Five-Year Trends in Pediatric Vision Screening and Access in the United States

Roughly 3% of children younger than 18 years in the United States experience visual impairment or blindness.[1] Visual impairment in childhood can lead to significant deficits in overall functioning.[2] It is estimated that by 2060, the number of children between 3 and 5 years of age with visual impairment will increase by 26% in the United States, owing in part to vision loss easily prevented by early detection.[3] Prevention of adverse vision outcomes in children is dependent on vision screening.[4] A recent study of school-aged children found a 1.4 to 3 times increase in myopia after the coronavirus disease 2019 (COVID-19) pandemic.[5] The impact of the pandemic on reported vision screening and access for children in the United States is unknown. The 2020 National Survey of Children's Health provides an opportunity to study 5-year trends in childhood vision metrics, including the potential impacts of the COVID-19 pandemic.[6] The purpose of this study was to examine recent trends in vision screening, vision specialist use, reported blindness, and unmet access in vision care, including specific changes before and after the COVID-19 pandemic.

The National Survey of Children's Health is a cross-sectional survey that examines children's physical and emotional health from birth to 17 years of age in the United States and includes data related to vision care access.[7] Our analysis included survey data from 174 551 children across 5 years. Survey collection in 2020 was not impacted by the COVID-19 pandemic. We examined 4 primary vision measures: vision screening, specialist use, vision status, and unmet vision access (Table S1, available at www.aaojournal.org). For vision screening, we considered if the child's vision was tested with pictures, shapes, or letters in the past year. Data also were collected on where children received vision care, namely, from an eye care specialist (e.g., ophthalmologist, optometrist) or nonspecialist (i.e., generalist, school nurse, etc.). For vision status, we analyzed measures related to children with blindness or problems with seeing even when wearing glasses. For unmet vision access, we examined forgone vision care, a measure of children who did not receive needed vision care in the past 12 months.

We pooled longitudinal data from the National Survey of Children's Health from 2016 through 2020 into a single dataset. We generated unadjusted weighted estimates of prevalence with 95% confidence intervals (CIs) for each year. We calculated absolute and relative differences. The relative difference is the absolute difference divided by the prevalence estimates from 2016 and multiplied by 100 to generate a percent difference. Our primary analysis included adjusted logistic regression models with year as an independent variable while controlling for the confounding influence of sociodemographic variables. To examine changes in trends that may have occurred with the onset of the COVID-19 pandemic, we fitted 3 confounder-adjusted logistic regression models. The first model tested trends over a 5-year period (2016−2020). The second model tested trends in the 4 years preceding the pandemic (2016−2019). The third model compared prevalence estimates between 2019 and 2020 (during the pandemic). Demographic variables included age in 3 categories (0−5 years, 6−11 years, and 12−17 years), sex, race and ethnicity constructs, and percentage of the federal poverty level (FPL; 0−199% FPL, 200−299% FPL, 300−399% FPL, and 400% FPL or more). Survey participants self-reported race and ethnicity, which were unchanged for this study (Hispanic, non-Hispanic Black, non-Hispanic White, non-Hispanic Asian, or other or multirace). Analyses were weighted to account for sampling design by matching each state's weighted survey responses to selected characteristics of the state's population of noninstitutionalized children (0−17 years of age) living in the United States. We conducted the analyses using Stata MP software version 14 (StataCorp LLC).

Vision screening prevalence steadily declined significantly from 2016 to 2020 (from 69.6% [95% CI, 68.6%−70.5%] to 60.1% [95% CI, 59.1%−61.1%], a 13.6% relative decrease; $P < 0.001$; Table 1). Decreases in vision screening were present before the onset of the COVD-19 pandemic (2016−2019), with statistically significant continuations postpandemic onset (2020) ($P < 0.001$). Of those who underwent screening, a significant 5-year decrease in the proportion of children undergoing eye screening from a specialist was found (from 55.6% [95% CI, 54.4%−56.9%] to 50.4% [95% CI, 49.0%−51.7%], a 9.4% relative decrease; $P < 0.001$), a trend that was exacerbated by the pandemic in 2020 ($P = 0.006$). A modest nonsignificant increase in reported blindness or trouble seeing when wearing glasses was found from 2016 through 2020 (from 1.6% [95% CI, 1.3%−1.9%] to 1.9% [95% CI, 1.5%−2.2%], a 18.8% relative increase; $P = 0.11$). Before the pandemic (2016−2019), a nonsignificant decrease (24.3%) in reports of unmet access for vision care was found ($P = 0.19$); however, after pandemic onset, a significant increase in reports of unmet vision care was found (from 0.5% [95% CI, 0.4%−0.8%] to 1.1% [95% CI, 0.8%−1.5%], an 85.7% relative increase; $P = 0.004$; Fig S1, available at www.aaojournal.org). Weighted prevalence for sociodemographic variables across vision measures are detailed in Table S2 (available at www.aaojournal.org).

Our study has several limitations. The analysis of trends as performed in this work may conceal distinct subpopulation patterns. Significant disparities in access to preventive care have been identified across sociodemographic variables.[7] Planned analyses will assess the degree to which access to vision care has changed among these distinct subpopulations over the past 5 years. For the vision screening variable, the reported prevalence may exclude children receiving instrument-based screening based on question framing (i.e., "with pictures, shapes, or letters"). Finally, the data do not allow for inferences of causality on the impacts of the COVID-19 pandemic.

