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Workshop on the Rise in Myopia: Perspectives on Vision Screening & Access to Care

National Academies Sciences Engineering Medicine

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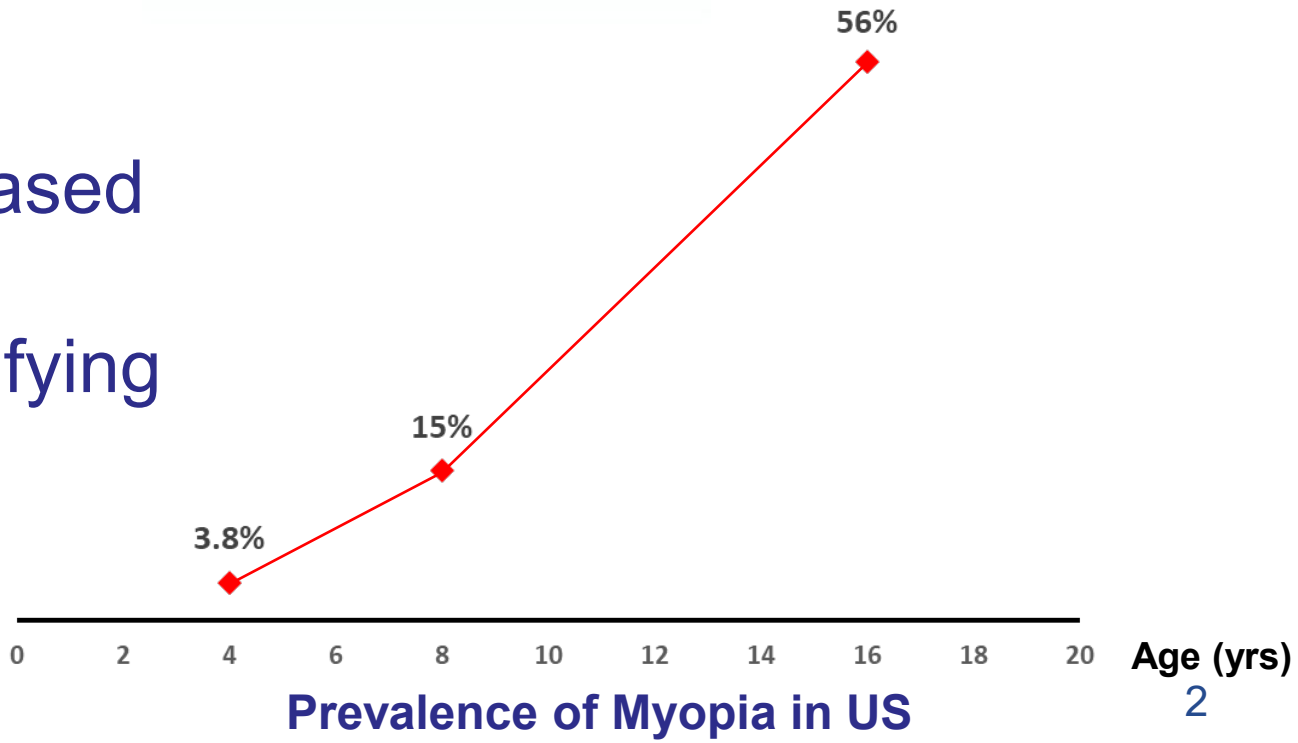
Screening focus shifts as children age

- Preschool-aged children
  - Screening focused on identifying amblyopia risk factor

Prevalence of amblyopia
1-3%

- School-aged children
  - Prevalence of myopia increased drastically
  - Screening focused on identifying uncorrected refractive error



Friedman et al. 2009. Ophthalmology
MEPEDS group. 2008. Ophthalmology
Borchert et al. 2011. Ophthalmology
Hrynchak et al. 2013. Optom Vis Sci
Theophanous et al. 2018. Clinical Ophthalmology

