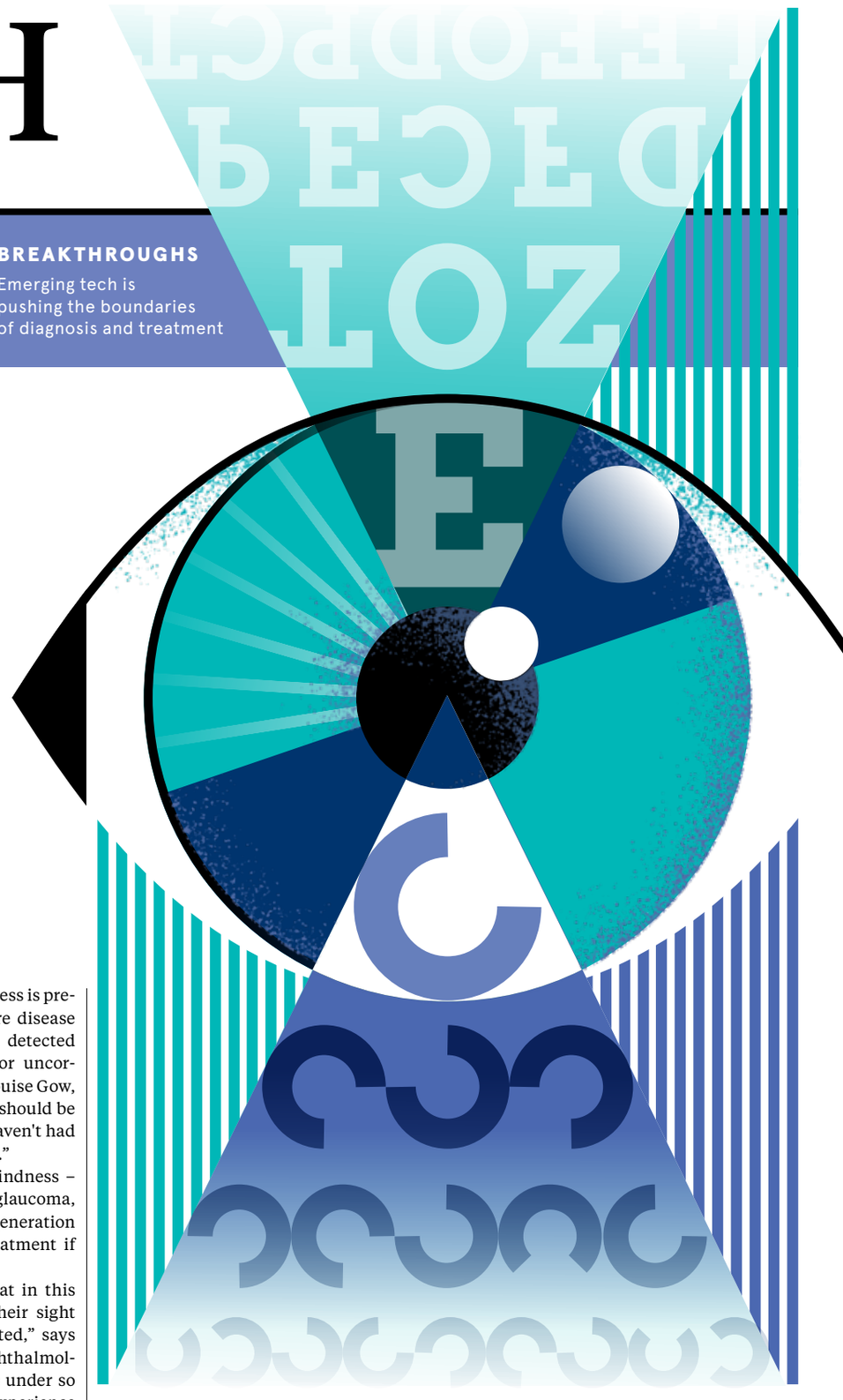
EYE HEALTH



BLINDNESS

Making avoidable blindness a thing of the past

Social and economic ramifications of sight loss are too big to ignore, but an array of inspiring projects is helping to tackle one of the biggest healthcare battles of our time

Danny Buckland

Sight, the precious sense that brings us perspective and wonder, is under unprecedented attack. Despite huge clinical and technological advances, record numbers of people are needlessly going blind.

The economic burden of sight loss has been estimated at £28.1 billion a year in the UK, yet more than 50 per cent of blindness is avoidable.

These stark statistics are made even more disturbing by the fact that, while health and longevity profiles across all disabilities are improving, sight loss is becoming worse.

Research projects are bringing us bionic eyes, stem cell regrowth and artificial intelligence (AI) that can combat the ravages of eye disease. But they are ranged against formidable harbingers of darkness in obesity, outmoded systems, poor funding and ageing populations.

It is a healthcare battle of our time. The rise of type-2 diabetes has led to an alarming climb of diabetic retinopathy over the last decade and, with more than five million people predicted to have the condition by 2025, the burden can only increase.

The maelstrom's force is accelerated by an ageing population suffering from natural sight loss and a stressed healthcare system that results in huge delays for basic sight-saving treatment and an acute shortage of ophthalmologists in training.

The All-Party Parliamentary Group (APPG) on Eye Health and Visual Impairment reported in June 2018 that sight loss is projected to increase by more than 10 per cent by 2020 and by 40 per cent by 2030.

Ophthalmology has the second highest outpatient attendance of any specialty with a 10 per cent increase over the last four years to almost 7.6 million appointments in 2016-17 in England, yet there is a chronic shortage of ophthalmology consultant posts.

A report from the Royal College of Ophthalmologists in 2018 warned that 67 per cent of hospital eye units were using locum doctors to fill consultant posts, an increase of 52 per cent since 2016, and that around 25 per cent of the current specialist workforce is nearing retirement.

> **People think of eye checks as a case of if you need spectacles or not, so a cultural change in understanding is needed**

Lack of provision has a cascade impact on health and wellbeing as evidenced by APPG research, which found 70 per cent of patients felt appointment delays and cancellations caused them anxiety or stress.

"More than 50 per cent of blindness is preventable and the main causes are disease processes that could have been detected early enough to slow it down, or uncorrected short or long sight," says Louise Gow, specialist lead for RNIB. "No one should be visually impaired because they haven't had access to care to prescribe glasses."

The major disease causes of blindness – diabetic retinopathy, cataracts, glaucoma, wet age-related macular degeneration (AMD) – are all amenable to treatment if diagnosed early enough.

"We should be making sure that in this country people are not losing their sight when it could have been prevented," says Ms Gow. "We have a fantastic ophthalmology service on the NHS, but it is under so much strain. Lots of patients experience delays for follow-up appointments and getting into the system, so they present with later-stage eye disease or do not even access the services and treatment they need. We need more ophthalmologists trained, and to utilise the skills of optometrists and dispensing opticians to take some of the strain from hospitals."

Dr Andy Cassels-Brown, medical director of the Fred Hollows Foundation, an international development agency working to eliminate avoidable blindness, underscores the need for medical and technical advances to be matched with system upgrades.

"While new technology is part of the solution to eliminating avoidable blindness, it won't be the single solution," he says. "Breakthroughs will also come in the form of new models of care that deliver services to more people and those most in need.

"Governments will need to oversee health systems, drive the adoption of affordable technologies and make them available to the most in need."

The need to harness brilliant innovation with the more prosaic system design is writ large in glaucoma, a condition that slowly damages the optic nerve and erodes sight. Around 900,000 people in the UK have the condition, but public awareness is so low that around 500,000 are unaware they have it and could suffer irreversible sight loss. Regular eye tests and faster routes to treatment could turn around an insidious problem that will lead to the loss of livelihood and independence.

"The optical profession has started asking itself why enough people don't get tested and one of the answers is for opticians to follow pharmacists in providing more services to patients and relieve the burden on GPs," says Karen Osborn, chief executive of the International Glaucoma Association. "People understandably think of eye checks as a case of if you need spectacles or not, so a cultural change in understanding is needed because there are so many other health conditions that can be picked up."

It is a sobering challenge, but eye health is awash with inspiring projects that have taken bionic eyes and regenerating optic cells from hope to reality.

Professor Paulo Stanga of Manchester University has successfully implanted bionic eye systems – a prosthesis linked to a visual display unit in a pair of spectacles – to restore some functional sight to patients with retinitis pigmentosa, an inherited disease that causes blindness and AMD.

