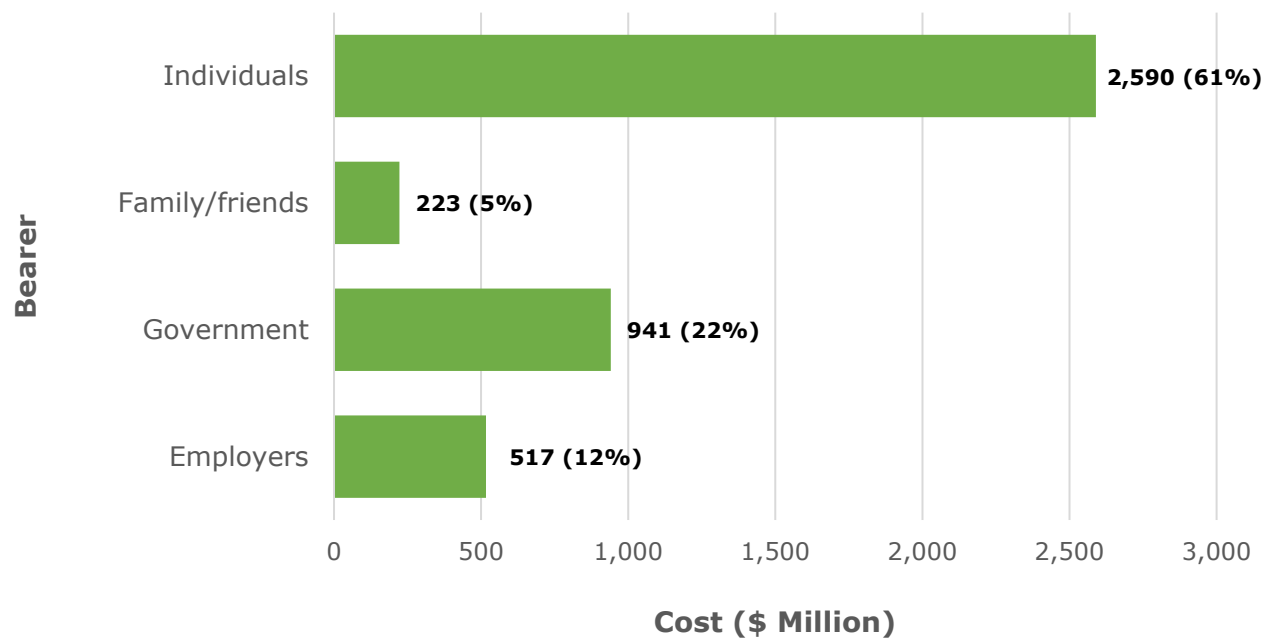
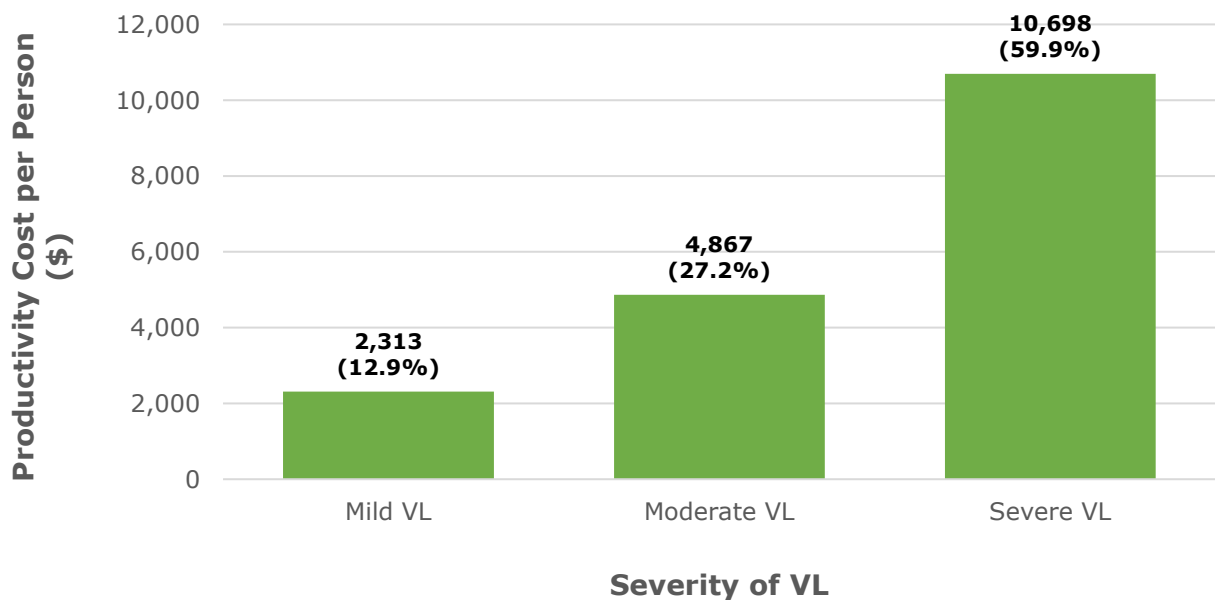