Vision Screening Recommendations by Age

Professional Organization	Year Published or Updated	Screening Age and Interval
American Academy of Ophthalmology (AAO)	2018	Age 3, 4, 5, and every 1–2 years after age 5
American Association for Pediatric Ophthalmology and Strabismus (AAPOS)	2019	Repeat every 1–2 years after age 5
American Academy of Pediatrics (AAP)	2016	Begin at age 3, then at age 4, 5, 6 and 8, 10, 12, and 15
American Association of Certified Orthoptists (AACO)	2021	Vision screening every 1–2 years beyond 5 years of age

Ambrosino C, Dai X, Antonio Aguirre B, Collins ME. Children. 2023.

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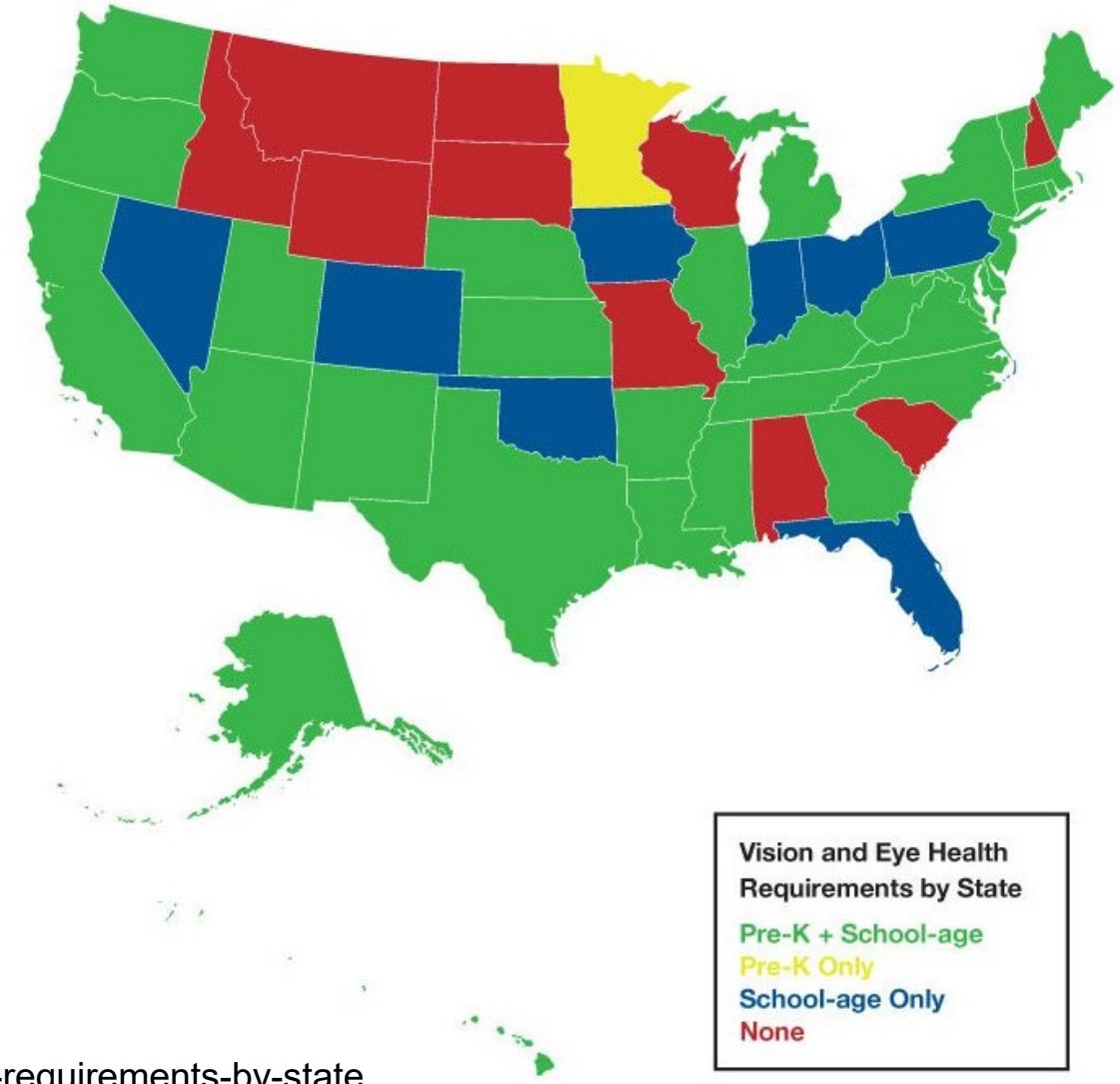
Vision Screening Requirements by State