Trials, funded by the NHS, are continuing and proving that a future where avoidable blindness is drastically reduced is more than just a dream.

Research is also progressing at London's Moorfields Eye Hospital NHS Foundation Trust to tackle the diagnostic challenge. Its collaboration with DeepMind Health, part of Google's healthcare division, uses AI technology to detect eye conditions automatically in seconds and triage patients to the right treatment, reducing the chances of sight loss.

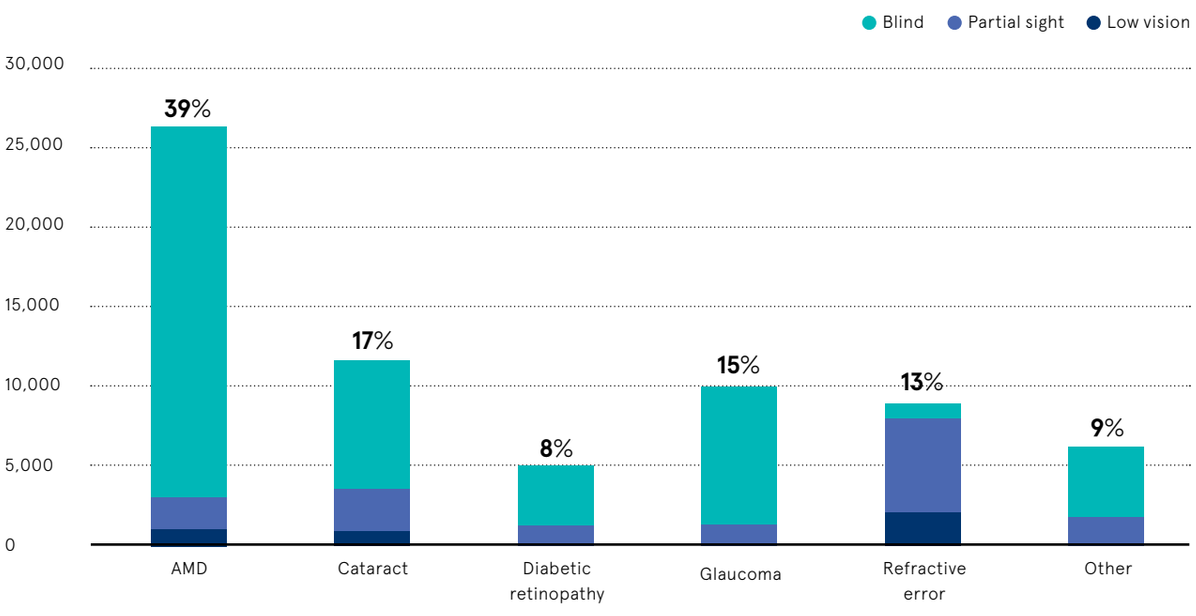
It claims a 94 per cent accuracy rate on eye-scan analysis and could, if clinically validated, reduce diagnosis time, release consultants for other work and create a data reservoir to improve future research.

Dr Pearse Keane, consultant ophthalmologist at Moorfields Eye Hospital, says: "Our work with DeepMind Health is using artificial intelligence to detect abnormalities in patient's eye scans. This has the potential to provide a much faster diagnosis, which is vital in preventing sight loss from a number of conditions, including age-related macular degeneration and diabetic retinopathy."

Avoidable blindness is verging on a national tragedy and it will need a concerted effort from campaigners, clinicians, scientists, and public health and government policy to ensure people can retain the gift of sight throughout their lives. ●

AGE-RELATED MACULAR DEGENERATION (AMD) IS THE LEADING CAUSE OF SIGHT LOSS IN THE UK

Years of healthy life lost per condition, by severity of sight loss; percentage refers to the total burden of disease caused by the condition



BMC Health Services Research 2018

>75%
of visual impairment worldwide is avoidable
International Agency for the Prevention of Blindness 2019

250
people lose their sight in the UK every day
RNIB 2017

1in5
people will live with sight loss in their lifetime
WHO 2016

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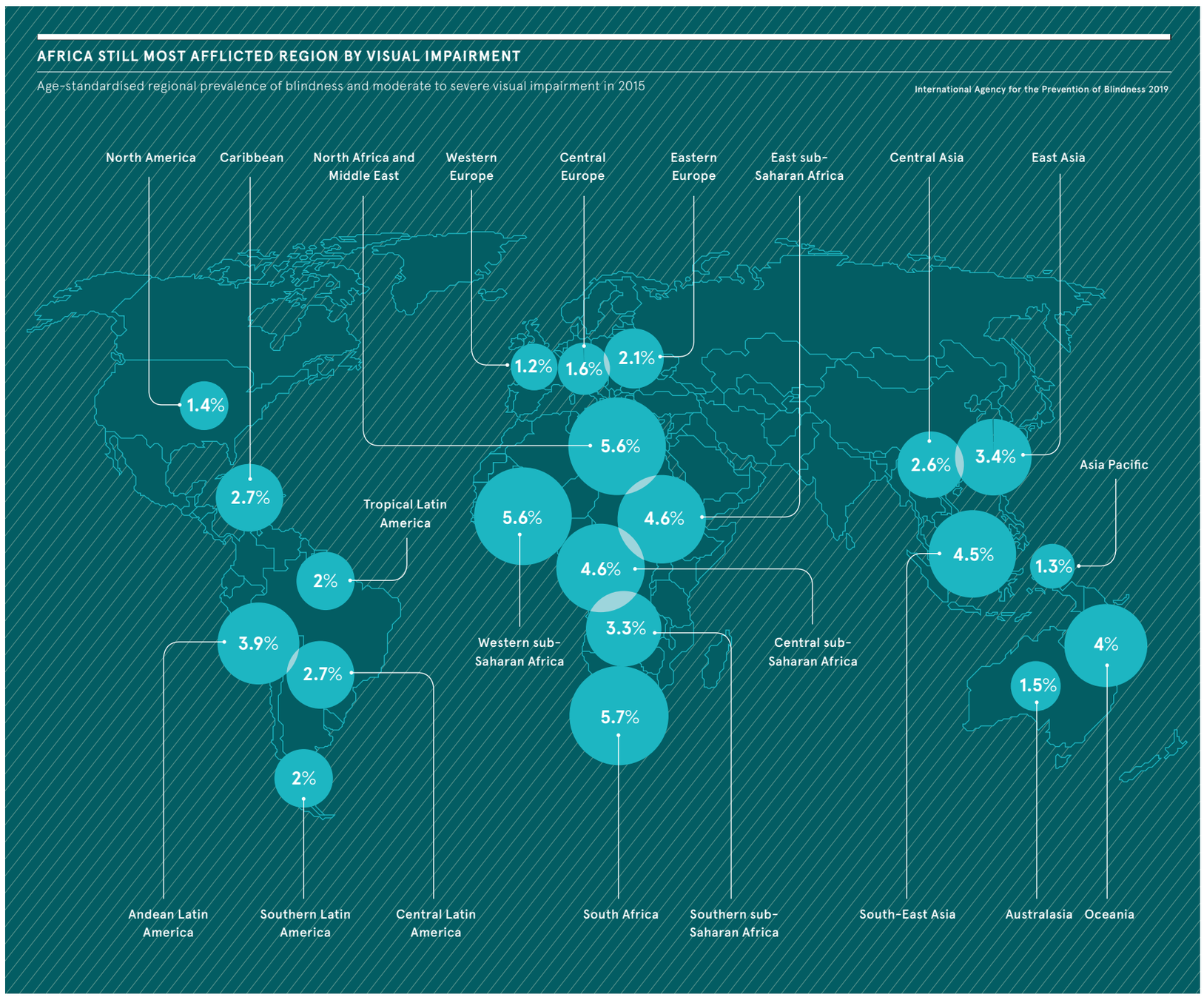
GLOBAL STRATEGY

Global mission sets its sights on universal eyecare

The decades-long initiative to improve eye health worldwide has spawned a number of important milestones in recent years. But how far away are we from stamping out avoidable blindness for good and cutting visual impairment on a global scale?



Nick Easen

Clear vision isn't a birth right for all mankind; it's a privilege and so is the ability to correct poor sight. More than two billion people wake up every day with an eyesight problem and 254 million, many in the developing world, are visually impaired. From blindness to cataracts, eye diseases to glaucoma, the healthcare of our most vital of senses is a challenge, even when many conditions are treatable.

