



Children's Vision Screening and Comprehensive Eye Examinations

Vision Impairment in Childhood

Revised: July 19, 2024

Vision impairment in childhood is common (Abdolalizadeh). In high-income countries, refractive error, amblyopia, and strabismus are the leading issues affecting young children's eyesight (Silverstein, Varma, Pai). Studies from the United States and Australia have shown that the majority of young children with vision impairment (69-76%) have a refractive error, while amblyopia and strabismus affect 25-43% and 6-16%, respectively (Silverstein, Varma, Pai). Astigmatism and hyperopia are the most common refractive errors (Pai).

Limited evidence from available small Canadian studies aligns with international research. According to these studies, 10% to 14% of young children have vision impairment, primarily caused by refractive errors such as astigmatism and hyperopia, followed by amblyopia and strabismus (Drover, Nishimura). Myopia is also a common refractive error that increases with age. The incidence of myopia among children is increasing at a fast pace, and so is the risk of visual impairment from certain associated conditions such as retinal detachment, maculopathy and cataracts. A 2018 study in Ontario revealed that the prevalence of myopia was 6% among children aged six to eight years and 30% among children aged 11 to 13 years (Yang).

Vision impairment can negatively impact children's academic performance (Mavi), educational attainment, social interactions with peers, self-esteem, and self-image (Carlton). Early childhood is a critical period for visual development (Burton.) It is essential for children to receive appropriate vision and eye care to ensure optimal visual functioning, eye health, and quality of life.

Issue

Improvements can be made to children's vision screening programs. Current public and school screening programs in Canada lack standardization, and there is a paucity of empirical evidence to attest to their efficacy and cost-effectiveness.

Vision Screening

Vision screening programs aim to identify children with risk factors and refer them to an eye care professional for further examination, diagnosis, and treatment. Typically, this screening is carried out before children start primary school since early detection has been shown to result in better outcomes. Particularly, treatment for amblyopia is most effective when administered to children between the ages of three and six years (Holmes). Furthermore, young children may not communicate their visual issues or exhibit symptoms that can be recognizable by parents, caregivers, and teachers. Vision screening is acceptable to preschool children (Nishimura). This can make screening a valuable preventative tool.

Primary care providers conduct well-baby and child visits for children up to five years of age. These could be part of the Rourke Baby Record and, in Quebec, the ABCDaire (Rourke, CHU Sainte-Justine). These screening procedures involve various tests, such as the red reflex test for serious ocular diseases, the cover/uncover test for strabismus, and visual acuity tests at ages three to five years (Rourke, CHU Sainte-Justine).

Limitations of Vision Screening

This position statement focuses on screening programs carried out in schools or in the community which are aimed at identifying potential risk factors for amblyopia, strabismus, and refractive errors, rather than more serious ocular diseases. These programs lack standardization, with variations in target age groups and screening protocols observed across provinces (MOHTLC, Manitoba). Furthermore, not all provinces provide such programs. Quebec offers a unique vision screening program called École de la Vue, through which optometrists deliver a nearly complete comprehensive eye exam to kindergarten children directly in schools (Fondation des maladies de l'œil).

The following are some limitations of children's vision screening programs which should be considered when designing and implementing such programs:

