

WHAT ARE WE LEARNING FROM THE WORLD'S MYOPIA CAPITAL?

A global leader in eye health, the Singapore Eye Research Institute, is battling to address the problem of short-sightedness, and is **USING AI TO SPEED UP DISEASE SCREENINGS**.

Four in five young adults in Singapore are myopic or nearsighted

— a condition of the eye that makes far away objects appear blurry — with 65% requiring glasses by the time they turn 12. It's a worrying statistic, given that myopia can lead to a number of eye disorders later in life, including glaucoma, early cataracts, and macular degeneration.

The Singapore Eye Research Institute (SERI) has made myopia a key research focus since its launch in 1997. Since then, our understanding and treatment of the condition — deemed the largest threat to eye health this century — has burgeoned, thanks

in part to research from SERI.

Some of this research has already had an impact around the world, which is significant given that half the global population is predicted to be myopic by 2050¹. Globally, many ophthalmologists now use eyedrops comprising of a low dose anticholinergic agent, which blocks the contraction of the eye muscle responsible for a loss of close-range focus.

This protocol — devised by SERI researchers in 2016² — prevents myopia progressing in young children.

The centre's work has also changed the local eye care landscape. In 2001, along with Singapore's Health Promotion

Board, SERI launched a National Myopia Prevention Program that introduced annual eye tests in schools and encouraged children to spend more time outdoors, among other initiatives. "With the help of this programme, we saw a stabilization of myopia in young kids," says Zhou Ting, who is in charge of research and academic affairs at SERI.

PUBLISHING POWERHOUSE

With more than 5,200 papers published, SERI helped Singapore achieve first place in global rankings that looked at the impact factor of peer-reviewed papers on eye disease per capita³. This is ahead of

the United States, the United Kingdom, and China, according to the independent study that analysed more than 65,000 papers on eye disease published between 2000 and 2020. "I'd say most publications on eye disease from Singapore are from SERI," says Jodhbir Mehta, SERI's executive director, underlining the significant impact the institute has had.

The institute is also renowned for its groundbreaking research in epidemiology. For example, it has conducted one of the largest, longitudinal, population-based eye studies in Asia, examining a handful of diseases that are prevalent in the region, including

diabetic retinopathy, age-related macular degeneration, glaucoma, refractive errors and cataracts.

Called the Singapore Epidemiology of Eye Diseases (SEED) programme, the study has followed more than 25,000 children and adults across groups that are Chinese, Malay or Indian in heritage. SEED has been tracking how prevalent the conditions are, their incidence rates, associated risk factors and health impacts since 2004.

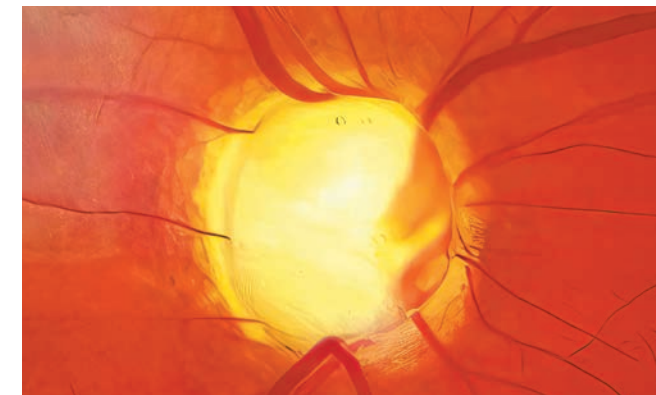
SERI researchers are still following some 3,000 adults aged 40 and older, with the study expected to end in 2029. "By then, we will have nearly 20 years of follow-up data, making SEED one of the longest running eye studies in Asia," Zhou says.

Already, the work has generated more than 600 scientific papers, which have helped advance eye health knowledge across East Asia. "It's really one of the most complete datasets we have," says Zhou, which is why the information collected has been "widely used and cited" by various national and international agencies, including Singapore's Ministry of Health, the World Health Organization, and the Global Burden of Disease study.

TRANSLATION TRACK

Today, the institute has broadened its focus far beyond these traditional areas of research. "I think one of the things that makes SERI unique is that we're strong in a variety of fields," says SERI's scientific director, Leopold Schmetterer, who cites ocular imaging, disease detection via artificial intelligence (AI) and cell therapy as examples.

A big part of the journey ahead lies with AI. Since mid-2021, the institute's researchers have been trialling the use of an algorithm, called the Singapore Eye LESioN Analyser (SELENA+).



▲ The Singapore Eye Research Institute is renowned for its groundbreaking research in epidemiology (top) and glaucoma (bottom).

The AI can screen retinal photographs for signs of diabetic retinopathy, a complication caused by damage to the blood vessels of the retina.

In early 2024, the system will be fully incorporated into a Singaporean-wide screening programme run by the Singapore National Eye Centre (SNEC) for diabetics. AI should shorten the wait for a diagnosis from hours to minutes, and potentially reduce the work of healthcare professionals by up to 50%.

The institute is looking at whether a similar system can be used to screen for other eye and systemic diseases. "It's something we're still working on," says Schmetterer. "But there are definitely a lot of opportunities for AI in the future."

A first of its kind, a Technology Development and Commercialization unit was set up in 2012 to assist

SERI researchers in patent, commercialization and incubator support, as well as providing links to potential investors for all SERI-developed technologies. "During the early days of SERI, maybe having a good number of publications and presentations at meetings was good enough," says Mehta. "But now it's way beyond that. We need to be looking at licensing assets, and start-ups, that has to be the ultimate goal — translation."

