

# INSIGHTS ON THE EFFICACY OF VISION EXAMINATIONS & VISION SCREENINGS FOR CHILDREN FIRST ENTERING SCHOOL

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## Abstract

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*In the year 2000, a law was passed in Kentucky that mandates an optometric or ophthalmologic examination for all children first entering the public school system. This has provided information that compares the effectiveness of vision screenings and full vision examinations. In 2002, data was collected from optometrists about the visual histories of 2,916 children who presented for mandatory school entrance eye examinations. Of a total of 466 diagnosed vision problems, only 75 (16.09%) had generated referrals for comprehensive eye examinations from the pediatrician or family physician who had examined the child within the past year. This provides significant insight into the limitations of vision screenings for school-aged children.*

*We review the literature on these limitations and conclude that vision screenings should not be the primary mechanism to identify children with vision problems.*

## Key Words

*amblyopia, children, children's vision, family physician, Kentucky, Kentucky Law HB 706, pediatrician, referral, school entrance eye examination, spectacles, strabismus, vision screening,*

## Introduction

**O**n July 15, 2000, Kentucky Governor Paul Patton signed House Bill No. 706 into law. This legislation requires all children to have "a vision examination by an optometrist or ophthalmologist" before entering the public school system for the first time.<sup>1</sup> Prior to its enactment, the mandated vision requirement for Kentucky's school children was limited to vision screenings performed by their pediatricians or family physicians as part of the required school entrance physical examinations. During the first year of the vision examination law, a survey of 5,316 children who were examined by 43 optometrists showed that 3.4% were diagnosed with amblyopia, 2.31% with strabismus and 13.92% were prescribed spectacle lenses.<sup>2</sup> If the Kentucky law had not been enacted, it is possible that many of these children would have entered school with vision disorders undetected and untreated.

Kentucky's law has put the spotlight on the debate regarding the most effective way to identify children with vision problems. The American Optometric Association<sup>3</sup> and the American Public Health Association<sup>4</sup> support comprehensive vision examinations for all children in order to identify undiagnosed and treatable vision disorders, such as amblyopia. On the other hand, the American Academy of Ophthalmology<sup>5</sup> and the American Academy of Pediatricians<sup>6</sup> favor vision screenings to identify children with vision disorders. These organizations contend

that performing vision exams on all children is expensive and may not identify significantly larger numbers of children with vision problems.

In order to compare the results of both vision screenings and eye examinations in the identification of vision disorders in children, optometrists in Kentucky were asked to provide information about the visual history of children presenting for mandatory eye examinations. The survey attempts to estimate the percentage of Kentucky's school children that would have entered school with an undiagnosed vision problem if HB 706 had not been enacted.

## Methods

Ninety optometrists were asked to compile and report the data from school entrance vision examinations completed between June and August 2002. For each examination, the optometrists reported the child's age, whether spectacle lenses were prescribed, and whether the child was diagnosed with amblyopia or strabismus. Additional information was collected from parents (or guardians) about their child's health and visual history. Parents were asked whether their child had received care from a pediatrician or family physician within the past year. If the answer was yes, the parent was asked if a visual problem had been detected. If a problem had been detected, the parent was asked if a referral had been made to an eye care practitioner. Sixty three of the 90 optometrists responded and provided data from 2,916 school entrance vision examinations.

**Results**

For the reported 2,916 school entrance examinations, 65 children (2.23%) were diagnosed with amblyopia, 58 children (1.99%) were diagnosed with strabismus, and 343 children (11.76%) were prescribed spectacles. Because some children had multiple diagnoses, a total of 362 children (12.41%) with visual problems were identified. Table 1 presents the number of diagnoses for each age group and compares the data from the present survey to the data obtained in 2000.

Of the children diagnosed with vision problems, 56 (86%) of the amblyopes, 46 (80%) of the strabismics, and 288 (84%) of those requiring a lens prescription had visited a pediatrician or family physician at least once within the past year, prior to receiving the eye examination required under Kentucky law. Thus, a high percentage of these children had received some form of medical care during the prior year. See Table 2.

However, only 11 (19.64%) of the amblyopes, 12 (26.09%) of the strabismics and 52 (18.05%) of those requiring a lens prescription were referred by the pediatrician or family physician to an eye care practitioner for an eye examination. See Table 2.