Figure 16: Productivity Costs per Person with VL by Severity of VL



Other Financial Costs Associated with VL

All other financial and economic costs are estimated at \$1.8 billion. These costs include the cost of low vision rehabilitation services (\$84.9 million) and the cost of vision aids, assistive technology, and home modifications (\$166.4 million). The cost of formal care for people with VL is estimated at \$336.6 million and the cost of aged and home care is estimated at \$446.8 million, while economic efficiency losses are estimated at \$769 million (Figure 17).

Almost half the other costs are borne by society as a whole (47.4%) while governments bear 27.2%, individuals bear 24.5%, and family/friends bear 0.9% (Figure 18).

Figure 17: Other Financial and Economic Costs

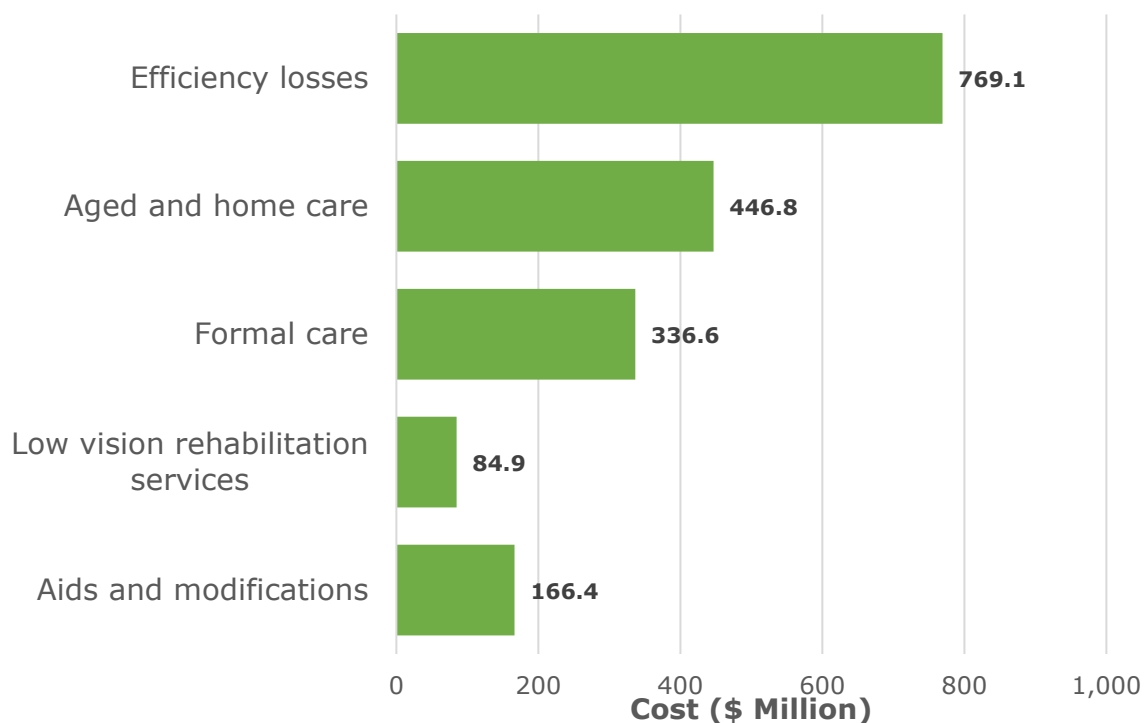
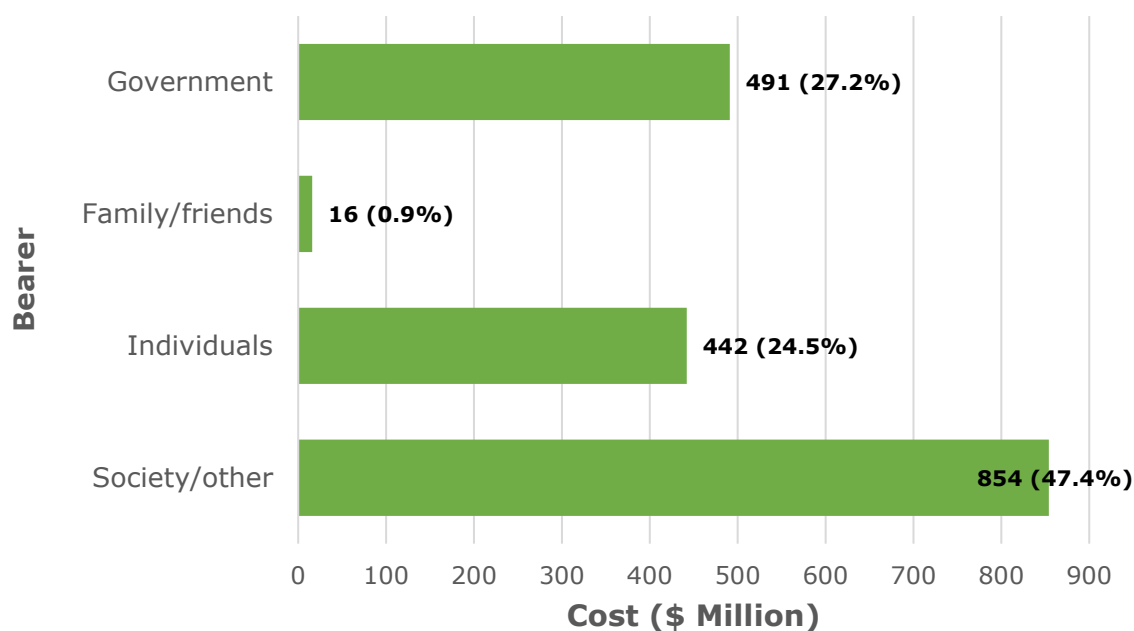