"Ultimately, we will all need eyecare at some point in our life. Eye health should be universal. The good thing is that there's been a transformational shift in recognising that we have a significant global population health and eye issue," explains Peter Holland, chief executive of the International Agency for the Prevention of Blindness (IAPB).

20-20 vision for all humanity was part of Vision 2020, the brainchild of the World Health Organization (WHO) and IAPB. Launched two decades ago, along with a series of more recent action plans, the aim has been to eliminate avoidable blindness, adopt universal eye health and cut visual impairment by the end of this year, with the backing of countless governments worldwide.

"The year 2020 due to its cultural positioning has been an automatic goal for all vision initiatives since the 1990s. All global vision efforts have been working towards this point for close to three decades," says Selina Madeleine from the Brien Holden Vision Institute. So how far have we come?

Grand figures are hard to come by, although the IAPB's *Vision Atlas* helps. However, all eyes are now on a new and long-anticipated study, the *World Report on Vision* from WHO, which is the first of its kind to be released by the Geneva-based global body. Out this autumn, it will be the definitive document for professionals worldwide and is expected to set the agenda for eye health in the decades to come.

"We're excited about its launch," says Dr Alarcos Cieza, WHO co-ordinator for blindness prevention. "There has been considerable effort over the last 20 years to address eye conditions and vision impairment, and this has resulted in many areas of progress."

But like a 3D game of constantly moving shapes, the landscape for eye problems has been rapidly evolving and it's therefore challenging to plot progress. Demographic changes, including population growth and ageing alongside the rise of non-communicable diseases, have led to a greater prevalence in eye diseases. At the same time, reaching the so far unreachable and identifying those neglected and remote populations remains an issue.

"We know the prevalence of vision impairment, adjusting for age, has consistently declined in every region of the world in the past 25 years, with the biggest gains in low-income countries. An estimated 90 million people around the world have been treated or prevented from vision loss since 1990," says Mr Holland.

There are also other milestones. River blindness is on track to be the first blinding disease to be eradicated globally. Also known as onchocerciasis, it was virtually eliminated in the Americas by 2015 and in 2016 there were almost 150 million treatments in Africa.

Meanwhile, the number of people at risk of trachoma, an infectious bacterial eye disease, has fallen from 1.5 billion in 2002 to 142 million in 2019, an astonishing reduction of 91 per cent, according to WHO data. A mind-boggling 450 million doses of antibiotic have been distributed so far and WHO has declared trachoma has been eliminated from eight countries.

"Progress made in the elimination of blinding neglected tropical diseases, namely onchocerciasis and trachoma, are probably the most striking success stories of Vision 2020," says Professor Serge Resnikoff, immediate past chair of the International Coalition for Trachoma Control.

> **An estimated 90 million people around the world have been treated or prevented from vision loss since 1990**

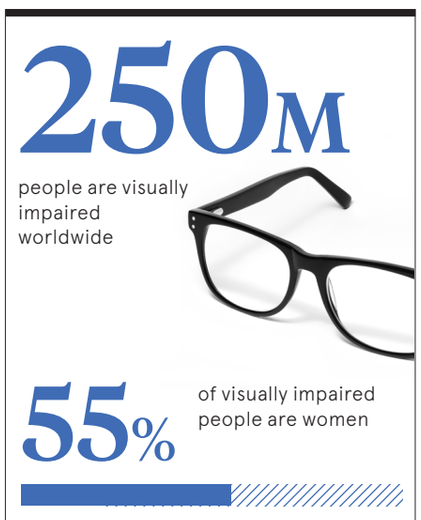
Cataracts, the leading cause of blindness and visual impairment globally and accounting for a quarter of all cases, has been a key focus for Vision 2020. As a result, many low and middle-income countries have seen substantial rises in cataract surgeries over time. For instance, India has successfully increased its rate by nearly nine-fold in three decades.

If it looks like a winning battle, think again. Despite gargantuan global efforts, the number of people with visual impairment is marching northwards, as we all live longer. "The number of people who are blind will triple by 2050," says Ian Wishart, chief executive of the Fred Hollows Foundation.

Drill down and the numbers speak for themselves. By 2030, globally we will have more than a billion people in old age and already this cohort accounts for half of those with eye problems, the IAPB says. By 2050, it is estimated there will be almost five billion myopic, or short-sighted, people; that's half the predicted global population, so clearly access to eye tests and glasses is still not universal.

"There are other issues too. By 2040, 70 million people will have diabetic retinopathy also known as diabetic eye disease. We need to act now if we are going to reverse these trends," warns Mr Holland.

The challenges are immense; most health systems in poorer countries are chronically under-funded. This is where 90 per cent of the world's visually impaired people live. The global cost of lost productivity due to uncorrected poor vision is also a staggering $272 billion a year, according to WHO. It reduces people's ability to learn and in severe cases can be debilitating. But visual impairment doesn't grab headlines, because it doesn't kill people; it isn't malaria or ebola.



"Eye health is not seen as a priority by governments, so while political effort at WHO level has been strong, it's difficult to make the case at national level where resources are scarce," says Juliet Milgate, director of global policy and advocacy at Sightsavers.

Worryingly, gender inequity in eye health is a burning issue. Women are still 1.3 times more likely to be blind than men, according to the IAPB, meaning 55 per cent of the visually impaired are women. Less access to transport, decreased social mobility, poor health literacy and less financial freedom are some of the reasons. "The fact is, in some places more health importance is given to men and boys," says Professor Shahina Pardhan, director of the Vision and Eye Research Unit at Anglia Ruskin University.

Despite these challenges, this is an exciting time to be tackling eye health, since the toolkit and capabilities have expanded; some are even calling it a pivotal moment. "We've reached a point where, for the first time in history, we could eliminate avoidable blindness and visual impairment," says Dr Andrew Bastawrous, chief executive of Peek Vision and associate professor at the London School of Hygiene & Tropical Medicine.

"This isn't just an abstract proposition; the treatments and infrastructure needed to address most of the world's avoidable issues are cost effective, proven and ready to be deployed."

It helps that universal health coverage is also topping the global agenda and at the same time there's greater recognition eye health is key to realising many United Nations Sustainable Development Goals.

"We now have adequate basic data, a degree of political will and a catalogue of demonstrable success upon which we can build," explains Ronnie Graham, trustee at Vision Aid Overseas. "Technology, both to reach more people and reduce costs of diagnosis and surgery, can also transform the sector."

For instance, Google is developing an artificial intelligence tool to detect diabetic eye disease. Other companies, such as Forus Health in India, are designing low-cost equipment to eradicate preventable blindness. While Arclight is an inexpensive, easy-to-use, pocket-sized ophthalmoscope for diagnosing diseases in the developing world, costing as little as £5. Peek Vision is also deploying smartphones to enable eye checks. Portability is key, since remote regions suffer more from poor eyecare.

"Often the nearest optician is 50 kilometres or even farther away from some communities, so there is a problem of access," says Kristan Gross, global executive director of the Vision Impact Institute. "The other issue is affordability, as solutions have historically been seen as a high-cost option."

This is not just a public health and government agenda, there are also calls on the global business community to play a roll. By tackling short-sightedness, or myopia, alongside blindness and other critical eye diseases raises the profile and clarion call for universal eyecare.

"We carried out research on productivity at a tea plantation in Assam, India. By simply providing pairs of affordable glasses, the plantation saw a 22 per cent increase in productivity, the largest productivity increase of any health intervention," says James Chen, founder and chief executive of Clearly.

"Putting free eyecare at the top of a business agenda makes sense, not just as a corporate social responsibility initiative, but also economically and for the future of any business growth."

The next 20 years will be a crucial period. Priorities will have to be made. Training more eyecare workers in places such as Africa and South America will be vital.

"In fact, each region has its own set of priorities, based on the prevalence of eye conditions and socio-demographic factors. There is no one size fits all," Mr Holland concludes. "Broadly, however, there is the challenge of getting the world to engage with eye health."

CASE STUDIES

Success stories from around the world

Nick Easen

Ending trachoma in Ethiopia

Hawiti Tufa, a 60-year-old grandmother, living four hours south east of Addis Ababa in rural Ethiopia, has been unable to help her family for a year because of the agony caused by trachoma, the world's leading infectious cause of blindness. It all changed after visiting a makeshift surgery. "I have better vision now and the pain is reduced," she says.

In Ethiopia, 72 million people live where this preventable disease is endemic. "Two years ago, we conducted the largest trachoma elimination project in the world here, supporting one in five surgeries and one in five doses of antibiotics globally," explains Ian Wishart, chief executive of the Fred Hollows Foundation.