https://preventblindness.org/vision-screening-requirements-by-state

AAPOS uniform guidelines for instrument-based pediatric vision screen validation 2021

Robert W. Arnold, MD,[a] Sean P. Donahue, MD, PhD,[b] David I. Silbert, MD,[c]
Susannah Q. Longmuir, MD,[d] Geoffrey E. Bradford, MD,[e] Mae Millicent W. Peterseim, MD,[f]
Amy K. Hutchinson, MD,[g] James W. O'Neil, MD,[h] Alejandra G. de Alba Campomanes, MD, MPH,[i]
and Stacy L. Pineles, MD, MS,[j] on behalf of the AAPOS Vision Screening and Research Committees

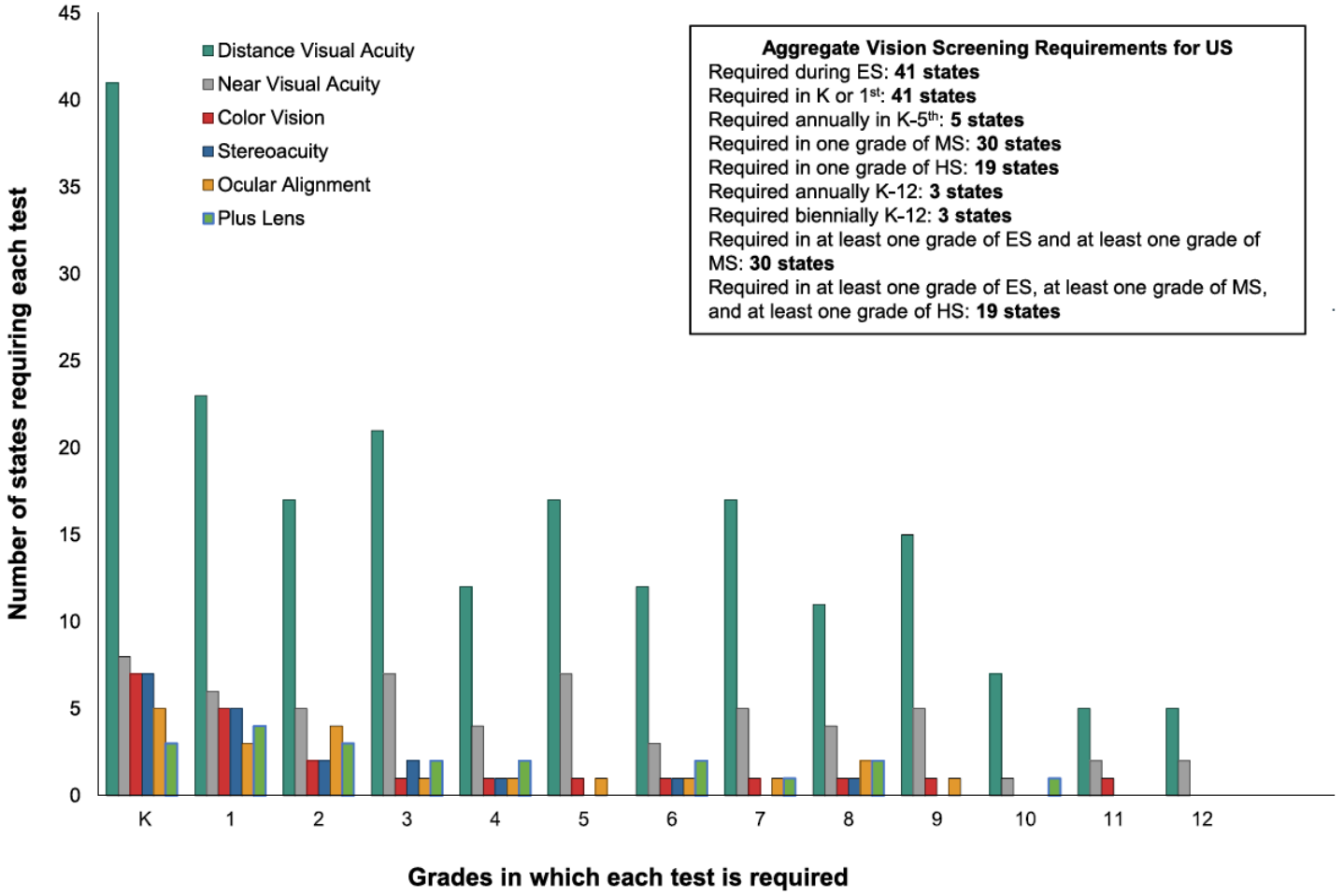
Table 2. Simplified 2021 AAPOS amblyopia risk factor and visually significant refractive error failure level definitions[a]

