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Tackling the Myopia Epidemic: Causes, Consequences, and Opportunities for Prevention

**Ryan Quigley:**
Welcome to *Eye on Ocular Health* on ReachMD. I'm Ryan Quigley, and joining me to discuss the burdens of myopia are Drs. Michael Twa and David Berntsen. Dr. Twa is a clinician scientist and the Dean of the University of Houston College of Optometry in Texas. Dr. Twa, thanks for being here today.

**Dr. Twa:**
My pleasure. Thanks, Ryan.

**Ryan Quigley:**
And also joining us from the University of Houston College of Optometry is Dr. Berntsen, who's the Golden-Golden Professor of Optometry and Chair of the Department of Clinical Sciences. Dr. Berntsen, it's great to have you join us as well.

**Dr. Berntsen:**
Yeah, great to be with you.

**Ryan Quigley:**
So let's start off with the big picture. Dr. Twa, how has the global prevalence of myopia shifted over the last few decades, and what's driving these changes?

**Dr. Twa:**
Yeah, that's a great question. So let me just start by saying myopia, or nearsightedness as most people know it, is the most common visual impairment in the world by far. I guess current estimates are around 25–30 percent globally, and without effective interventions, we're projecting somewhere upwards of 50 percent or more—in the neighborhood of 5 billion people by 2050—will have myopia. Some are even calling that number to be triple or more than that, so it's not a small number that we're talking about. The global prevalence is dramatically rising but it's also not rising uniformly. It's been called a global pandemic by the World Health Organization, and it's really not an overstatement here.

It's important to note, I think, that this number doesn't seem to be going up because of better detection. It's not screening and finding this condition that's making those numbers go up. In the US, we have seen this number double approximately from the 1970s from nearly 25 percent up to about 42 percent in the United States. In Australia, the prevalence remains around 30 percent in studies that have been done over the last 20 years, so that number seems to be holding relatively steady. But if you look in Asia and in China specifically, national estimates that we've seen recently are that 53 percent of the population overall has myopia. And there's a 2014 study that reported 80 percent of high school students were myopic, and that number is increasing. Likewise in Korea, a 2024 study of late adolescents was estimating 71 percent of myopia prevalence, so the rates are not uniform, and there's clearly regional differences that can affect the many factors that are driving this. We're trying to figure out really what are those drivers, and that's the most active area of investigation right now.

So myopia is going up, and we think that we can really hang that on a couple of potential factors. One of them is biological or genetic factors, let's say optical signals within the retina that can ultimately drive ocular growth; environmental effects like sun exposure and time outdoors; and behavioral factors like the use of digital screens and extended near work time. Those are some of the things that we think are the most likely suspects that are driving this increase in prevalence.

**Ryan Quigley:**
Now, Dr. Twa, as a quick follow-up, you mentioned high school students and how rates are going up with them. How do prevalence rates and risk factors differ across some of these other age groups?

**Dr. Twa:**
The prevalence of myopia and really its onset—let me talk about incidence for just a moment—that incidence is usually before age 10. You can detect it. Myopia is either there or likely to be there in the next decade of life, so the fact that we're seeing this prevalence in high schoolers means that it was probably detectable long before then and is just progressing. And this is where a lot of the focus of intervention has been, is trying to figure out who's on the trajectory to have their eye grow longer, and how soon can we predict that successfully for an individual? And if we can detect it and predict its trajectory successfully, how can we then intervene in order to prevent that progression?

**Ryan Quigley:**
And now turning to you, Dr. Berntsen, what can you tell us about geographic and socioeconomic disparities in myopia prevalence and management? And I know Dr. Twa touched on that a little bit, but are there any other specifics that you can dive into on that?

**Dr. Berntsen:**
I think one thing that is important to note is he mentioned outdoor time as being something that is potentially related, and we know that kids who spend more times outdoors have a decreased risk of becoming nearsighted to begin with. It's one of the few things in the literature across studies in different parts of the world that we know: a couple hours of outdoor time a day is protective against the onset of nearsightedness.

Now, that said, there's lots of other environmental factors that are involved, and these could be differences by region as far as potentially affecting the prevalence that we see. Although one thing that's important to note that gets cited a lot is that kids are spending more times on screens nowadays—and may be more in some cultures than in others—but one thing I like to point out whenever I lecture about this to students or other professionals is the first iPhone didn't come out until 2007, and these rates were well on their way to increasing well before we really got to where we are now today where there's full penetration of digital handheld devices. So it's more than just "kids are spending more times on screens."

As far as socioeconomic disparities specifically, in most of the studies there are differences in how many are myopic and how quickly myopia progresses by race and ethnicity, but as far as socioeconomics specifically, there's not as much there as far as what's in the literature.

**Ryan Quigley:**
For those just tuning in, you're listening to *Eye on Ocular Health* on ReachMD. I'm Ryan Quigley, and I'm speaking with Drs. Michael Twa and David Berntsen about the growing global burden of myopia.