Trachoma elimination is a major success story. Charting via the Global Trachoma Mapping Project has been the single largest infectious disease mapping project in the world, leading to increased screening and treatment with infection rates dropping by 91 per cent.

"Moreover, the number of people requiring surgery for trachomatous trichiasis, the late blinding stage of trachoma, has reduced from 7.6 million people in 2002 to 2.5 million in 2019," says Professor Serge Resnikoff, immediate past chair of the International Coalition for Trachoma Control.

Battling cataracts in Pakistan

Mihi Bali stopped work as a cotton picker in Sindh, Pakistan, when her vision started to cloud because of cataracts, yet she could not afford to visit an eye doctor. A health worker eventually made a diagnosis and had her treated at a hospital. "I'm happy now that I will start working as an agricultural worker to increase my family's income," explains Ms Bali.

Over half a million people have cataracts in Pakistan; it's the most common cause of avoidable blindness in the country. Scale this up and an estimated 18 million globally have cataracts. "Yet it can now be treated with surgery at remarkably low cost," says Juliet Milgate, director of global policy and advocacy at Sightsavers.

Cataract surgical rates are now on the increase in many countries and the disease is included in most national plans for the prevention of blindness. "We are plateauing now in terms of cataract visual impairment," says Ronnie Graham, trustee at Vision Aid Overseas. Data from WHO shows there's a 25 per cent decrease in blindness prevalence in India and this could be due to increased cataract surgeries.

Tackling river blindness in Uganda

Okello Charles works as a volunteer in northern Uganda, distributing the antibiotic Mectizan, used to treat river blindness. The 35 year old volunteered as fly catcher on the Aruu River, near his village Lapaya, which is a breeding ground for the tiny black flies that spread the disease.

"I feel happy I can do something to protect my children," he says. "I have many friends and relatives who have gone blind. That is what encouraged me to be part of the team that catches flies."

Sightsavers has been busy over the last three years delivering 60 million treatments to stop infection from spreading and reaching 9.5 million people with onchocerciasis, not just in Uganda, but in the Democratic Republic of Congo, Guinea-Bissau and Nigeria.

"The progress made to date is significant and demonstrable," says Juliet Milgate of Sightsavers. "On neglected tropical diseases such as onchocerciasis, it is essential that we continue to support existing efforts and don't take our eye off the ball." Globally, more than 300,000 people are blind because of river blindness. But the disease is being eliminated in some countries.

THE SCIENCE BEHIND EYE NUTRITION

Whether it's carrots to see in the dark or stories about WWII fighter pilots eating blueberry jam to make their sight keener, dietary advice on improving eyesight is plentiful. However, what foods and nutrients could actually have an impact on eye health? Raconteur investigates the science behind the myths to understand what's at play

Omega-3 fatty acids

Omega-3 is a polyunsaturated fatty acid, which contains EPA and DHA, both of which are vital for proper visual development and retinal function. As a result, a deficiency is linked to impaired vision and retinal degradation, particularly in children.

EPA and DHA are concentrated in oily fish but vegetarian DHA can be manufactured from microalgae.

Conditions helped

- Conjunctival xerosis (dry eye)
- Diabetic retinopathy
- Glaucoma
- High eye pressure
- Neovascular macular degeneration

Top five sources

mgs per serving

Mackerel	4,107
Salmon	4,023
Herring	3,181
Cod liver oil	2,664
Oysters	565

Lutein and zeaxanthin

Lutein and zeaxanthin are two carotenoids - the pigment responsible for the orange colour in certain vegetables and fruits - that play an important antioxidant role in the eye. They work by defending the macula region of the retina against unstable molecules called free radicals. Specifically, they cancel out harmful oxygen free radicals and help block blue light damage.

Lutein and zeaxanthin are commonly found in leafy greens, but also in pistachios, egg yolks and red grapes.

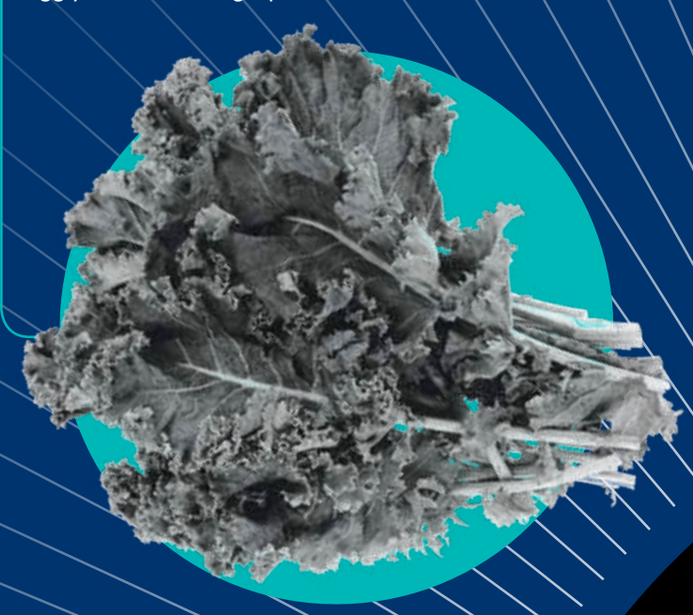
Conditions helped

- AMD
- Cataracts
- Diabetic retinopathy
- Eye detachment
- Uveitis

Top five sources

mgs per serving

Kale	23.7
Salmon	20.4
Herring	19.3
Cod liver oil	14.6
Oysters	12.2



Gamma-linolenic acid

Gamma-linolenic acid (GLA) is an omega-6 fatty acid, which unlike other omega-6 fatty acids has anti-inflammatory properties. Studies have shown that the fatty acid can have a positive impact on meibomiam gland dysfunction, a primary cause of dry eye.

GLA is not a widely occurring chemical compound but is available in a selection of plant oils.

Conditions helped

- Conjunctival xerosis (dry eye)

Top three sources

mgs per serving

Borage oil	210
Evening Primrose oil	76
Blackcurrant oil	70

Zinc

Zinc is a part of many essential enzymes, including superoxide dismutase, which works as an antioxidant. Research suggests that is involved in the formation of visual pigments in the retina and consequently a deficiency can lead to conditions including night blindness and cataracts.

Conditions helped

- AMD
- Cataracts

Top five sources

mgs per serving

Oysters	74
Beef	7
Alaskan crab	6.5
Fortified breakfast cereal	3.8
Lobster	3.4

Vitamin A

Vitamin A is a group of unsaturated fat compounds that are vital to human health. Consuming food rich in the vitamin can help combat night blindness by helping maintain rhodopsin, a light sensitive pigment found in the retina. Furthermore, it has been shown to slow the deterioration seen in age-related macular degeneration (AMD), the leading cause of blindness in the developed world.

The vitamin is most prevalently found in its active form in animal products. However, it also exists as a provitamin A carotenoid in some fruits and vegetables, which the human body can convert into its active form.

Conditions helped

- AMD
- Conjunctival xerosis (dry eye)
- Bitot's spots
- Corneal scarring
- Corneal ulcers
- Corneal xerosis
- Night blindness

Top five sources

mgs per serving

Beef liver	6.4
Lamb liver	2.1
Liver sausage	1.5
Cod liver oil	1.4
King mackerel	0.4

Vitamin C

In addition to being critical to tissue repair and immune system function, vitamin C is also a powerful antioxidant, which is needed by the human eye. Indeed, studies have shown that the vitamin is linked to decreased risk of cataracts and AMD

As an essential vitamin, vitamin C can't be produced by the body, meaning that it has to be obtained from fruits and vegetables.

Conditions helped

- AMD
- Cataracts

Top five sources

mgs per serving

Kakadu plums	2,650
Acerola cherries	822
Guava	126
Rose hips	119
Chili peppers	65

Vitamin E

Vitamin E is a group of fat-soluble antioxidants that can help protect the fatty acids in the retina. Research suggests that vitamin E is linked to the reduction in cataract formation, and in severe cases a deficiency may lead to retinal degeneration and blindness.

The vitamin is common in most foods but especially rich in cooking oils, seeds and nuts.

Conditions helped

- Cataracts

Top five sources

mgs per serving

Wheat germ oil	20
Sunflower seeds	10
Almond	7.3
Hazelnut oil	6.4
Mamey sapote	5.9

Commercial feature

Investing in the workforce

Britain's workplace productivity can be boosted by the adoption of regular eye tests, research has shown

A staff eye health scheme can improve productivity, reduce absenteeism, promote well-being across a company and translate into balance-sheet benefits, which are particularly welcome in tough trading conditions.