FOCUSED FUNDING

Support from Singapore's government has helped shaped SERI's success. "The country makes research a national priority and invests significantly in this field," says Schmetterer.

From a founding team of five staff, SERI now has a workforce that's more than 250-strong, encompassing doctors, clinician scientists and research fellows.

It is also the research arm of SNEC, the country's tertiary eye care referral facility, which receives upwards of 350,000 outpatients every year. In 2022, SERI's annual budget was more than \$52.5 million Singaporean dollars (US\$39.1 million), 70% of which came from competitive external grants.

Its strong funding has also allowed SERI to make critical investments in its people, explains Mehta. "We could fund those who wanted to go abroad to take on higher degrees or extend their clinical training. It's helped us create a really mature support environment for our clinicians and researchers."

Merging clinical work with research has also been instrumental in why SERI has done so well, he says. "It allows us to see the problems patients face, and then figure out how to solve those problems."

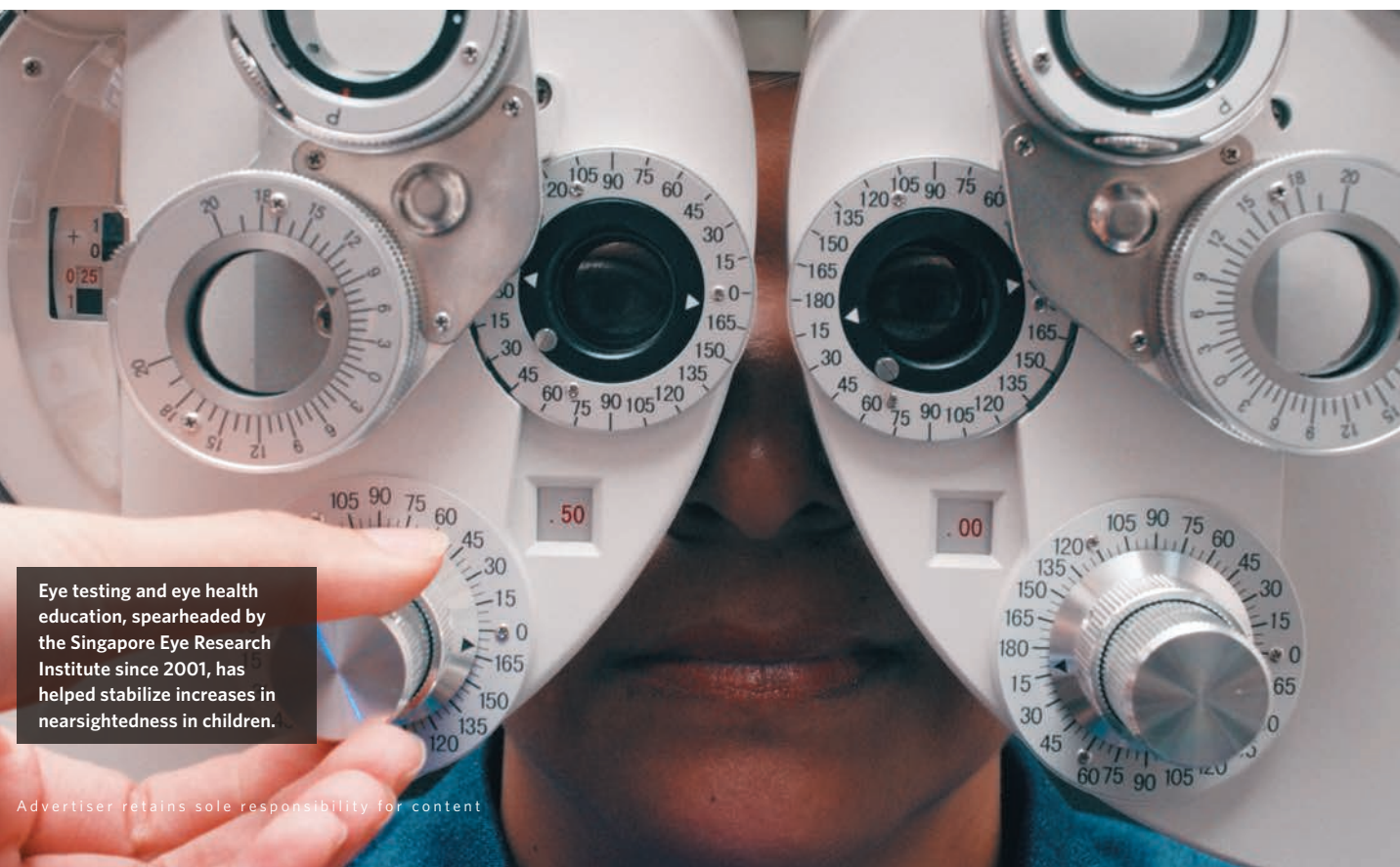
Opportunities beckon for the translation of science into innovations that impact communities, says Mehta. The institute is venturing into gene and cell therapy, which it sees as particularly useful for treating corneal and retinal diseases. And SERI will focus on age-related eye care and disease prevention. With one in every four people in Singapore expected to be 65 or older by 2030, "the focus is not just on treating diseases, but also preventing them," says Zhou. ■

REFERENCES

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Eye testing and eye health education, spearheaded by the Singapore Eye Research Institute since 2001, has helped stabilize increases in nearsightedness in children.