Figure 18: Other Financial Costs Due to VL by Bearer



Loss of Well-Being

Loss of well-being is a measure of the human toll of VL. The total cost of well-being lost in 2019 is estimated to be \$17.4 billion. Calculated in terms of years of healthy life lost due to disability (DALYs), the total overall loss of well-being is 41,613 DALYs, which is greater than that of several other prominent conditions including eating disorders, malignant skin melanoma, and upper respiratory infections.

The magnitude of the loss of well-being increases with age and severity of VL (Figures 19 and 20).



Figure 19: Loss of Well-Being by Age

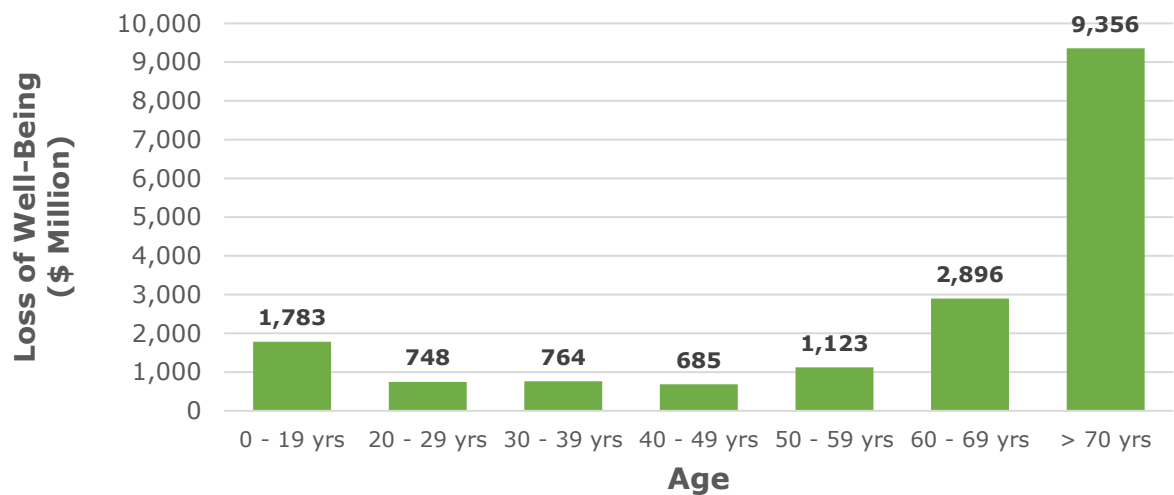
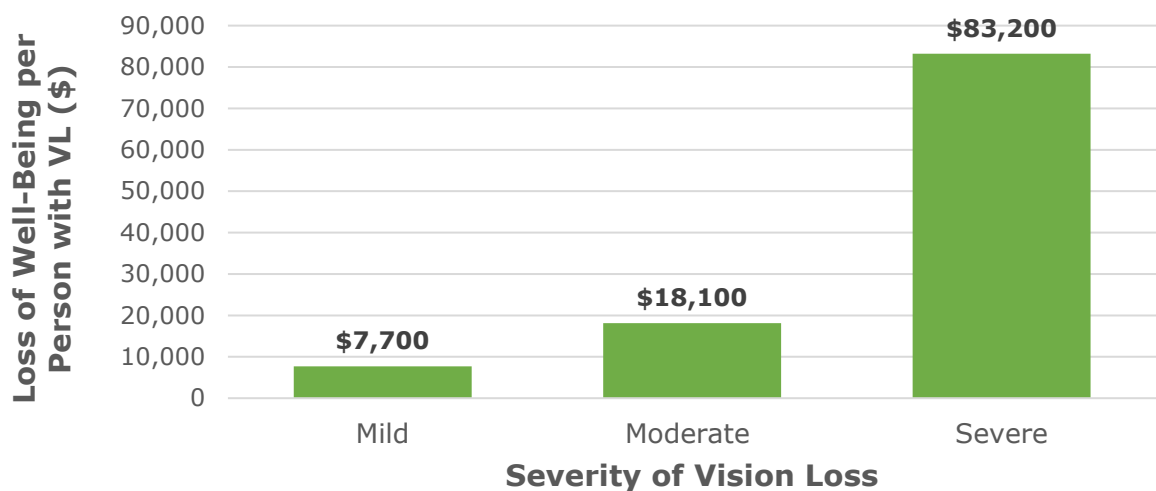


Figure 20: Loss of Well-Being per Person with VL by Severity of VL



Direct Health Costs Compared with Other Major Conditions

The direct health system costs associated with VL are substantial and are greater than those of all cancers, respiratory disorders, and endocrine diseases, of which diabetes is a subset.



F. Conclusions

The evidence generated by this report suggests a number of key takeaways:

Slow the progression of VL: The cost of mild VL is substantially lower than the cost of severe VL. This highlights that each increase in VL severity category comes with a significant increase in financial burden on the individual, government, and society. The aim is therefore to reduce the physical, psychological, and economic impacts associated with a transition from mild and moderate VL to more damaging and costly forms of severe VL. This could be achieved by ensuring individuals receive a holistic approach to care, where eye health is considered an essential element of overall well-being, and by ensuring that services, innovations, and treatments are available to all Canadians in an equitable fashion — that is, regardless of race, gender, socioeconomic status, geography, or other factors. And again, systems, policies, and technologies that facilitate the early detection of VL before it becomes personally and financially catastrophic are essential in this endeavour.

Increasing the scope of and investment into assistive technology and accessibility for those living with VL: Ongoing commitment from corporations and governments to create an overarching environment of inclusion and support for those with VL is crucial. One of the essential ways of doing this is to fully embrace advancements in assistive devices and technologies, and to ensure that those advancements are accessible to all Canadians with VL. Personal technologies — especially smart phones, which have started to replace more traditional assistive technologies — have emerged as invaluable devices for many, whether it be in facilitating navigation and transportation or engaging in online conversations and enjoying books. But the buy-in cost for these and other devices can be extraordinary, blocking many in the VL community from enjoying their benefits. New partnerships and programs that bring the advantages of accessible and assistive technologies to as many Canadians as possible should be a priority. It should also be recognized that accessibility extends far beyond devices and is central to inclusivity developments in urban planning, software development, job creation, and many other domains. It is important that new accessibility movements be



built from the ground up as global ways of thinking and planning that envision accessibility and inclusiveness as foundations in collective projects, not as extraneous additions or afterthoughts. The creation of a truly accessibility society — for not only VL but other conditions as well — will have far-reaching and profound benefits.