So, Dr. Berntsen, if we look beyond prevalence statistics, what are broader public health consequences of myopia?

**Dr. Berntsen:**
First off, myopia for a long time has been classified as a refractive error, something where the prescription gets worse, you prescribe a new prescription, and the person sees clearly with no other consequences. We know that's not the case though. It doesn't matter if there are low amounts of myopia because even low amounts of myopia are associated with increased comorbidities, such as retinal detachments, myopic macular degeneration, and glaucoma later on in life. So there are health consequences that are related to being myopic, and the more myopic you are, the greater that risk grows. Very recently, just last year, there was a report that came out by the National Academies of Science specifically on myopia where they recommended—and I wholeheartedly support this—that myopia is a disease. When you look at the definition of the disease, it meets all the different criteria for that definition. There are consequences to it. It's not just simply 'prescribe something new, and there's no harm, no foul.' The more myopic people become, the greater the burden is later on in life for other issues related to eye health.

So the public health consequences are big because as more people are becoming myopic, that also means the number of people who are becoming what I'll call a "high myopic prescription" is growing, meaning that—depending on where you look—their prescriptions above a -4 or -5 as far as amount of myopia. Those eyes also then are at even greater risk for those various different eye diseases later on in life, so seeing the growing number of people who are becoming myopic and then seeing how myopic they're becoming is also increasing. It just means that this is a moving train with all of these different other consequences and risk factors that are associated with it that are now then also moving along as those prevalence trajectories increase.

**Ryan Quigley:**

And now, Dr. Twa, turning back to you, in regard to some of these public health consequences, what can clinicians do to help address these impacts?

**Dr. Twa:**
Yeah, that's a great question. I think of this from the standpoint of what would we do if it were an infectious disease pandemic? The strategies that we have available to us to use are really the same. It's prevention and treatment, right? So screening and early identification are key. I think clinicians should get involved in community programs that target early detection. Once identified, early intervention and monitoring for progression are things that clinicians can be doing. That can influence the ultimate trajectory, as Dr. Berntsen was just describing, and their lifelong risk for other causes of visual impairment. For the individual, it also can have a huge impact on their ultimate educational attainment, so these things matter. Detecting this can have a very large public health impact on the population at large. So despite the fact that in the US right now, we have many sources and resources that people can have available to them for detection and intervention, children that are often identified with visual impairment problems don't often receive care. Some recent studies show that 60 percent of children who have some form of visual impairment aren't detected or don't receive care.

So for clinicians wanting to know, what can we do about this to help close the gap between identification and intervention? I think that comes down to collaboration between healthcare providers, pediatricians, and eye care providers. Make sure that those identified have an effective link between the detection stage—whether it's a pediatrician, school nurse, or some community clinic—and the care provider who can fully examine and then intervene if appropriate. Get involved with private health and educational foundations to support access to care and early detection. And then engage with public health resources to address the prevention and intervention, as we were talking about before.

**Ryan Quigley:**
And as we approach the end of our program, I have one last question for you, Dr. Berntsen. If we look ahead, what are the biggest challenges and opportunities in reducing the burden of myopia?

**Dr. Berntsen:**
As far as challenges, I think there's a lot of education that's happening where providers are now becoming aware of the various things that are available. In the United States, though we're a bit behind the curve compared to pretty much every other country as far as what's actually approved in the United States as far as these interventions go, there are a number of things that we know from clinical trials do slow progression, but a lot of them are off-label indications, whether it be contact lenses or certain pharmaceutical drops like low-concentration atropine. Even in pretty much every other part of the world, there are novel, specially designed spectacles that are able to slow the progression of nearsightedness. We know they work from clinical trials, but they're not available in the United States because they don't have FDA approval. So hopefully soon, we'll start seeing some of these interventions receive approval in the United States so that they do become available, and it will increase the arsenal of possible treatments that are available to providers, which will greatly improve the ability to care for our patients. It'll be a game changer, for example, when there's a specially designed spectacle lens that providers can prescribe. But one of the biggest challenges right now is that we don't have access to that full arsenal, and then it comes back to access to care and these things aren't covered by insurance right now, so that also obviously creates a barrier for a number of families.

**Ryan Quigley:**
With those key insights in mind, I want to thank my guests, Drs. Michael Twa and David Berntsen, for joining me to discuss the widespread impacts of myopia. Dr. Twa, it was great having you on the program today.

**Dr. Twa:**
Thank you, Ryan. My pleasure.

**Ryan Quigley:**
And, Dr. Berntsen, it was wonderful having you on as well.

**Dr. Berntsen:**
Yeah. Thanks, Ryan. It was great being here.

**Ryan Quigley:**
For ReachMD, I'm Ryan Quigley. To access this and other episodes in our series, visit *Eye on Ocular Health* on ReachMD.com, where you can Be Part of the Knowledge. Thanks for listening.