

# Vision disorders in Ohio's children: Vision screenings vs. comprehensive eye exams



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Policy Proposal  
March 29, 2019

## Abstract

Childhood vision loss is a significant public health problem. It is estimated that one-third of all children suffer from a vision disorder [1-3]. Uncorrected refractive error is considered the leading cause of vision disorders in children [4-6]. Refractive errors when left uncorrected in children place them at higher risk for amblyopia (lazy eye) and strabismus (eye turn) [7]. An estimated 12.8 million children 5 to 15 years of age worldwide are affected by uncorrected refractive error [8]. The recognition of any refractive error in children is a major step in preventing childhood vision loss. Uncorrected refractive error can place significant burden on the individual. School-age children represent a particularly vulnerable group, as uncorrected refractive error may have a dramatic impact on learning capability and education potential. With almost a quarter of Ohio's population under the age of 18, there are over 2.6 million children who are potentially affected [9].

### Vision Disorders in Children: The Problem

Vision plays a vital role in a child's interpretation of the world. Visual impairment severely impacts a child's emotional and physical development [10]. Vision loss is associated with a substantial and measurable reduction in quality of life [11, 12], and while the proportion of visually impaired children is far lower than older adults, the impact of visual impairment during this critical period of social, physical and educational development is likely to be greater [10]. There are many children suffering from vision disorders in the United States and Ohio, specifically. It can be estimated that approximately 24 million children in the U.S., and about 1 million children in Ohio have a vision disorder [1-3, 9, 13]. If left undetected or untreated, these vision disorders can lead to significant delays and deficiencies in educational milestones, as well as learning abilities. How can we be sure all children with vision disorders are detected and offered treatment?

### Vision Disorders in Children: The Evidence

The most common forms of vision disorders in children are refractive in nature. Refractive errors include myopia (near-sightedness), hyperopia (far-sightedness) and astigmatism. It has been reported the prevalence of myopia in children between 0-72 months is 2%-7%, the prevalence

of hyperopia in the same age range is between 10%-32%, and the prevalence of astigmatism is 5%-19% [14]. In school aged children 6-18 years of age, the prevalence of myopia increases to about 15% while hyperopia and astigmatism remain similar [15]. These disorders if detected in a comprehensive eye exam are treatable with eyeglasses and/or contact lenses. However, 79% of children have not visited an eye care provider in the past year and 35% have never seen an eye care professional [16, 17]. Other vision disorders commonly found in children include amblyopia, strabismus and binocular vision dysfunction. These disorders have been shown to be associated with poor reading and other poor school outcomes [18].

Often times, children do not know they have a vision disorder because they do not know their vision to be any other way. Therefore, it is important to establish a policy to ensure that vision disorders are detected as early as possible in children and treated to minimize the problems and delays associated with undiagnosed vision disorders. Vision disorders in children can be detected in varying ways, however the definitive diagnosis is usually made through an exam with an optometrist or ophthalmologist.

Research suggests that children are being screened at low rates and those screened often do not receive the necessary follow-up assessments and treatment services

[19]. Furthermore, there is currently a wide variation in the requirements for child vision screening and examinations before entry to school and during their school years. Although the majority of states require some type of vision screening for children in public school settings, they often fail to identify or require methodologies that meet or exceed the sensitivities and specificities of the National Eye Institute's Vision in Preschoolers Study or programmatic elements that assure necessary follow-up examination.

Even though universal comprehensive eye exams for children before entry to school would result in many more children being diagnosed and successfully treated for various eye diseases, only three states (Kentucky, Missouri and Illinois) have mandated eye examinations for preschool children. Unfortunately, the states do not follow the same protocol, and different states use various terminology for different test methods. Though guidelines exist and many states require screening or eye exams, the vague terminology used when describing laws, legislation, and requirements, does not readily address questions about the implementation of such guidelines for all children [20].

Eye and vision disorders can impose a significant burden on patients, parents, and the public. The total economic cost of vision loss and eye disorders among children younger than 18 years of age in 2012 was estimated to be \$5.9 billion [21]. This includes the direct medical costs for eye examinations, eyeglasses, and low vision aids. Also, the debilitating nature of vision loss results in major indirect and nonmedical costs, including special education services, federal assistance programs, and decreased quality of life. The average reimbursement for an eye examination in Ohio is \$47 [22], making the average annual cost \$6.5M to examine every entering kindergartener. However, the exact cost to Ohio and its citizens is difficult to estimate due to the wide range of insurance providers and payment arrangements between patients, insurance companies, and providers.

### **Vision Screenings: The Concerns**

Vision screenings have been used as a diagnostic tool for identifying child vision problems for over a century, as the first school vision screening program was implemented in Connecticut in 1899 [23]. Many studies, however, have shown that vision screenings have high error rates and/or documented that many children identified in the

screening process do not receive follow-up care [24, 25]. There is much controversy about the validity and effectiveness (e.g., sensitivity and specificity) of vision screening by various providers, especially compared with comprehensive eye and vision examinations for preschool and school-age children [26].

