

Myopia

NATIONAL
ACADEMIES Sciences
Engineering
Medicine

Causes, Treatment, and Prevention
of an Increasingly Common Disease

**Research To Prevent
Blindness Vision Research
Funding Partnership**

**March 25, 2025
Washington, DC**

**Committee on Focus on Myopia: Pathogenesis and Rising
Incidence**

NASEM Board on Behavioral, Cognitive, and Sensory Sciences





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A close-up photograph of a microscope's control panel, showing several silver-colored adjustment knobs with black rings and white numerical scales. The scales are marked with numbers such as 0, 3, 6, 9, 12, 15, 18, 20, 30, 60, 90, 120, 150, and 180. The knobs are arranged in a circular pattern, and the lighting creates soft shadows and highlights on the metallic surfaces.

SUMMARY

- The chapters cover multiple areas of existing research, practices and policies spanning various levels from the systemic to teams, communities, and organizations.
- Pivots from examining extant evidence to highlighting key points from each chapter, with the identification of areas/themes to consider for further exploration that may not have been fully studied or emphasized before.
- It is our hope that this consensus study sets forth a research agenda, as directed by the committee's Statement of Task, which states that the committee's final consensus report will "identify and assess the current mechanistic understanding of myopia pathogenesis and the causes of its increased prevalence, to identify knowledge gaps and barriers to progress, and to develop a research agenda aimed at better understanding the biological and environmental factors that could explain its increasing incidence."

Abbreviated Statement of Tasks

- What are the gaps in knowledge and barriers to progress in understanding the link between known risk factors for myopia development in children and the mechanisms controlling eye growth?
- To what extent do changes in environmental factors (e.g., outdoor time, near work, electronic devices) explain the rapid increase in myopia prevalence?
- What are the socioeconomic, demographic, and regional barriers to diagnosing refractive correction needs, especially in underserved populations? What research efforts might lead to effective methods for mitigating these issues?



Evidence Gathering: Public Workshop

Workshop on the Rise in Myopia: Exploring Possible Contributors and Investigating Screening Practices, Policies, and Programs December 5-6, 2023

Foundations of the Study

Martin Banks, Ph.D., Herbert Wertheim School of Optometry & Vision Science, University of California, Berkeley
Bill Geisler, Ph.D., University of Texas at Austin Center for Perceptual Systems
David Williams, Ph.D., University of Rochester Institute of Optics

Exploring Novel International Initiatives and Implications for the Development and Progression of Myopia

David Mackey, AO, University of Western Australia Medical School, Centre for Ophthalmology and Visual Science
Daniel Ting, MBBS (Hons), M Med(Ophth), FAMS, PhD (UWA), Singapore National Eye Centre
Pei-Chang Wu, M.D., Ph.D., Chang Gung University
Andrew Bastawrous, OBE, London School of Hygiene & Tropical Medicine & Peek Vision
Priya Morjaria, Ph.D., International Center for Eye Health & Peek Vision

Myopia Screening Practices, Policies, and Programs

Megan Collins, M.D., M.P.H., Johns Hopkins Berman Institute of Bioethics
Donna Fishman, M.P.H., National Center for Children's Vision and Eye Health
Jessie Mandle, M.P.H., Healthy Schools Campaign

The workshop also included presentations by authors of the commissioned papers listed on the next slide.



Evidence Gathering: Five Commissioned Papers

- **Bullimore, M.** (2024). Animal models of myopia: Lessons for the understanding of human myopia.
- **Hammond, C., & Williams, K.** (2024). Perspectives on genetic and environmental factors in myopia, its prediction, and the future direction of research.
- **Harewood, J., Contreras, M., Huang, K., Leach, S., & Wang, J.** (2024). Access to myopia care—A scoping review.
- **Khanal, S., Harrington, S., & Tomiyama, E.** (2024). Treatment of childhood myopia.
- **Macros, S.** (2024). Optical and visual diet in myopia.

Committee Recommendations for Research and Funding



Lack of data on myopia prevalence in the US prevents adequate tracking and policy decisions

Between ~1970s and early 2000s, U.S. prevalence for ages 12 to 54 increased from 25% to 41.6%

In some parts of the world, myopia prevalence already exceeds 90%

Recommendations:

- U.S.: collect consistent data nationwide for a central repository
- International: develop consistent definitions and measurement methods



Exposure to outdoor settings reduces myopia onset

Promote outdoor time for children outdoors (at least one hour per day in school and up to 2 hours total)

Data supporting roles for near work and electronic devices in myopia is limited or inconclusive





Targeted research is needed to elucidate mechanisms of genetic and environmental factors on myopia