Therefore, of a total of 466 diagnosed vision problems, only 75 (16.09%) had generated referrals for vision examinations prior to receiving Kentucky's mandated vision examination. Consequently, if only vision screenings had been required, approximately 58 of the 362 children with vision problems would have been referred. If every referral had resulted in a comprehensive vision examination, then approximately 304 children (10.4% of our total sample of 2,916 children) would still have entered school with undiagnosed vision problems.

**Discussion**

The prevalence rates of amblyopia and strabismus in children have been reported to range from 1.0% to 4.8%.<sup>7</sup> The results of the 2000 and 2002 studies both confirm that schoolchildren in Kentucky present normal prevalence rates for these conditions. In both studies, more than 11% of the children entering the school system were prescribed spectacle lenses. The percentage of children with refractive conditions needing correction has been estimated at between 15 and 30%.<sup>8</sup>

AGE	# of EXAMS		AMBLYOPIA		STRABISMUS		LENS RX	
	2000	2002	2000	2002	2000	2002	2000	2002
3 y.o.	632	686	13 (2.06%)	9 (1.31%)	20 (3.16%)	13 (1.90%)	68 (10.76%)	65 (9.48%)
4 y.o.	1504	1059	50 (3.32%)	31 (2.93%)	40 (2.66%)	26 (2.46%)	173 (11.5%)	127 (11.99%)
5 y.o.	2071	1066	69 (3.33%)	21 (1.97%)	38 (1.83%)	17 (1.59%)	274 (13.23%)	135 (12.66%)
≥6 y.o. *	1109	105	49 (4.42%)	4 (3.81%)	25 (2.25%)	2 (1.90%)	225 (20.29%)	16 (15.24%)
<b>TOTAL</b>	<b>5316</b>	<b>2916</b>	<b>181 (3.40%)</b>	<b>65 (2.23%)</b>	<b>123 (2.31%)</b>	<b>58 (1.99%)</b>	<b>740 (13.92%)</b>	<b>343 (11.76%)</b>

\* In 2000, all children entering school for the first time were required to have a vision examination, regardless of age. In 2002, the law was amended to require exams only for 3-6 year olds.

AGE	AMBLYOPIA			STRABISMUS			LENS RX		
	# DX	Visited MD	Referred by MD	# DX	Visited MD	Referred by MD	# DX	Visited MD	Referred by MD
3 y.o.	9	7	1 (14.29%)	13	11	2 (18.18%)	65	54	6 (11.11%)
4 y.o.	31	29	5 (17.24%)	26	20	4 (20.00%)	127	102	18 (17.65%)
5 y.o.	21	17	4 (23.53%)	17	13	6 (46.15%)	135	119	24 (20.17%)
6 y.o.	4	3	1 (33.33%)	2	2	0 (0.00%)	16	13	4 (30.77%)
<b>TOTAL</b>	<b>65</b>	<b>56</b>	<b>11 (19.64%)</b>	<b>58</b>	<b>46</b>	<b>12 (26.09%)</b>	<b>343</b>	<b>288</b>	<b>52 (18.06%)</b>

In the present (2002) survey, the additional information quantifying the number of referrals generated by pediatricians and family physicians provides significant insight into the limitations of vision screenings for youngsters entering school for the first time. Approximately 14% of the children with diagnosed vision disorders had not visited a pediatrician or family physician within the past year. Thus, there was no opportunity for the children's vision to be assessed.

Further, for the approximately 84% who had visited the pediatrician or family doctor, there is the possibility that vision might not have been evaluated. In a study of 102 pediatric practices in 23 states, it was estimated that vision screenings were attempted on just 66% of children aged 3-5 years. In the same study, vision screenings were not even attempted on 3 year olds.<sup>9</sup> Efforts to improve screening rates have met with limited success. For example, in one study of pediatric practices, six months after receiving training

in performing vision screenings, there was no significant increase in the screening of 4 and 5 year olds. Although the frequency of screening 3 year olds did improve, 60% of these practices reported that they still screened "none" or "almost none" of their 3-year-old patients.<sup>10</sup>

Even if the pediatrician had performed an age appropriate vision screening, vision screenings fail to identify all children with vision problems. Studies of vision screenings have found that between a low of 1%<sup>11</sup> to a high of 11%<sup>12-14</sup> of children that pass a screening actually have a vision problem requiring treatment. In addition, "the fact that screening procedures are non-diagnostic and therefore in no way indicate if treatment will be required is an illusory concept at best for the general public."<sup>15</sup> At least some parents assume that because their child has passed a vision screening, there is no vision problem. Their children do not receive the comprehensive examination that is required to separate the "true negatives" from the