ARF or refractive error	Age	Threshold
ARF (severity ranked)		
Media opacity		>1 mm
Strabismus		>8 PD manifest
Anisometropia		>1.25 D
Hyperopia		>4.00 D
Astigmatism	<4 years	>3.00 D
Visually significant refractive errors		
Astigmatism	≥4 years	>1.75 D
Myopia	<4 years	< −3.00 D[b]
Myopia	≥4 years	< −2.00 D[b]

ARF, amblyopia risk factor; *D*, diopters; *PD*, prism diopters.
[a]ARFs are stratified by amblyopia severity so combined cases could be listed by the more severe condition. Media opacity, manifest strabismus, anisometropia, and hyperopia are for all age levels. Reporting validation for each ARF and refractive error independently and also combined is recommended.
[b]More myopic than 3 D.

Arnold et al. 2022. J AAPOS.

The most common required test: distance acuity, color vision, near vision



ES: Elementary school
MS: middle school
HS: high school

Wahl et al. 2021. Optom Vis Sci.

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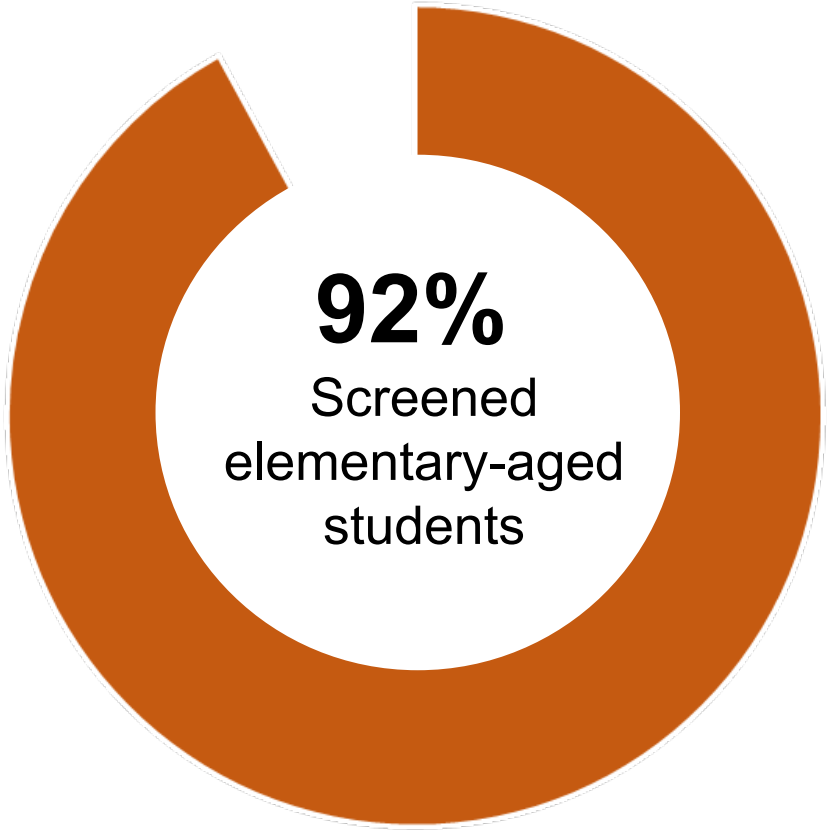
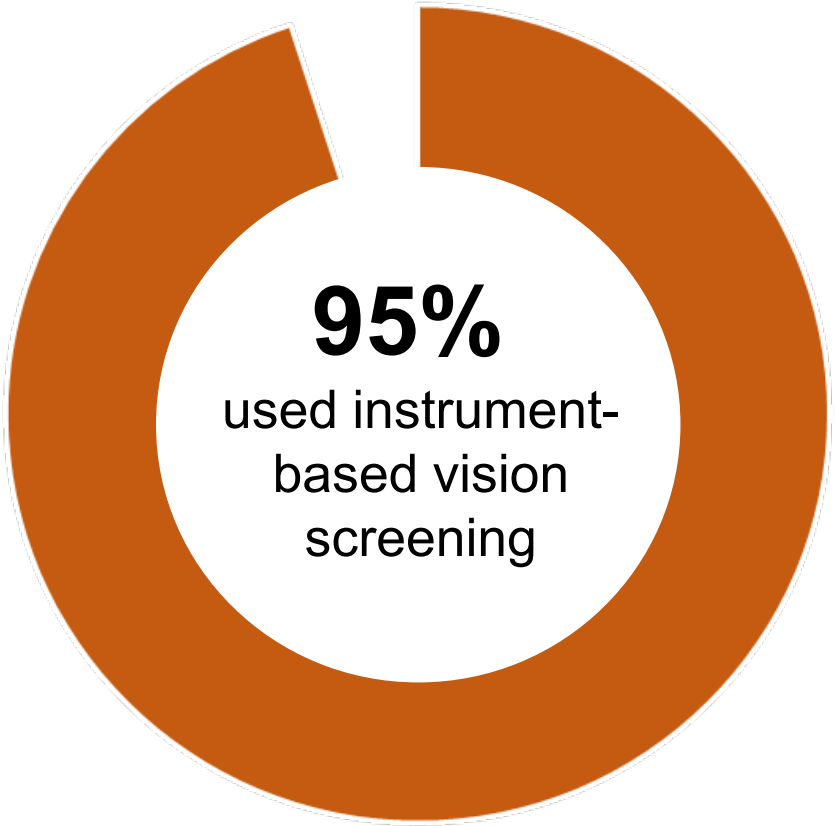
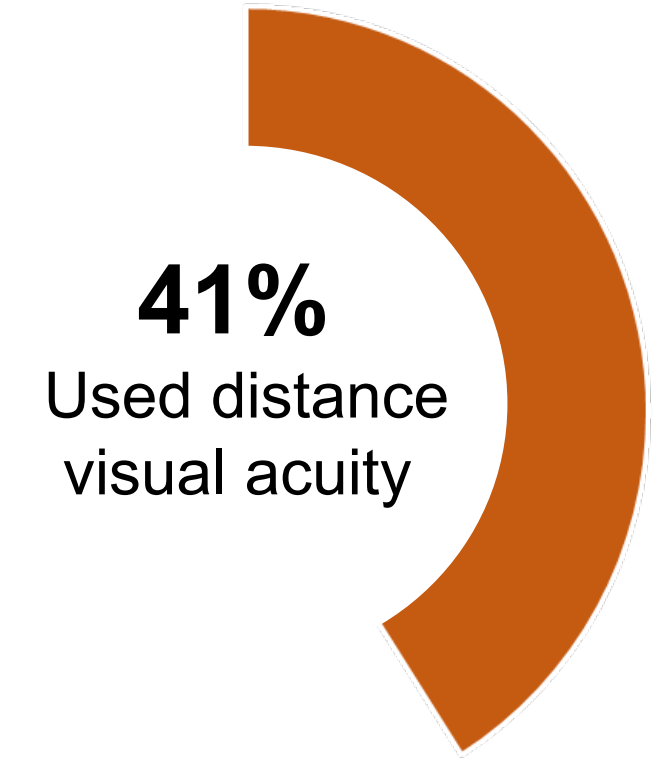
National survey on 184 school-based vision programs