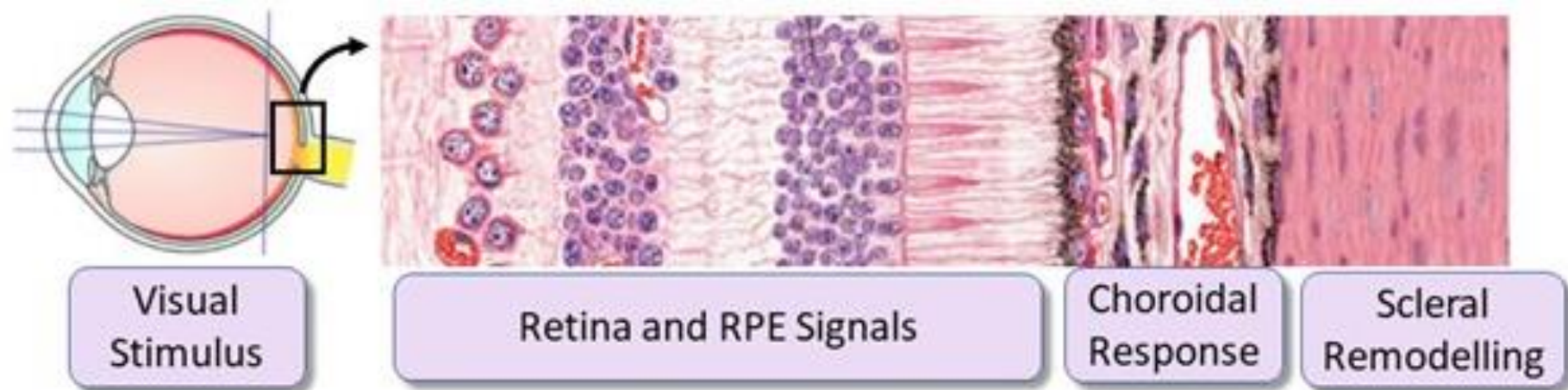
- Specific features of the indoor and outdoor visual diet
- Role of near work versus other environmental factors
- Longitudinal studies incorporating technologies for data capture
- Interaction of genetic and environmental factors

The entire retina, not only the fovea, plays a critical role in regulating eye growth

Two potential mechanisms: the "luminance network" and a closed feedback loop for homeostasis of eye growth

Research needed on

- "ON/OFF imbalance hypothesis"
- Modeling of ocular and environmental elements
- Diagnostic biomarkers
- Role of choroid
- Scleral changes
- *In-vitro* models