Another concern with vision screenings is that they are not standardized. The quality and frequency of vision screenings vary by individual site or screener [27]. The public, and, most importantly, parents and teachers, believe that vision screenings can accurately identify those children who need a comprehensive eye exam. This frequently creates a false sense of security. A vast majority of children's vision screenings have high rates of false negatives, failing to adequately detect signs of significant vision problems in children chronically burdened by these difficulties. A study done in Kentucky in 2003, where mandatory comprehensive eye exams for children became law in 2000, showed that a large majority of children diagnosed with vision problems (86% of the amblyopes (lazy eye), 80% of the strabismic (eye turn), and 84% of those needing a lens prescription) had visited their primary care clinician (a pediatrician or a family practitioner) the prior year of the vision examination and the diagnoses were not caught during the screenings [28, 29].

The largest study to date that tests the effectiveness of screening tests on detecting vision disorders was the Vision in Preschoolers Study (VIP) from 2004 -2005 and was funded by the National Eye Institute (NEI). The results of the VIP study showed that even trained professionals using screening procedures can fail to detect vision disorders in up to one third of children [30]. Due to this study, there has been more importance placed on the value of comprehensive eye exams in detecting children's vision problems and eye diseases. There have been several professional organizations who have come out in support of children's eye exams before they enter school, including the American Academy of Pediatrics, the American Association of Pediatric Ophthalmology and Strabismus, the American Academy of Ophthalmology and the American Society of Certified Orthoptists. A joint statement issued by these organizations states: "eye examination and vision assessment are vital for the detection of conditions that result in blindness, signify serious systemic disease, lead to problems with school performance, or worse, threaten the child's life" [31]. The American Optometric Association's position is that every

child should receive a comprehensive eye and vision prior to entering school [32]. The American Public Health Association recommends a regular comprehensive eye examination schedule as opposed to just screening so that all children have exams performed at approximately age 6 months, 2 years, and 4 years [33].

### **Policy Solution: Mandatory Children’s Eye Exams**

A proposed solution would be to mandate comprehensive eye examinations by an optometrist or ophthalmologist before a child enters school in Ohio. The protocol for a pediatric eye examination to detect vision disorders is well established [34]. Comprehensive pediatric eye and vision examinations are essential for timely diagnosis and treatment of eye disease and maintenance of good vision. A comprehensive eye examination by a doctor of optometry or ophthalmologist is the reference standard of eye care [35].

The facilitation of such a mandate could utilize the existing infrastructure of practicing optometrists and ophthalmologists across the state. A reporting system would need to be created, as well as an informational network, to promote the mandate to school systems and parents statewide. The eye examination report would be added to the necessary paperwork to enroll with a school system and become a part of a child’s school file.

A factor that may limit access to comprehensive eye and vision examinations and treatment services is the inability of parents/caregivers to afford needed services due to lack of insurance coverage or limited family income [36]. Limited access due to cost may now be partially resolved because comprehensive eye and vision examinations have received increased attention from the Affordable Care Act and other insurance programs that review essential health benefits necessary for children. Political feasibility for such a mandate could be difficult due to limited comparable models implemented nationally and the relatively volatile public response to healthcare mandates. However, Ohio can look to its border state, Kentucky, for a successful precedent.

### **Recommendation**

The objective of this policy is to detect and treat vision disorders in children before they enter school. A comprehensive eye exam by an optometrist or ophthalmologist for every child in Ohio before they begin kindergarten is perhaps the best way to do this. A precedent of this type was established in Kentucky in 2000 to address the high rates of vision problems limiting young Kentuckians’ ability to learn and succeed in school. The law was aimed at ensuring all children entering the school system were visually prepared to learn and focused primarily on reducing and eventually eliminating amblyopia across the state.

An analysis of the first seven years of data from Kentucky reveals 13% of children were identified as needing corrective lenses (glasses or contact lenses); 3.4% were diagnosed with amblyopia; and 2.3% were diagnosed with strabismus. Additionally, the law’s impact was analyzed against the results from the Commonwealth Accountability Testing System. These data reveal that the number of Kentucky children proficient or distinguished in core scholastic success measures showed significant improvement only a few years after the preschool law was implemented [28, 29].

A policy implemented in Ohio should follow a similar model. A comprehensive eye exam conducted by an optometrist or an ophthalmologist before a child enters kindergarten should be reported to and required by the child’s school as part of their entrance documentation. This policy would ultimately reduce the health disparities in access to vision care and improve vision care equity and efficiency across the state without a significant cost to the citizens of Ohio. Undiagnosed and untreated vision-related learning problems are significant contributors to reading difficulties and poor school performance. Detecting and treating these vision disorders early in a child’s life is of utmost importance to ensure they have necessary tools to succeed in school and, ultimately, in life.

	Political Feasibility	Cost	Outcomes
<b>Vision Screenings</b>	High	\$1.5 Million/Year (low)	33-67% Detection of vision disorders in children
<b>Mandatory Comprehensive Pediatric Eye Examinations</b>	Low	\$6.5 Million/Year (moderate)	> 95% Detection of vision disorders in children

**Table 1:** Political feasibility, cost, and outcomes associated with vision screenings and mandatory comprehensive pediatric eye examinations.

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