Details on vision screening and access trends in the United States in the pediatric population are vital to inform future

Table 1. Prevalence and Adjusted Trend Analysis for Vision Screening, Specialist Use, Vision Status, and Unmet Vision Access, 2016 through 2020 (n = 174 551)

Variable	Weighted Prevalence (95% Confidence Interval)			Trend over 5 Years (2016−2020)			Before the Coronavirus Disease 2019 Pandemic (2016−2019)			During the Coronavirus Disease 2019 (2019−2020)		
	2016 (n = 50 212)	2018 (n = 30 530)	2020 (n = 42 777)	Absolute Difference	Relative Difference	P Value*	Absolute Difference	Relative Difference	P Value*	Absolute Difference	Relative Difference	P Value*
Vision screening†	69.6 (68.6-70.5)	64.8 (63.7-66.0)	60.1 (59.1-61.1)	−9.5	−13.6	**< 0.001**	−5.6	−8.0	**< 0.001**	−4	−5.74	**< 0.001**
Vision specialist‡	55.6 (54.4-56.9)	52.2 (50.7-53.6)	50.4 (49.0-51.7)	−5.2	−9.4	**< 0.001**	−2.4	−4.3	**0.015**	−2.8	−5.3	**0.006**
Vision status§	1.6 (1.3-1.9)	1.7 (1.5-2.0)	1.9 (1.5-2.2)	0.3	18.8	0.11	0.2	12.5	0.23	0.07	4.3	0.83
Unmet access‖	0.7 (0.5-0.9)	0.5 (0.3-0.7)	1.1 (0.8-1.5)	0.4	57.1	0.133	−0.17	−24.3	0.19	0.6	85.7	**0.004**

*Adjusted model controlling for child age (3 categories), sex, race and ethnicity, and income level.
†Vision testing with pictures, shapes, or letters in the past 12 months. Of note, the 2016 and 2017 survey measures for vision screening included additional data during the previous 2 years for children 6 to 17 years of age and if ever measured for children 0 to 5 years of age with tests using pictures, shapes, or letters.
‡A measure of receiving care from an eye care specialist or a nonspecialist (i.e., generalist, school nurse, etc.). Data included only those for whom vision screening was received (n = 118 831).
§A measure of children with blindness or problems with seeing even when wearing glasses.
‖A measure of children who did not receive needed vision care during the past 12 months.

policymaking and patient care. These analyses provide an exploration of vision-related trends in screening and access focusing on the impacts of the pandemic. We found notable declines in vision screening and specialist use from 2016 through 2020. Decreases in specialist use were exacerbated after the pandemic. Another notable trend observed after the pandemic onset was the significant increase in unmet vision health care needs that occurred despite downward trends in the preceding years (2016−2019). Previous work showed that preventive medical visits (not including vision screening) decreased significantly from 2019 through 2020.[6] Our findings align with this observation and suggest that decreases extended to vision-related access. Future research should explore the impact of health insurance status on vision care access and need among children in the United States across the same period. Additionally, the impact of the expansion of certain methods of health care access during the pandemic, such as virtual appointment platforms, should be examined.

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No animal subjects were included in this study.

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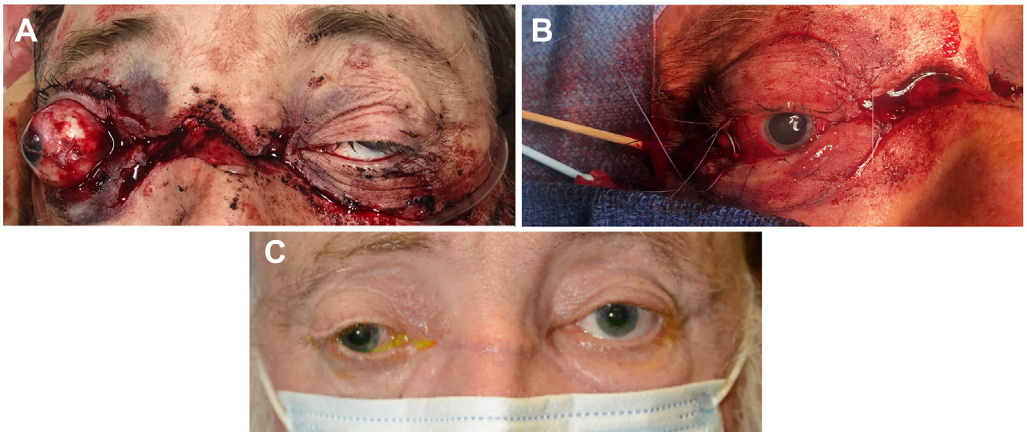
Pictures & Perspectives



Cosmetic Salvage of a Blind Traumatically Luxated Eye

A 61-year-old man emergently presented with right globe luxation, extensive facial bone fractures, and facial lacerations after being run over by a horse-drawn disc tiller (Fig **A**). The globe was intact, the optic nerve was on stretch, and partial remnants of rectus muscles were observed. The globe was repositioned by suturing the detached skirt of conjunctiva back to the limbus, followed by a permanent lateral tarsorrhaphy for the extensive residual proptosis (Fig **B**). Seven weeks postoperatively (Fig **C**), the patient's vision remained no light perception. He retained some extraocular motility, had minimal signs of exposure keratopathy, and was without pain (Magnified version of Fig **A**-**C** is available online at www.aaojournal.org).

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