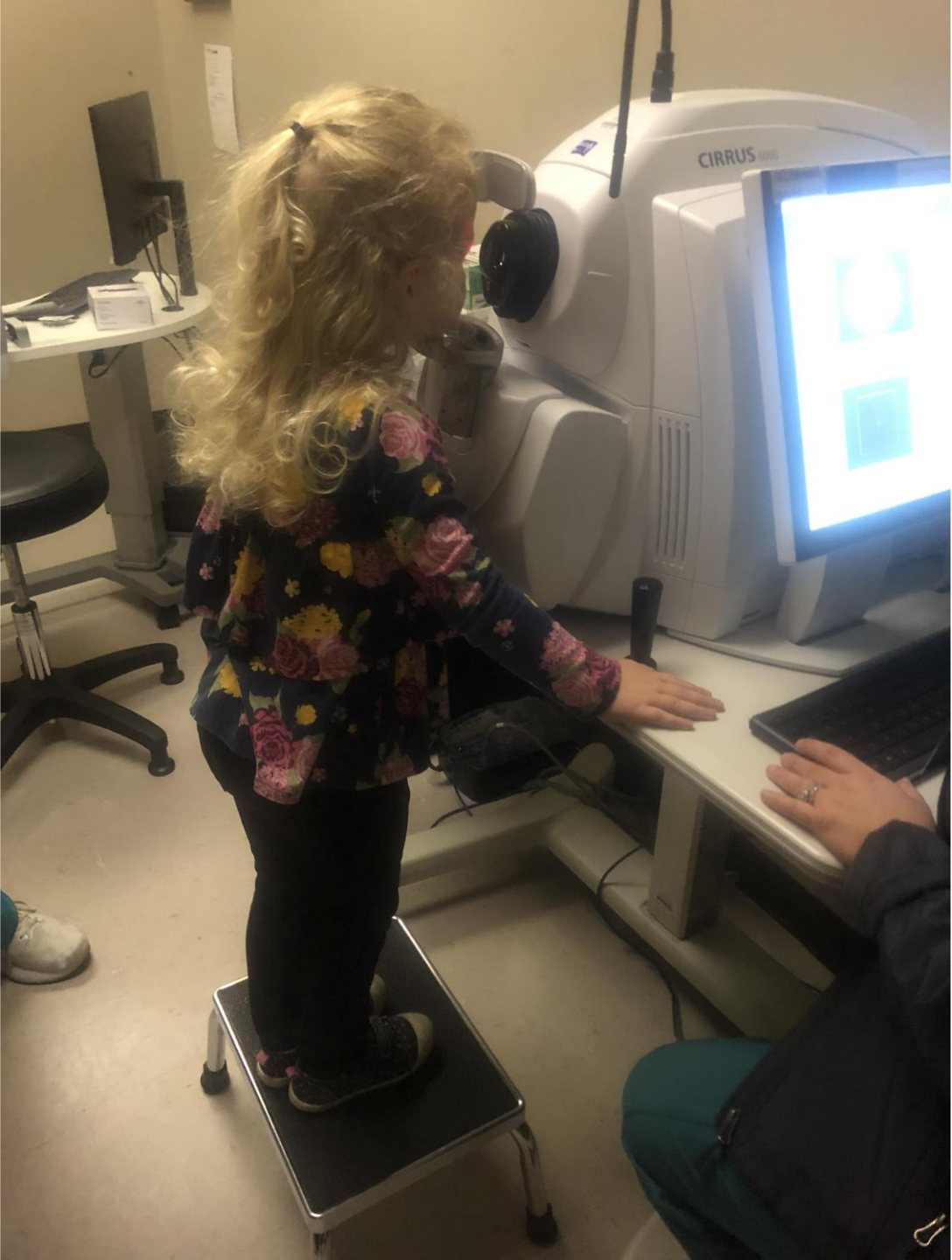




Treatment options for myopia progression have increased in last 20 years, but have limited effects

Determine mechanisms to improve treatments

- Ensure treatment safety for children
- Develop new myopia treatment strategies
- Fund long-term clinical trials at earlier ages



Assessment and diagnostic technologies need improvement

Recommendations:

- Use cycloplegic drops for accurate assessment
- Develop better diagnostic myopia technologies
- Establish consensus on myopia treatment standards
- Make technology adaptable, accessible, portable, and child-friendly

In the U.S., identifying and treating children with myopia has multiple barriers



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- Lack of awareness about visual health
- Shortage of eye care professionals
- Lack of national consensus and surveillance
- Funding shortfalls to support vision health programs

Top key points:

- Myopia should be classified as a disease and a diagnosis
- Exposure to outdoor settings reduces myopia onset
- Need funding for interdisciplinary studies on myopia mechanisms
- Understanding mechanisms of myopia would aid development of better treatment.
- Intentional intervention at a young age is ideal, as early-onset myopia has wide-reaching quality of life and economic implications
- Safety is a fundamental component of effective treatment
- Health impacts of this global myopia epidemic disproportionately affect the most vulnerable communities

Top key points- continued:

- Multiple stakeholders and implicated parties need to recognize their responsibility and impact of affecting intentional and increased change to thwart this shift.
- There is a need to think big picture and in non-traditional ways regarding partners to address this issue on multiple levels.
- We suggest greater attention to and offerings of competitive small to large research grants, local screening and treatment provision efforts that are coordinated state-wide and nation-wide, to collaborations with global health agencies.
- All efforts and data collection need to be harmonized such that true comparisons can be made to detect refractive error and other visual disorder shifts in communities.
- We recommend greater study and work to customize therapies coordinated with parameters of risk assessments. This will require multidisciplinary teams that may not actually study myopia but have the tools and varied perspectives to approach the problem differently and more comprehensively.

Study Sponsors:

American Academy of Optometry

American Optometric Association

Health Care Alliance for Patient Safety

Herbert Wertheim School of Optometry & Vision
Science, University of California, Berkeley

Johnson & Johnson Vision

National Eye Institute

Reality Labs Research

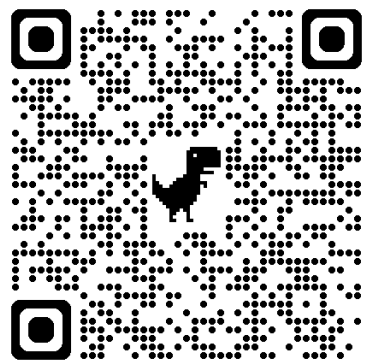
Research to Prevent Blindness

Warby Parker Impact Foundation



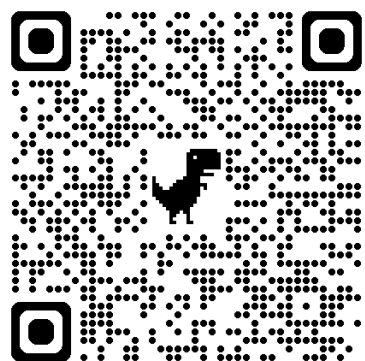
Thank you!

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For more information and to access the full report after public release, visit the study website: <https://www.nationalacademies.org/our-work/focus-on-myopia-pathogenesis-and-rising-incidence>

Or email:
Molly Dorries, mdorries@nas.edu
Dan Weiss, dweiss@nas.edu



Check out other studies under way at the Board on Behavioral, Cognitive, and Sensory Sciences:
<https://www.nationalacademies.org/bbcss/board-on-behavioral-cognitive-and-sensory-sciences>