Reduce the incidence of eye disease and VL through preventive health:

The development of preventive approaches to eye disease and injury is critical to the elimination of avoidable blindness and VL. Ongoing, population-targeted preventive measures that collectively address the known, modifiable risk factors for eye disease and injury are essential to reducing costs to the individual, government, and society. Greater integration of population-based eye health promotion and coordination of public health promotion activities across Canada will ensure that messages about eye health and risk factors are delivered in a clear and consistent fashion to the Canadian population. Optometrists, ophthalmologists, and researchers emphasize the importance of timely eye examinations. As the onset of eye diseases often increases with age, it is important that individuals receive timely eye examinations and follow the recommended frequency of undergoing an eye examination. Further, public health promotions need to be tailored to the sub-populations they are intended to influence.

Develop a far-reaching, coordinated plan for vision health in Canada:

In 2003, the Canadian government made a commitment to the WHO that it would develop a Vision Health Plan for Canada by 2007 and implement this plan by 2009. To date, no such plan has been developed. This report outlines the economic and prevalence-based scale of the problem of VL in Canada, showing that it is a complex and sizable one. Federal leadership and agenda-setting are required to implement policies that address the issue head on, and that build a framework for coordinated action that will address the multifaceted nature of the issue. A comprehensive and national plan for vision health in Canada is not only desirable, rational, and ethical, but also long overdue.



G. Appreciation

This report was made possible by unconditional grants from many of the vision loss community's key stakeholders, several of Canada's corporate supporters, and a number of Canada's leading research-based pharmaceutical companies. The report's partners would like to express their sincere appreciation and gratitude for the sponsors' generous support, without which this important initiative could not have been accomplished.



H. Research Leads

Keith Gordon, Principal Investigator

Dr. Keith Gordon is the Senior Research Officer of the Canadian Council of the Blind (CCB) and the author of the CCB report “The Impact of the COVID-19 Pandemic on Canadians Who Are Blind, Deaf-Blind, and Partially-Sighted,” published in April 2020.

Dr. Gordon is past Vice President Research of the CNIB and past Research Director of Blind and Low Vision New Zealand. He is also a board member of BALANCE for Blind Adults, and Chair of the Board of the international organization Retina Action.

He is an adjunct professor in the Department of Ophthalmology and Vision Sciences at the University of Toronto and an Honorary Teaching Fellow in the School of Optometry and Vision Science at the University of Auckland in Auckland, New Zealand.

Larissa Moniz, Investigator

Dr. Larissa Moniz joined Fighting Blindness Canada (FBC) in December 2019. She has a Ph.D. in molecular and cancer biology from the University of Toronto and has continued her research in the UK at University College London. Dr. Moniz has worked in research and knowledge translation at a number of health charities, both in the UK and Canada, most recently at Prostate Cancer Canada.

At FBC, Dr. Moniz’s team works to deliver on the mission of the organization, which is to fund research toward treatments to preserve and restore vision, to ensure that all Canadians have access to appropriate vision care, and to provide support and information to individuals living with VL.

Chad Andrews, Investigator

Dr. Chad Andrews is a researcher and writer with a Ph.D. in Cultural Studies. As a consultant and advisor, he works with stakeholders in health science and policy to analyze and comprehend the physical, psychological, and socioeconomic impacts of disease and disability.

Collaborating with patients and patient groups, he has been involved in a number of burden of illness projects that study the personal and social dimensions of vision loss, including an article on patient communication and diabetic macular edema (DME) that was recently published in the *Canadian Journal of Diabetes*.



Dr. Andrews is also active in the humanities, occasionally teaching and publishing in the areas of literature, primarily speculative fiction; policy, especially frameworks that govern the products of technoscience; and political and technological theories.

Michael Baillargeon, Project Co-Lead

Michael Baillargeon is Senior Advisor, Government Relations and Special Projects for the Canadian Council of the Blind (CCB). Over the last 16 years, he has been an advisor to and advocate for the VL community. He has played a key role on a wide range of issues before the Council, including being publisher of *White Cane Week Magazine* and managing White Cane Week events.