But, according to studies by Specsavers, around one third of employers offer no eye testing for staff even though 89 per cent of their workers are classed as screen users, who might need and benefit from wearing glasses.

"It is a requirement to offer eye tests to staff and it makes economic sense as it leads to better productivity, retention and loyalty," says Jim Lythgow, director of strategic alliances at Specsavers Corporate Eyecare.

"Employees who are struggling with their eyes could find their performance at work suffering, and that can be hugely frustrating for them and detrimental to the business.

"Many employers are missing a trick by not providing eyecare. They may well be flouting health and safety rules, and their employees will not be receiving the many associated health and wellbeing advantages that come with an eye test."

Employers are required by law to arrange for eye tests for users of display-screen equipment that request one and must provide spectacles if they are prescribed for screen use. Work tasks are now dominated by computer, tablet and smartphone use across many professions.

"You would struggle to find a profession that doesn't involve spending less than an hour or two on a screen, which is the level the Health and Safety Executive sets for employers to monitor," adds Mr Lythgow.

"Employers' awareness of their responsibilities is lower than it should be at a time when, with an ageing population and an ageing work population, that responsibility is even higher.

"Eyecare can support productivity as it helps with more minor ailments like migraines, tired eyes and headaches, all of which can reduce an employee's efficiency. But an eye test can also pick up the early symptoms of a number of conditions such as age-related macular degeneration, high blood pressure and even tumours."

Employers also have responsibility for helping maintain the eyesight of any staff members who drive as part of their jobs. The amount of time spent on the roads is increasing with the Department for Transport recording 324 billion vehicle miles in 2016-17, an increase of 20 per cent of the previous five years and a jump of 70 per cent from 1997. Taxis and cars account for 253 billion miles, up 1.5 per cent over the last three years.

"More and more trade is on the road now, particularly with home delivery, so employers have a duty of care to their staff and to other road users to look after their drivers' eyesight," says Mr Lythgow. "Specsavers provides more than 500,000 employee eye tests every year through its Corporate Eyecare scheme, and the benefits for the employee and the company are always positive."

Specsavers operates an efficient and cost-effective pre-paid voucher scheme for companies so their staff can get a convenient eye test at one of the company's 750-plus stores and get their prescription swiftly.

The company, which carries out ten million sight tests in the UK every year, has invested heavily in technology so eye tests pick up sight issues and alert for more insidious and often asymptomatic eye conditions. Problems such as glaucoma and diabetic retinopathy, which can cause blindness, can be treated if diagnosed early, so staff can retain their jobs and remain productive.

Recent Specsavers' research reported that only 52 per cent of companies and organisations provided eyecare at work. More than 25 per cent of employers surveyed said they offered eyecare to improve productivity, while a significant 24 per cent provided eye tests to reduce absence.

> **Many employers are missing a trick by not providing eyecare**

"We have seen a great increase in employers' understanding of eyecare as a valued benefit in itself and as part of a bigger picture of preventative health solutions," says Mr Lythgow. "We are working to help make the most of this trend into as many businesses and organisations as possible by making employers and employees aware of the much wider benefits of eyecare, such as the detection of serious health conditions, glaucoma or symptoms of cardiovascular disease.

"Eyecare is essential to health and wellbeing, and we are delighted that so many employers are taking this enlightened view.

"For relatively little cost, you can protect employee eyesight. It will promote loyalty and can only benefit your bottom line."

For more information please visit specsavers.co.uk

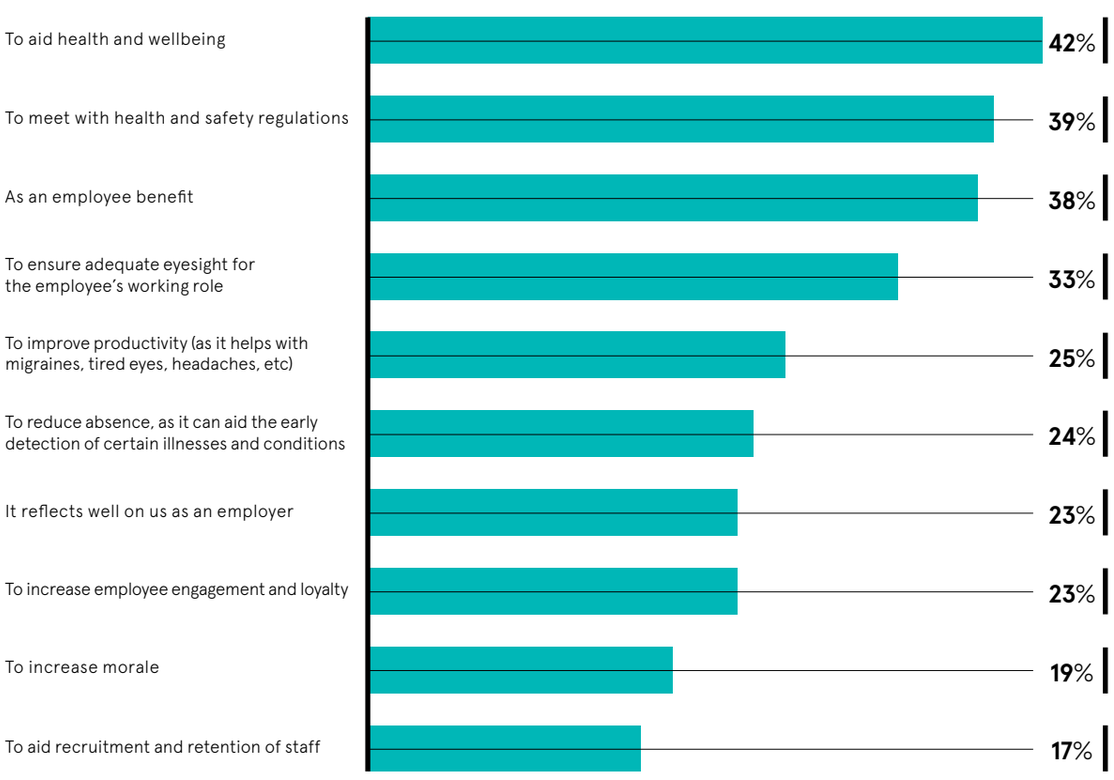
Specsavers

44%

of optometrists have seen a patient in the last month who carried on driving despite being told to stop

Association of Optometrists 2017

WHY DO YOU OFFER EYECARE?



WORKPLACE

Making eye health a duty of care

Employers have a duty of care to ensure their staff are looked after, so why is eye health often the lowest priority?

Cath Everett

Despite the pervasive use of digital devices and increasing screen time both in the workplace and at home, provision of free eye tests for employees is not as common as you might hope.

Over the last five years or so, health and wellbeing has risen steadily up the executive agenda due to a growing awareness that fit and happy staff demonstrate higher levels of engagement and productivity.

But while providing them with everything from gym membership to mindfulness classes has become *de rigueur*, employee eyecare is all too often overlooked, particularly in the private sector.

In the public sector, on the other hand, health and safety personnel are starting to take much more interest, due to the potential for employee claims if it can be proven that existing work patterns, which include excessive screen time, are having a detrimental impact, explains Kevin Rogers, chief executive of health insurance provider Paycare.

Such fears are making themselves felt even though the UK's Health and Safety Executive (HSE) attests that working at a computer screen neither causes permanent damage to eyes or eyesight nor makes existing defects worse.

What the HSE does acknowledge, however, is that long spells in front of a screen are visually demanding and can lead to computer vision syndrome, which includes tired, red eyes, temporary short-sightedness and headaches. It can also make individuals aware of eyesight problems that may have previously slipped their notice.

There is currently no standard definition in UK law of what constitutes excessive screen time, not least because the impact depends on variables, such as age, health and gender. But the issue is undoubtedly compounded by additional heavy screen use outside work, with some studies indicating the light from screens can even have a negative impact on sleep patterns.

Another significant problem is dry eyes, says Ali Mearza, director and founding partner at eyecare centre Ophthalmic Consultants of London. While people naturally blink 15 to 20 times a minute, when focusing on a screen, this figure drops to between one and three times a minute, which leads to eyes becoming irritated.

But eye problems also tend to be more marked among the increasing number of workers over the age of 40. Presbyopia is more common in older workers, for example, as the muscles of the eye weaken and lenses get stiffer, often leading to blurry near-vision as well as eye strain and headaches.