- **Limited evidence of efficacy:** Even though programs, such as École de la Vue in Quebec (Fondation des maladies de l'œil), have noted success, evidence to support the efficacy of children's vision screening remains limited. Systematic reviews on children's vision screening programs have yet to determine whether such programs improve outcomes (Jonas, PHO, NIPH).
- **Screening tools have varying degrees of accuracy:** The accuracy of screening tools can differ depending on factors such as the type of tool used and the population screened (Nishimura) (See Appendix A). False positives are common and can lead to unnecessary referrals (Jonas). There is also insufficient evidence to demonstrate the accuracy of community screening conducted by non-expert screeners to detect strabismus in children between the ages of one and six years (Hull)
- **Compliance issues:** School vision screening programs often face challenges with compliance. Not all children eligible for vision screening participate in such programs or receive follow-up care. One study from Ontario revealed that programs that rely on passive consent resulted in an average of 64% of eligible children being screened (Nishimura). Another study in the United States found that 20-50% of children identified for follow-up and referred to an eye care provider received such care (Shakarchi). Another study from the United States found that two-thirds of school districts studied had follow-up rates of between 20% and 50% (Ly). Furthermore, research in Ontario has shown that approximately one-third of students who are referred for eye care do not receive it (Wang, Nishimura). Programs that offer comprehensive in-school examinations by an optometrist following vision screening may improve compliance. (Kruszewski, Griffith).
- **May exacerbate socioeconomic disparities:** Vision screening has the potential to create social disparities (AOA), as children from more socially deprived areas may be at a higher risk of vision problems but may face barriers to accessing eye care. School districts with high concentrations of Black students and students living in poverty may have significantly lower follow-up rates (Ly).
- **Potential misunderstanding of the purpose of screening:** Without proper education, parents may confuse vision screening for comprehensive eye examinations (Schmalzried) and forego further care for their children.

Children's Comprehensive Eye Exam

A comprehensive eye examination conducted by an optometrist allows for a full oculo-visual assessment of a child's vision and eye health. Unlike vision screening, comprehensive eye examinations allow for the diagnosis of conditions including amblyopia, strabismus, and uncorrected refractive error, as well as more serious conditions like cataracts and retinoblastoma (Delporo). Optometrists can also refer children to specialists if the needed care falls beyond their scope of practice (Delporo).

Although comprehensive eye examinations are essential for maintaining vision and eye health, many children do not receive them in accordance with Canadian frequency guidelines. A 2018 study of a cohort of Ontario children found that 35% of children with myopia were uncorrected (Yang).

Effectively communicating the results of the oculo-visual assessment to caregivers and educating them about their child's visual status and the signs or symptoms to monitor are essential components of the comprehensive eye examination process.

Policy Position

Vision issues, such as refractive errors, amblyopia, and strabismus, significantly affect the health and development of children in Canada and worldwide. The prevalence of these conditions underscores the critical need for effective vision care strategies that ensure prevention, early detection, and treatment.

The Canadian Association of Optometrists recognizes that well-planned and appropriately executed vision screening programs can serve as a tool for the early detection of vision-related issues in children. The Canadian Association of Optometrists also recognizes that inadequate protocol standardization, training of screeners, and documentation contribute to decreased efficacy, compliance, cost-effectiveness, and quality of evidence.

The Canadian Association of Optometrists calls for a comprehensive approach to pediatric vision care that enhances the effectiveness of vision screening while ensuring access to comprehensive eye examinations for all children. This approach should include the following elements:

Integration of Vision Screening and Comprehensive Eye Care: We call for the development of a model that seamlessly integrates vision screening within a broader framework of pediatric eye care. This model should ensure that screening is not an isolated intervention but is part of a continuum of care that includes prompt referrals, comprehensive eye examinations, and treatment and follow-up as needed.

Engagement of trained professionals, especially optometrists, in the planning and executing screening programs to ensure that children receive the necessary care at the primary level, as well as referral to specialized services when indicated.

Parental and community education to increase awareness among parents, caregivers, and communities is essential about the importance of early detection and treatment of vision issues. Educational efforts should clarify the difference between vision screening and comprehensive eye examinations and promote the benefits of timely eye care.

Standardization of protocols: We call for developing and implementing national screening protocols to address the variability and lack of standardization in current screening practices. These protocols should be evidence-based and adaptable to the needs of diverse communities and populations.

The Canadian Association of Optometrists cautions against conflating vision screening with the comprehensive eye exam, which every child must undergo in accordance with the current frequency guidelines (Appendix C), regardless of whether they have been screened at school or in the community.