Most recently, Baillargeon project-managed CCB studies on accessible technology and assistive devices, as well as the Survey Report on the Impact of COVID-19 on People with Vision Loss in 2020. Through advocacy and research, Baillargeon is dedicated to building public awareness and improving the well-being and quality of life of those living with VL. Baillargeon is proud of his efforts with the CCB to dismantle barriers to accessibility and to change what it means to be blind.

Doug Earle, Project Co-Lead

Doug Earle joined Fighting Blindness Canada (FBC) in December 2018 as President and CEO. Since then, he has been leading FBC through a transformation to accelerate research into all blinding eye diseases in order to discover treatments and cures for blindness, and to improve access to innovative gene and cell therapies and medications. Earle co-chaired the Canadian Vision 2020-21 Summits with Michael Baillargeon, consulting the community to identify its advocacy agenda in these symbolic years.

Over Earle's 30-year career, he has served in progressively more senior roles at five health charities, two hospitals, two universities, and TVOntario public television. He played instrumental roles in the advocacy that led to the Krever Commission of Inquiry on the Blood System in Canada and compensation for people living with HIV and hepatitis C through tainted blood, and has worked with philanthropists to fund millions in medical research and other projects.



I. Endnotes

ⁱ Klein BEK, Moss SE, Klein R, Lee KE, Cruickshanks KJ. Associations of Visual Function with Physical Outcomes and Limitations 5 Years Later in an Older Population. *Ophthalmology* 2003;110:644-650

ⁱⁱ Ehrlich JR, Ramke J, Macleod D et al, 'Association between vision impairment and mortality: a systematic review and meta-analysis' (2021) S2214-109X(20) *The Lancet Global Health* 20549.

ⁱⁱⁱ Gordon KD, Cruess AF, Bellan L, Mitchell S, Pezzullo ML. The Cost of Vision Loss in Canada 1. Methodology. *Can. J Ophthalmol* 2011. 46: 310-314.

^{iv} Cruess AF, Gordon KD, Bellan L, Mitchell S, Pezzullo ML. The Cost of Vision Loss in Canada 2. Results. *Can. J Ophthalmol* 2011. 46: 315 – 318.

^v A BCVA standard was used instead of presenting vision (PV). With PV, acuity is measured with whatever refractive correction (glasses, contacts, etc.) the patient is currently using. In some cases, this will not be the best correction (not BCVA), and as a result the measured acuity will be lower than BCVA. What BCVA misses, then, are those individuals who have vision loss before an ideal correction. This is meaningful, especially for low-income and marginalized communities where corrective measures are either not available or not ideal. That said, this study uses data from the National Health and Nutrition Examination Survey (NHANES) run by the Centers for Disease Control and Prevention (CDC), where BCVA is the preferred approach. This is an excellent source of data for vision loss studies, but it must be recognized that BCVA excludes individuals with vision loss stemming, at least partly, from uncorrected refractive error, and therefore underestimates the total number of individuals living with VL.

^{vi} Institute for Health Metrics and Evaluation, Global Burden of Disease Study 2019 (2020) <http://ghdx.healthdata.org/record/ihme-data/gbd-2019-disability-weights>, accessed 12 March 2021.

^{vii} Statistics Canada. Population estimates on July 1st, by age and sex. Available at <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1710000501&pickMembers%5B0%5D=1.1&pickMembers%5B1%5D=2.1&cubeTimeFrame.startYear=2019&cubeTimeFrame.endYear=2019&referencePeriods=20190101%2C20190101> Accessed 26 March, 2021.

^{viii} Brien Holden et al, 'Global Prevalence of Myopia and High Myopia and Temporal Trends from 2000 through 2050' (2016) 123(5) *Ophthalmology* 1036.

^{ix} Tiffany Chan et al, 'Estimates of Incidence and Prevalence of Visual Impairment, Low Vision, and Blindness in the United States' (2018) 136(1) *JAMA Ophthalmology* 12.

^x Yang M, Luensmann D, Fonn D, Woods J, Jones D, Gordon K, Jones LW. Myopia prevalence in Canadian schoolchildren: a pilot study. *Eye* (2018) doi:10.1038/s41433-018-0015-5

^{xi} Ontario Association of Optometrists (2015) Optimizing Optometry's Role in Ontario Better care, better value... closer to home. Toronto

^{xii} Retina Action. What is age-related Macular Degeneration? Available at: <https://retinaaction.org/amd-toolkit/> Accessed March 28th, 2021.





The Cost of Vision Loss and Blindness in Canada