"This affects people's concentration and general efficiency, but providing ideally annual eye tests for employees and a prescription for reading glasses can rectify the situation quite easily," Mr Mearza advises.

For preventative healthcare reasons, he also recommends eye checks if individuals experience recurrent headaches as they could be a symptom of more serious conditions, such as type-2 diabetes.

But it is not just eye health that is affected by excessive screen time. Poor posture over prolonged periods can lead to a range of musculoskeletal issues, including neck and back strain, which are the second most common cause of sickness absence behind stress and mental health considerations in the UK.

Emma Bartlett, partner at law firm Charles Russell Speechlys, says current health and safety legislation means employers have a duty of care to ensure their staff are fit for work. As a result, they need to assess whether desk areas that include screens are suitable for employee needs and take steps to reduce any potential health risks if not.

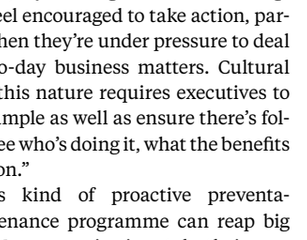
In terms of eyecare, employers are also required to pay for eye tests for employees every two years, if requested, and for special glasses if an individual's usual prescription does not enable them to view the screen at its normal distance.

But beyond these basic requirements, there are other simple steps employers can take to support better employee eyecare. For example, following the 20-20-20 rule – every 20 minutes, take a 20-second break and look at something 20 feet away – allows eye muscles temporarily to relax from having to focus intently, which guards against fatigue.

Toning down the brightness of computer screens can help. But encouraging staff to take regular five to ten-minute tea breaks away from their screen every hour or so can arguably be most beneficial. Doing so will not only help guard against eye problems, but also ensure employees gain some of the health benefits associated with movement and regular exercise.

6.5

hours a day spent in front of computer screen by average office worker



36%

have to squint regularly to see text on computer screen

48%

of office workers who don't take regular breaks suffer from eye dryness or soreness

Acuvue 2018

For many organisations though, ensuring such health and wellbeing initiatives are taken seriously requires education, awareness-raising activities and sponsorship from the top.

Otherwise, says Mr Rogers: "Middle managers won't feel encouraged to take action, particularly when they're under pressure to deal with day-to-day business matters. Cultural change of this nature requires executives to lead by example as well as ensure there's follow-up to see who's doing it, what the benefits are and so on."

And this kind of proactive preventative maintenance programme can reap big rewards. "Many organisations take their people for granted and continue to talk about low productivity while not taking their health and wellbeing seriously. But there's a direct link between the two, so it's about taking both ownership of this and positive action," Mr Rogers concludes.

MYOPIA

Battling blue light obsession

With half the world expected to be myopic within the next three decades, screen time habits may need to change before it's too late

Martin Barrow

If you are reading this article online, you might want to look away now. The curse of the digital age is our relentless focus on screens and a pandemic of myopia is unfolding before our very eyes.

Myopia, commonly known as short-sightedness, is estimated to affect one in three people in the UK and it is becoming even more common. Research, jointly funded by the College of Optometrists and Ulster University, has shown myopia is more than twice as prevalent among children in the UK now than in the 1960s.

"To avert tomorrow's explosion of blindness, we have to defuse this time bomb today," says Bhavin Shah, myopia control consultant.

This is a global phenomenon, which is being felt across the world with variations between regions and ethnic groups. In South Korea, for example, an extraordinary 96.5 per cent of 19-year-old males are myopic. But, in varying degrees, myopia is becoming the new normal and more than half the world's population will be myopic by 2050, based on current trends.

So, why it is happening now? Scientists believe modern lifestyles play a key role, including the fact that we spend more time indoors, away from natural light, and we are not getting enough sleep.

Increasingly, researchers are coalescing around one significant factor: screen time. There is no clear evidence that screen time alone is a direct cause of myopia. But there is evidence that spending more time outdoors reduces the risk of short-sightedness.

Scientists are studying the long-term effect of exposure to blue light, a high-energy visible light with shorter wavelengths, which we see from screens such as TVs, computers, smartphones and tablets.

There is currently no scientific evidence that blue light damages your eyesight, but studies are ongoing. We do know that carrying out near tasks, involving looking at something close up, such as mobile devices and computers, can increase eye strain for those who do this for long periods. But while it does not cause permanent damage to your eyes, it can be uncomfortable.

One of the main symptoms is temporary blurred vision, but other signs, such as sore and tired eyes, dry eyes and headaches, are also associated with digital eye strain.

Although mild myopia typically does not increase the risk of eye health problems, moderate and high myopia can be associated with serious side effects that can put a person's eyesight at risk.

Studies have shown that cataracts develop sooner in highly myopic eyes. They also have found that eyes with high myopia have a higher prevalence of co-existing disease and complications, such as retinal detachment.

Meanwhile, myopia, even mild and moderate kinds, has been associated with an increased risk of glaucoma. An Australian study found that people with short-sightedness had a two to three times greater risk of glaucoma than those with no myopia.

Retinal detachment is another risk associated with myopia. A study published in *American Journal of Epidemiology* showed eyes with mild myopia had a four-fold increased risk of retinal detachment compared with non-myopic eyes. Among eyes with moderate and high myopia, the risk increased ten-fold. The study authors also concluded that almost 55 per cent of retinal detachments not caused by trauma are attributable to myopia.

Short-sightedness can usually be corrected effectively with a number of treatments. Corrective lenses, such as glasses or contact lenses, help the eyes focus on distant objects. Increasingly, people are turning to laser eye surgery to alter the shape of the eye, while artificial lens implants are also becoming more widely available, using a man-made lens inserted into the eyes to help them focus.

Although an outright cure for myopia has not been discovered, treatments are emerging to raise hope that we may be able to slow its progression. Studies of atropine eye drops to control myopia progression have been impressive, at least for the first year of treatment. More research is needed to understand how atropine can best be used for the longer term.

Orthokeratology involves the use of gas-permeable contact lenses that are worn during sleep at night to correct short-sightedness temporarily, so glasses and contact lenses are not needed during the day. Evidence suggests children who undergo orthokeratology do better than children who wear glasses or regular contact lenses during the peak years for myopia progression.

Myopia often begins in childhood or adolescence, so parents are advised to schedule regular eye tests. It is also important to encourage children and young people to spend more time outdoors in regular play or exercise. Studies show two hours of outdoor activity every day is ideal.

Best practice for safe mobile use includes night settings on devices to help children sleep by reducing the amount of blue light given off by the mobile phone, for example. It is also recommended that digital devices be switched off at least one hour before bedtime.

More research is needed to help us understand the impact of smartphone eye strain and the best strategy for mobile usage. In the meantime, the message is slowly getting through that less is best when it comes to screen time. ●

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What is myopia?

Myopia is an eye condition that causes distant objects to appear blurred, while close objects can be seen clearly. Other symptoms include squinting, eye strain and headaches. Feeling fatigued when driving or playing sports can also be a sign of uncorrected short-sightedness.