Appendix A: Accuracy of Five Vision Screening Tools

Screening Tool	Sensitivity	Specificity	Positive Predictive Value	Negative Predictive Value
Combination of all five tools	84%	50%	37%	90%
Cambridge crowded acuity	59%	73%	44%	83%
Randot preschool	33%	90%	55%	79%
Plusoptix photoscreener	64%	88%	65%	87%
Spot photoscreener	60%	93%	76%	86%
Pediatric vision scanner	41%	77%	38%	78%

Appendix B: National Guideline on Children’s Vision Screening from birth to five years of age (Delporo)

Guideline	Age Group	Recommendation
<i>Evidence-based clinical practice guidelines for the periodic eye examination in children aged 0-5 years in Canada (2019) (Delporo)</i>	Infants and Children (0-5 years)	Routine age-appropriate screening as recommended by Rourke and ABCDaire (red reflex test, cover/uncover test, and visual acuity) of infants and children by a primary health care provider or pediatrician should continue.
		If an infant or child is identified with an abnormality, they should be referred to the appropriate eye care professional.
		In addition to age-appropriate screening, children aged 0-5 years should undergo ocular assessment by an individual with the expertise to detect risk factors for amblyopia. <ul style="list-style-type: none"> • Ideally, the ocular assessment should occur by age 3 years. • The ocular assessment should include refraction and ocular motility evaluation.

Appendix C: Canadian Association of Optometrists Frequency of Comprehensive Eye Examinations Guideline (Robinson)

Age Group	Recommendation
Infants and Toddlers (Birth to 24 months)	Infants and toddlers should undergo their first eye examination between the ages of 6 and 9 months
Preschool Children (2 to 5 years)	Preschool children should undergo at least one eye examination between the ages of 2 and 5 years.
School Age Children (6 to 19 years)	School children aged 6 to 19 years should undergo an eye examination annually.