“false negatives” (or underreferrals). As a result, the “false negatives” are not receiving appropriate care because they participated in a screening program.<sup>16</sup>

In the present study approximately 19% of the children with vision problems were referred for a vision examination. Perhaps some of these children had even participated in vision screenings in other settings. However, vision screenings suffer from poor compliance with recommendations after a failed vision screening. The ultimate success of any screening program is judged by the use of diagnostic services and compliance with treatment protocols by patients with a positive screening result. Two studies published by the American Academy of Ophthalmology found that 40-67% of children who fail a vision screening do not receive the recommended follow-up care.<sup>17,18</sup> One cause of poor compliance is poor communication with parents who may or may not be present at the vision screening. One study found that two months later, 50% of parents were unaware that their child had even failed a vision screening.<sup>9</sup> As a result of these limitations, there can be significant delays in identification and treatment of vision problems. According to one study, when a 5 or 6 year old failed a vision screening, the average delay before evaluation by an eyecare professional was 4.1 years.<sup>19</sup> Because delays in diagnosis and treatment may result in permanent vision loss, these high error and poor compliance rates are quite alarming.

Economics are often used to justify vision screenings as the best system to reliably detect most vision problems at a much lower cost than providing vision examinations for all children. Certainly, if one considers only the direct costs of services, then a vision screening is far less expensive than a comprehensive vision examination. However, in order to be valid, all indirect as well as direct costs associated with each procedure must be included in the comparison. Given the large number of vision disorders that are missed by vision screenings, the indirect costs are likely substantial, if not incalculable. How can the negative impact of an undiagnosed vision problem on the academic performance and quality of life of these children be calculated?

## Conclusions

According to the US Department of Health and Human Services, the eco-

nomic impact of visual disorders and disabilities on the US economy was more than \$38.4 billion in 1995.<sup>20</sup> Amblyopia has been reported as the leading cause of vision loss in the 20-70-year-old age group.<sup>21</sup> Delayed diagnosis and treatment of vision problems, including amblyopia, can lead to vision loss, the need for more costly and prolonged treatment, and ultimately loss of productivity. As a result, high error and poor compliance rates inherent in vision screening programs contribute to the economic impact that vision disorders place on our society.

In January 2002, President Bush signed the No Child Left Behind Act into law.<sup>22</sup> At the foundation of this legislation is the understanding that the American school system had become a two-tiered system—“similar to apartheid.”<sup>23</sup> If we are to eliminate the two-tiered system, then we must diagnose and treat vision disorders before America’s children enter school to allow every child to take full advantage of their educational opportunities. Research with at-risk students,<sup>24</sup> Title I students,<sup>25</sup> adjudicated delinquents,<sup>26</sup> and literacy problems<sup>27</sup> has documented significant numbers of students with either undiagnosed or untreated vision problems. In many ways these children have already been left behind.

Vision screenings certainly play an important role in identifying visual dysfunctions in a variety of settings. However, our data strongly indicates that, in the case of youngsters entering school for the first time, vision screenings can identify some youngsters with visual dysfunctions, but can miss a significant number of others. The children in this latter group are effectively left behind before they start.

*Portions of this article have been taken directly or paraphrased from a Special Report entitled “Pediatric Eye Exams: Needed or Not?” This unpublished report was produced by First Vision Media Group in conjunction with the Vision Council of America. These groups have given permission for us to use these portions. The Special Report can be obtained by contacting vca@visionsite.org.*

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*EDITORIAL continued*

Another factor that contributed to the success of this meeting was at least equally important. It was the attendees. The term "electricity" was used by a number of people to describe the ambience that prevailed. The audiences were firmly attentive to the speakers; people were leaning forward in their seats to be closer to the presenters, and sat back only to take notes. I perceived that people were there not solely for the continuing education credits, but more for the education itself. While the sense of family that has always been a hallmark of COVD's annual meetings prevailed, it had a different aura; people attended not only for the social aspect, but to seriously conduct the family business of learning about and legitimizing the various components of functional optometry. This was particularly impressive to a number of optometric students with whom I spoke.

The officers and staff of COVD should be recognized for conducting a meeting that exceeded most expectations.

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- Visual Information Processing: Removing the Mystique, Roger Dowis, O.D.