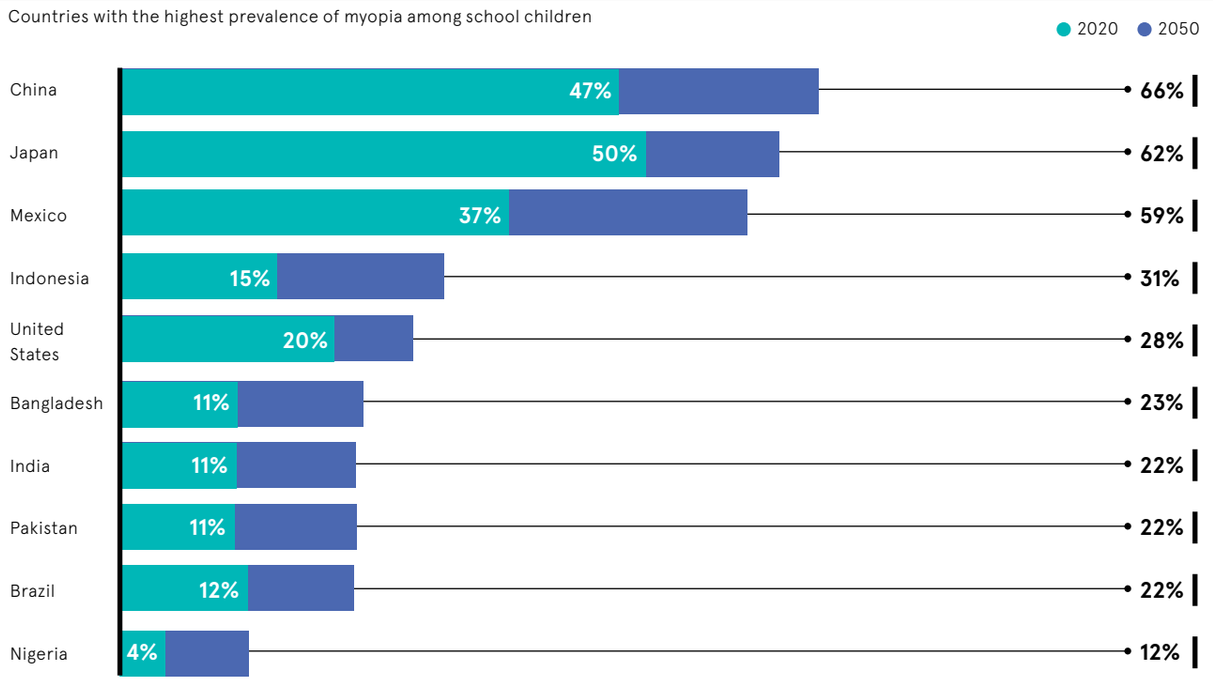
The condition occurs when the eyeball is too long, relative to the focusing power of the cornea and lens of the eye. This causes light rays to focus at a point in front of the retina, rather than directly on its surface.

Short-sightedness can also be caused by the cornea being too curved for the length of the eyeball. In some cases, myopia occurs due to a combination of these factors.

Myopia typically begins in childhood and you may have a higher risk if your parents are short-sighted. In most cases, it stabilises in early adulthood, but sometimes continues to progress with age.

ASIAN COUNTRIES PROJECTED TO BE MOST AFFECTED BY JUVENILE MYOPIA

Countries with the highest prevalence of myopia among school children



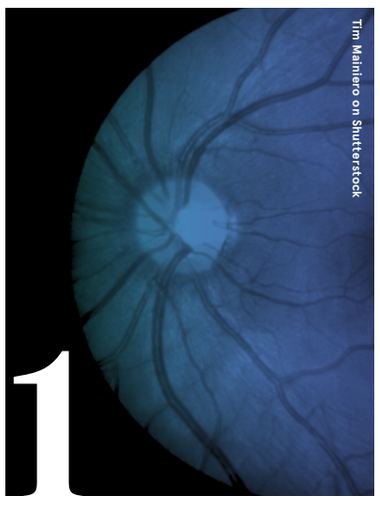
Clearly 2019

TECHNOLOGY

Breakthrough tech in the fight against sight loss

Profiling three pioneering technology projects that could help those suffering from severe eye conditions

Danny Buckland



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1

Implantable miniature telescope

A pea-sized optical lens magnifies and transmits images missed in blindspots and vision loss caused by age-related macular degeneration (AMD), which principally attacks the central vision. The device, developed by California-based VisionCare Ophthalmic Technologies, deploys two micro-lenses in a small glass tube that generates images that are picked up by healthy retinal tissue outside the central damaged areas. The eye's natural lens is removed and the telescope implanted in its capsule enabling light to be enlarged by three times which, although it does not cure AMD, allows patients to recognise people and objects that would have appeared dark prior to the operation. The device is implanted in one eye, which experiences a loss of peripheral vision, and the brain learns to balance the information from both eyes to create fuller images.

Retinal pigment patch

An engineered patch derived from stem cells is used to treat people with severe sight loss from wet age-related macular degeneration (AMD), a chronic condition with swift onset. Diseased cells at the back of the patients' affected eye are replenished with a stem cell-based patch, which is inserted under the retina with a special surgical tool in an operation lasting one to two hours. Two patients monitored on a 12-month trial went from not being able to read even with glasses, to reading 60-80 words a minute with normal reading glasses. The study by the London Project to Cure Blindness, a partnership between London's Moorfields Eye Hospital NHS Foundation Trust, University College London Institute of Ophthalmology and National Institute for Health Research, could lead to off-the-shelf treatments being available on the NHS in the next five years.

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2

Bionic eye

Patients in London and Manchester made history by receiving the world's first bionic eye implants. The Argus II system, developed by US company Second Sight Medical Products, restores a degree of functional sight in patients with retina pigmentosa, an inherited condition. An implant, containing a micro-electronics pack, an antenna and an electrode, is positioned in the retina and links to a video processing unit pack and pair of sunglasses worn by the patient. The Argus II bypasses damaged areas of the eye by using a small video camera built into the sunglasses to generate images which are translated into electrical impulses that stimulate the remaining healthy cells in the eye to transmit visual images from the optic nerve to the brain. Hundreds of patients have successfully recovered some sight with the device. ●

Second Sight Medical Products

3

VUI Diagnostics

Simon Rabinowicz and Uddhav Vaghela, founders of VUI Diagnostics

CASE STUDY

The device shining a light on old-fashioned care

Danny Buckland

VUI Diagnostics, the brainchild of two university medical students, could hold the key to improving eyecare inefficiencies and patient diagnosis.

A simple plug-and-play tool could revolutionise eye-screening to save sight and streamline the NHS clogged clinical pathway.

An innovative device, created by two final-year medical students at Imperial College London, could create a dynamic shift to preserve sight for patients and provide an economic boost across a strained health pathway.

Simon Rabinowicz and Uddhav Vaghela, both 23, got their idea after being on GP placements where they noticed the standard hand-held ophthalmoscope diagnostic tool was either feared or not used because of its poor functionality and results.

"This device had barely changed since the 1870s and we discovered that many doctors did not feel comfortable using it," says Simon, who runs VUI Diagnostics with Uddhav in spare time around their studies.

"GPs are fearful of making a false diagnosis and, if you are not confident, then the likelihood is you will refer the patient on and so our clinics are packed with people who could have been diagnosed earlier."

The pair combined their backgrounds in bio-engineering and software design to create the portable, box-shaped device which takes less than a minute to diagnose both eyes compared with the ophthalmoscope's tortuous ten-minute process.

"The ophthalmoscope involves the doctor getting very close to the patient and shining a light that gives a pin-hole image. They then have to move the light around and stitch every image together in their mind before making a diagnosis. It is uncomfortable and inaccurate," adds Simon, who comes from London.

"Our system just involves the patient looking at the box while the camera takes an image and transmits it to a computer screen where a doctor can make a detailed assessment of a full image rather than trying to remember scores of tiny images."

> **"Our device removes doubt so GPs can make much clearer management plans and just saving a fraction of these will save millions of pounds for the NHS**

The students' ingenious application of technology won the £40,000 Venture Catalyst Challenge 2019 top prize earlier this year and has attracted support from experts at the Western Eye Hospital and Royal Free Hospital in London.

The device, which features proprietary technology to acquire and transmit images, is easy to operate and could be used by healthcare professionals or even patients at home. It is moving into clinical trials with the aim of launching in mid-2021.

"This is a simple, affordable solution that addresses a big problem," says Uddhav, from Teeside. "We have spoken to patients who were put down for a non-urgent referral and seen months later by which time they had lost quite a lot of vision from macular degeneration.

"Our device removes doubt so GPs can make much clearer management plans and, if you think that every referral costs £120, just saving a fraction of these will save millions of pounds for the NHS."

The students believe the device will have a huge impact in developing countries where avoidable blindness affects up to 800 million people, according to the World Health Organization. It can be used remotely to generate early and accurate diagnosis, so patients can be treated before their eyesight deteriorates or disappears. ●

Commercial feature

Understanding glaucoma

A regular eye test does more than ensure you have the right prescription glasses; it could save your sight or even your life

According to research by the Royal National Institute for Blind People (RNIB), 14 million people in Britain are not having their eyes tested every two years as recommended by the College of Optometrists.

And, although according to a 2018 YouGov poll 70 per cent of people value their sight more than any other sense, there are up to one million people in the UK with some degree of preventable sight loss.

One of the main causes of avoidable sight loss is something that seldom presents symptoms in its early stages and is often called the "silent thief of sight", the condition known as glaucoma.

The most common form of glaucoma progresses slowly causing the death of nerve fibres in the optic nerve, which connects the eye to the brain. This results in a gradual loss of peripheral vision in the affected eye that often goes unnoticed at first.