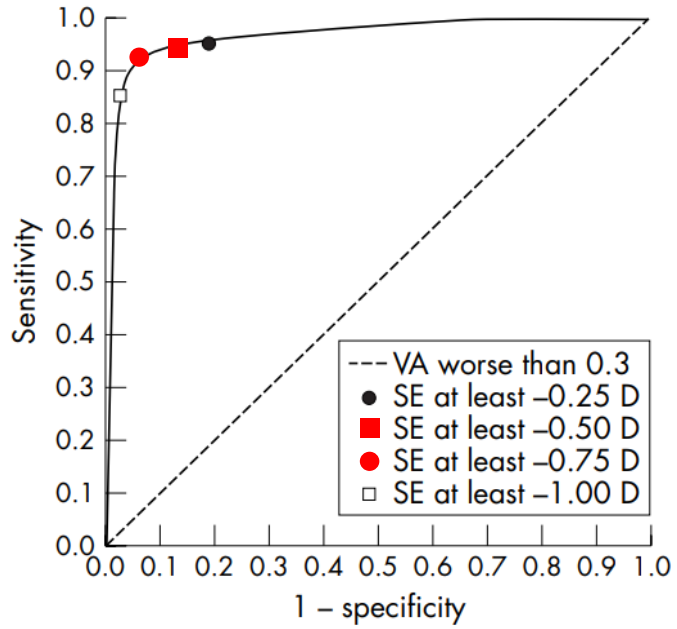




Rahmeh et al. Manuscript to be submitted.

Decreased distance visual acuity is sensitive in identifying children with myopia

Acuity **< 20/40**:
Predictive of –0.75D and –0.50D myopia in children ages 7-9



Acuity **< 20/32**:

- Predictive of –1.00D myopia in children ages 11-14
- Most sensitive predicting myopia among all refractive errors

Table 1. Sensitivity and Specificity for Predicting the Presence of Significant Refractive Error From LogMAR Visual Acuity (VA) in Either Eye[a]

	LogMAR VA of Each Eye, Letters Read (Snellen Equivalent)							
	55 (6/6)	50 (6/7.5)	45 (6/9.5)	40 (6/12)	35 (6/15)	30 (6/19)	25 (6/24)	20 (6/30)
All refractive errors, %								
Sensitivity	81.7	67.6	59.4	52.3	46.6	40.8	33.0	25.2
Specificity	81.0	96.1	98.3	99.3	99.7	99.9	100.0	100.0
Myopia, %								
Sensitivity	100.0	99.7	97.8	92.5	84.3	75.9	62.4	48.3
Specificity	77.9	93.9	97.1	98.7	99.3	99.7	99.9	100.0
Hyperopia, %								
Sensitivity	52.3	24.6	15.4	7.7	4.6	1.5	0.8	0.8
Specificity	73.1	87.7	90.5	92.2	93.3	94.2	95.4	96.5
Astigmatism, %								
Sensitivity	77.4	55.2	39.7	30.2	25.0	19.0	13.9	10.7
Specificity	75.4	89.8	92.2	93.5	94.4	95.1	96.0	97.0

[a]Letters read indicates the number of letters achieved when reading down the logMAR vision chart. Each line contains 5 letters (eg, 55 letters is equivalent to 6/6; 40 letters, 6/12; and 20 letters, 6/30).