References

1. Abdolizadeh, P., Chaibakhsh, S., & Falavarjani, K. G. (2021). Global burden of paediatric vision impairment: A trend analysis from 1990 to 2017. *Eye*, 35(8), 2136-2145. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8302648/>
2. Silverstein, M., Scharf, K., Mayro, E. L., Hark, L. A., Snitzer, M., Anhalt, J., ... & Levin, A. V. (2021). Referral outcomes from a vision screening program for school-aged children. *Canadian Journal of Ophthalmology*, 56(1), 43-48. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S000841822030658X>
3. Varma, R., Tarczy-Hornoch, K., & Jiang, X. (2017). Visual impairment in preschool children in the United States: demographic and geographic variations from 2015 to 2020. *JAMA Ophthalmology*, 135(6), 610-616. Available from: <https://jamanetwork.com/journals/jamaophthalmology/fullarticle/2624762>
4. Pai, A. S. I., Wang, J. J., Samarawickrama, C., Burlutsky, G., Rose, K. A., Varma, R., ... & Mitchell, P. (2011). Prevalence and risk factors for visual impairment in preschool children: the Sydney Paediatric Eye Disease Study. *Ophthalmology*, 118(8), 1495-1500. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0161642011000601>
5. Drover, J. R., Kean, P. G., Courage, M. L., & Adams, R. J. (2008). Prevalence of amblyopia and other vision disorders in young Newfoundland and Labrador children. *Canadian Journal of Ophthalmology*, 43(1), 89-94. Available from: https://www.researchgate.net/profile/Mary-Courage/publication/5646123_Prevalence_of_amblyopia_and_other_vision_disorders_in_young_Newfoundland_and_Labrador_children/links/00463536a4c54176e6000000/Prevalence-of-amblyopia-and-other-vision-disorders-in-young-Newfoundland-and-Labrador-children.pdf
6. Nishimura, M., Wong, A., Dimaras, H., & Maurer, D. (2020). Feasibility of a school-based vision screening program to detect undiagnosed visual problems in kindergarten children in Ontario. *Canadian Medical Association Journal*, 192(29), E822-E831. Available from: <https://www.cmaj.ca/content/192/29/E822>
7. Yang, M., Luensmann, D., Fonn, D., Woods, J., Jones, D., Gordon, K., & Jones, L. (2018). Myopia prevalence in Canadian school children: a pilot study. *Eye*, 32(6), 1042-1047. Available from: <https://pubmed.ncbi.nlm.nih.gov/29391573/>
8. Mavi, S., Chan, V. F., Virgili, G., Biagini, I., Congdon, N., Piyasena, P., ... & Little, J. A. (2022). The impact of hyperopia on academic performance among children: a systematic review. *The Asia-Pacific Journal of Ophthalmology*, 11(1), 36-51. Available from: https://journals.lww.com/apjoo/Fulltext/2022/02000/The_Impact_of_Hyperopia_on_Academic_Performance.7.aspx?context=LatestArticles
9. Carlton, J., & Kaltenthaler, E. (2011). Amblyopia and quality of life: a systematic review. *Eye*, 25(4), 403-413. Available from: <https://www.nature.com/articles/eye20114>
10. Burton, M. J., Ramke, J., Marques, A. P., Bourne, R. R., Congdon, N., Jones, I., ... & Faal, H. B. (2021). The Lancet global health commission on global eye health: vision beyond 2020. *The Lancet Global Health*, 9(4), e489-e551. Available from: [https://www.thelancet.com/journals/langlo/article/PIIS2214-109X\(20\)30488-5/fulltext](https://www.thelancet.com/journals/langlo/article/PIIS2214-109X(20)30488-5/fulltext)
11. Holmes, J. M., Lazar, E. L., Melia, B. M., Astle, W. F., Dagi, L. R., Donahue, S. P., ... & Pediatric Eye Disease Investigator Group. (2011). Effect of age on response to amblyopia treatment in children. *Archives of Ophthalmology*, 129(11), 1451-1457. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3217111/>
12. Rourke, L., Leduc, D., & Rourke, J. (2020, Jan 22). *Rourke baby record: evidence-based infant/child health maintenance*. Available from: <https://www.rourkebabyrecord.ca/pdf/RBR%202020%20NAT-EN-3vpp-TEAL-2020-Apr-29.pdf>
13. CHU Sainte-Justine. (2022, Dec). *ABCDaire: suivi collaborative des 0 à 5 ans*. Available from: <https://enseignement.chusj.org/ENSEIGNEMENT/files/27/277f8466-db3b-4f9d-b3af-f13bdb6b411e.pdf>
14. Ministry of Health and Long-Term Care. (2018). *Child visual health and vision screening protocol, 2018*. Queen's Printer for Ontario: Toronto. Available from: https://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/protocols_guidelines/Child_Visual_Health_and_Vision_Screening_Protocol_2018_en.pdf