Luo et al. 2006.Br J Ophthalmol.
Leone et al. 2010. Arch Ophthalmol.

Vision screening practice & guidelines in school-aged population

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- Lack of national guidelines
- Marked variation at the state and program levels
- Lack of consensus on instrument-based vision screen

Availability of National Guidelines within Other Fields

Condition	Age group	Recommending Organization
Depression	12 – 18 years	USPSTF, American Academy of Pediatrics
Anxiety	8 – 18 years	USPSTF
Obesity	6+ years	USPSTF
Dental	5+ years	USPSTF

Lack of National Vision Screening Policies

- No Health Resources & Services Administration mandate for pediatric vision screenings within community health centers and federally qualified health centers
- Not required as a benchmark within Medicaid reimbursement packages
- Variation in reimbursement for vision screening
  - Separate codes are used for optotype- and instrument-based screening
  - Decrease in reimbursement for instrument-based screening[1]
    - Some insurances will not accept instrument-based screening[2]

[1]Oke, Isdin, et al. Pediatrics. 2023
[2]Reimbursement and Coverage Reference Guide for Photoscreening and Visual Acuity. Go Check Kids.

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Disparities in Vision Screening Access and Follow-up

Among disadvantaged and racial/ethnic minority groups, there is

1) Increased need for vision screenings

- Increased need for eye care among children from low-income families[1]
- Rates of visual impairment due to refractive error projected to increase most among Black and Hispanic pre-school children[2]

2) Decreased access to vision screenings and follow-up eye care

- State-wide variation in vision screenings correlated with parent-reported vision testing[3]
- Low-income children are particularly vulnerable to barriers in connecting with eye care following a failed vision screening[4]
- National Survey of Children's Health 2018-2019 data shows lower odds of vision screening based on insurance status, immigration status, and parent education[5]

[1] Ethan D, et al. J of School Health. 2010
[2] Varma R, Tarczy-Hornoch K, Jiang X. JAMA Ophthalmol. 2017
[3] Lillvis, John H., et al. J of AAPOS. 2020
[4] Majeed M, et al. British J of Ophthalmol. 2008
[5] Oke, Isdin, et al. JAMA Ophthalmol. 2023

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Novel Approaches to Maximize Screening Access

SCHOOL-BASED VISION PROGRAMS

FEDERALLY-QUALIFIED HEALTH CENTERS & COMMUNITY HEALTH CENTERS

Among both, additional approach of increasing collaboration with community eye care providers

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JAMA Ophthalmology, 2023

Invited Commentary

Bridging the Gap in Adolescent Vision Care Through Schools

Megan E. Collins, MD, MPH; Bani Antonio-Aguirre, MD, MPH

JAMA Ophthalmology | Brief Report

Vision Testing for Adolescents in the US

Isdin Oke, MD, MPH; Natalie Slopen, ScD; David G. Hunter, MD, PhD; Ann Chen Wu, MD, MPH

Key Points

Question What factors are associated with caregiver-reported vision testing among adolescents in the US?

Findings In this cross-sectional study of 24 752 US adolescents who participated in a nationally representative survey, approximately 1 in 4 adolescents did not receive vision testing within the previous 12 months. Vision testing was less frequently reported among adolescents who were older, male, or uninsured; had caregivers with less than high school education; and were from a family born outside the US.

Meaning These findings suggest that efforts to expand the role of school-based vision testing for older adolescents from socioeconomically disadvantaged backgrounds may offer avenues to address existing disparities in untreated refractive error in this population.

- Schools overcome access barriers
- Eyeglass provision improves academic performance
- School-based vision programs
  - Foster trusted partnership with the school community
  - Improve health literacy among students
  - Provide valuable experiential learning opportunities for trainees interested in community-based initiatives