15. Manitoba Education and Training Inclusion Support Branch. (2019). *Vision screening in Manitoba schools*. Available from: https://www.edu.gov.mb.ca/k12/specedu/blind/viscreening/vision_screening_manual.pdf
16. Fondation des maladies de l'œil. (2023). *Historique*. Available from: <https://lecoledelavue.ca/fr/historique>
17. Jonas, D. E., Amick, H. R., Wallace, I. F., Feltner, C., Vander Schaaf, E. B., Brown, C. L., & Baker, C. (2017). Vision screening in children aged 6 months to 5 years: evidence report and systematic review for the US Preventive Services Task Force. *Journal of the American Medical Association*, 318(9), 845-858. Available from: <https://pubmed.ncbi.nlm.nih.gov/28873167/>
18. Public Health Ontario. (2016). *Effectiveness of vision screening programs for children aged one to six years*. Toronto, ON: Queen's Printer for Ontario. Available from: https://www.publichealthontario.ca/-/media/Documents/V/2016/vision-screening-effectiveness.pdf?sc_lang=en
19. Norwegian Institute of Public Health. (2018). *Systematic review: vision screening in children under the age of 18*. Available from: <https://www.fhi.no/globalassets/dokumenterfiler/rapporter/2018/vision-screening-in-children-under-the-age-of-18-report-2018.pdf>
20. Kruszewski, K., May, C., & Silverstein, E. (2023). Evaluation of a combined school-based vision screening and mobile clinic program. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 27(2), 91-e1. Available from: <https://www.sciencedirect.com/science/article/pii/S1091853123000472>
21. Griffith, J. F., Wilson, R., Cimino, H. C., Patthoff, M., Martin, D. F., & Traboulsi, E. I. (2016). The use of a mobile van for school vision screening: results of 63 841 evaluations. *American Journal of Ophthalmology*, 163, 108-114. <https://www.sciencedirect.com/science/article/abs/pii/S0002939415007291>
22. Hull, S., Tailor, V., Balduzzi, S., Rahi, J., Schmucker, C., Virgili, G., & Dahmann Noor, A. (2017). Tests for detecting strabismus in children aged 1 to 6 years in the community. *Cochrane Database of Systematic Reviews*, (11). Available from: <https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD011221.pub2/full?highlightAbstract=vision%7Cscreen%7Cscreening>
23. Shakarchi, A. F., & Collins, M. E. (2019). Referral to community care from school-based eye care programs in the United States. *Survey of Ophthalmology*, 64(6), 858-867. Available from: <https://www.sciencedirect.com/science/article/pii/S0039625718302248>
24. Ly, V. V., Elhusseiny, A. M., Cannon, T. C., & Brown, C. C. (2023). Race, poverty, and the lack of follow-up for Arkansas students that fail vision screenings: a cross-sectional study over 7 years. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 27(3), 129.e1-e6. Available from: [https://www.jaapos.org/article/S1091-8531\(23\)00081-2/fulltext](https://www.jaapos.org/article/S1091-8531(23)00081-2/fulltext)
25. Wang, P., Bianchet, S., Carter, M., Hopman, W., & Law, C. (2023). Utilization and barriers to eye care following school-wide pediatric vision screening. *Canadian Journal of Ophthalmology*, 58(5), 465-471. Available from: <https://www.sciencedirect.com/science/article/abs/pii/S0008418222001272>
26. Asare, A. O., Maurer, D., Wong, A. M., Saunders, N., & Ungar, W. J. (2023). Cost-effectiveness of Universal School- and Community-Based Vision Testing Strategies to Detect Amblyopia in Children in Ontario, Canada. *JAMA Network Open*, 6(1), e2249384-e2249384. Available from: https://jamanetwork.com/journals/jamanetworkopen/articlepdf/2800002/asare_2023_oi_221400_1671470060.22764.pdf
27. American Optometric Association. (2021, April). *The misnomer "vision screening" is interfering with children receiving essential vision care in the U.S*. Available from: <https://www.aoa.org/AOA/Documents/Advocacy/HPI/Misnomer%20E2%80%9CVision%20Screening%E2%80%9D%20Interfering%20with%20Children%20Receiving%20Vision%20Care.pdf>

28. Schmalzried, H. D., Gunning, B., & Platzer, T. (2015). Creating a school-based eye care program. *Journal of School Health*, 85(5), 341-345. Available from: https://www.researchgate.net/profile/Hans-Schmalzried/publication/274641978_Creating_a_School-Based_Eye_Care_Program/links/5e52a403a6fdcc2f8f5d65d9/Creating-a-School-Based-Eye-Care-Program.pdf
29. Delpero, W. T., Robinson, B. E., Gardiner, J. A., Nasmith, L., Rowan-Legg, A., & Tousignant, B. (2019). Evidence-based clinical practice guidelines for the periodic eye examination in children aged 0–5 years in Canada. *Canadian Journal of Ophthalmology*, 54(6), 751-759. Available from: https://www.cos-sco.ca/wp-content/uploads/2020/08/54-6_EyeExamGuidelines_EN.pdf
30. Robinson, B. E., Stolee, P., Mairs, K., Santi, S., & Glenny, C. (2019). Review of the Canadian Association of Optometrists frequency of eye examinations guideline – summary. *Canadian Journal of Optometry*, 73(4), 15. Available from: <https://openjournals.uwaterloo.ca/index.php/cjo/article/view/582>