"People often won't know they have it until it's fairly advanced and by that time any vision loss is pretty much irreversible," says Dr Nigel Best, Specsavers' clinical spokesman.

"We are encouraging people, but especially the over-40s, to have regular eye examinations every two years to check for early signs of glaucoma so they can be referred for early treatment to protect their sight."

50%

of glaucoma in the community remains undiagnosed; previously undetected cases are largely identified at routine sight tests by community optometrists

10%

of people with glaucoma are registered blind

Royal College of Ophthalmologists 2016

The RNIB advises a biennial eye examination even if there is no change in vision, but its figures show that 14 million adults in Britain have not had their eyes tested for more than two years.

The International Glaucoma Association (IGA) estimates 700,000 people in the UK have the condition, but around 50 per cent are unaware they have it and glaucoma worsens if not detected. At the point of diagnosis, men are 16 per cent more likely than women to have signficant sight loss, probably because of a traditional male reluctance to engage with healthcare.

"The vision loss is so gradual that people don't notice it; you can lose up to 40 per cent of vision before it becomes apparent," says Karen Osborn, IGA chief executive.

"Glaucoma is characterised by misty, patchy vision in the peripheral field. One of the reasons it goes unnoticed is that the brain is wonderful at filling in the gaps from images provided by the optic nerve, while the eyes work together with overlapping fields of vision which compensates for weaknesses."

IGA is funding research to develop treatments, cures and improved testing methods that will deliver earlier diagnoses.

"Glaucoma is complex and there is no cure at the moment, which makes having regular eye examinations so important," says Ms Osborn. "Losing your sight can have a huge impact on your life and your independence. One of the things I'd love never to hear again is 'I wish I'd had my eyes tested'. The impact of delaying can be profound."

Specsavers is now spearheading a national programme to reduce avoidable sight loss drastically by introducing optical coherence tomography (OCT) scanning equipment in all its stores.

The non-invasive imaging machine enables optometrists to detect minute changes in the retina and optic nerve that can highlight glaucoma up to four years earlier than traditional methods.

"OCT can measure down to a couple of microns – a micron is a millionth of a metre – to give us an accurate assessment of the thickness of the retinal nerve fibre layer, which is a very good indicator of glaucoma," explains Dr Best.

"Glaucoma can be difficult to diagnose, but this technology is a game-changer as it significantly enhances our ability to spot glaucoma, and other sight-threatening conditions, at an earlier stage. The OCT scans the optic nerve and measures the thickness of the nerve fibres present.

"It then compares this thickness measurement with measurements taken from thousands of similar patients to indicate to an optometrist whether the thickness is as expected or thinner than expected, which can indicate glaucoma.

"An optometrist will consider the OCT findings in conjunction with other more traditional signs of glaucoma, for example eye pressure, and decide whether referral for further investigation is necessary.

"It is a quick, easy and painless examination. The patient simply positions their chin on a rest and feels nothing as the machine takes less than a minute to scan each eye.

"If we can start treatment at an early stage, then vision loss will hopefully be minimal and most glaucoma patients will have no disease progression. However, most patients will need to put in eye drops daily for the rest of their lives to preserve their sight."

Specsavers is committed to raising awareness of preventable sight loss and making it easier for people to have regular eye examinations that can protect their sight.

> **Glaucoma can be difficult to diagnose, but OCT technology is a game-changer as it significantly enhances our ability to spot glaucoma at an earlier stage**

For more information please visit specsavers.co.uk

Specsavers

Routine sight test picks up potentially sight-threatening condition

When Mary Booth made an appointment at her local Didcot opticians for a routine eye examination, she had no idea that the visit would ultimately help to save her sight.

Mary, 78, a regular customer of Specsavers in Didcot, made the appointment for a sight test earlier this year. She'd not been experiencing any unusual symptoms, but thought she might need a new pair of glasses as her vision had deteriorated a little.

She was seen by optometrist and store director Rukhsana Bi, who quickly picked up that Mary's optic disc in her left eye looked different from her previous visits. Further tests using an optical coherence tomography (OCT) machine, which uses a laser light source to produce a structural scan of the eye, along with field and pressure tests, led Rukhsana to believe that Mary had the early signs of glaucoma. Rukhsana urged Mary to contact her GP to arrange an appointment at the eye hospital.

"I managed to get an appointment with an eye consultant within a month and he confirmed Rukhsana's suspicions about glaucoma," says Mary. "The consultant was also amazed that this had been picked up at all during a routine eye examination at such an early stage and praised Rukhsana for her professionalism."

Fortunately, as Mary's condition had been caught early, she was prescribed with special eye drops to reduce any damage to her eyes. She'll also continue to have regular check-ups at the hospital.

"The thought never crossed my mind that I might have glaucoma," adds Mary. "I'd not had any symptoms and there's no history of the condition in my family. So, if I hadn't seen the optician when I did, I could ultimately have lost my sight. At least my two children, now in their 40s, can be monitored early as a result, as glaucoma can be hereditary. I'd recommend everyone visits their opticians regularly, irrespective of whether they think they need new specs or not."

"Mary's story really does demonstrate how important it is to keep up to date with your eye examinations," Rukhsana concludes. "Glaucoma is a progressive disease, so the earlier it's picked up the better. We're just thankful Mary came in to see us when she did."

RESEARCH

Five exciting developments in eye health research

Some of the most important technological and treatment innovations over the past 12 months could transform the future of eyecare

John Illman

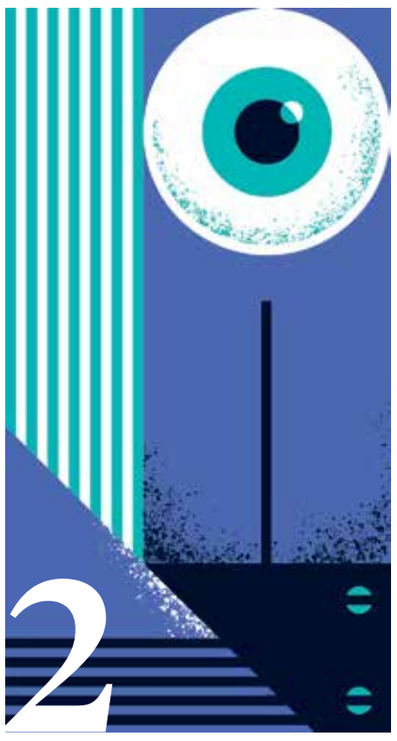
Accurate diagnostics with AI

A remarkable piece of eye health research reported in *Nature Medicine* has shown that an artificial intelligence (AI) programme can make the correct referral decision for more than 50 eye diseases with 94 per cent accuracy. This matches world-leading experts.

The DeepMind system could revolutionise the management of eye tests, enabling healthcare professionals to spot conditions earlier and prioritise patients with the most serious diseases before irreversible damage sets in.

Pearse Keane, consultant ophthalmologist at London's Moorfields Eye Hospital NHS Foundation Trust and clinician scientist at University College London Institute of Ophthalmology, says: "The number of eye scans we're performing is growing at a pace much faster than human experts are able to interpret them. There is a risk this may cause delays in diagnosis and treatment of sight-threatening diseases, which can be devastating for patients.

"The AI technology we're developing is designed to prioritise patients who need to be seen and treated urgently by a doctor or eyecare professional. If we can diagnose and treat eye conditions early, it gives us the best chance of saving people's sight. With further research it could lead to greater consistency and quality of care for patients with eye problems in the future."



Pain-free, cost-cutting laser treatment

A simple, safe, pain-free laser treatment not only works better than eye drops at preventing glaucoma from deteriorating, but could also save the NHS tens of millions of pounds a year, according to eye health research at Moorfields Eye Hospital and UCL Institute of Ophthalmology.

Gus Gazzard, glaucoma service director at Moorfields and reader in glaucoma studies at UCL, says: "These results strongly suggest that laser should be the first treatment for glaucoma in all newly diagnosed patients."

The results could potentially improve global glaucoma treatment while saving the NHS up to £1.5 million a year in treatment costs for newly diagnosed patients. If the treatment proves to be as effective with previously diagnosed patients, Moorfields estimates annual savings to the NHS could reach up to £250 million.

Reported in *The Lancet*, the three-year trial is the largest ever of its kind. It involved 718 patients, newly diagnosed with glaucoma or ocular hypertension (higher than normal pressure in the eye).

Patients receiving laser therapy more regularly achieved the target intraocular pressure (pressure in the eye) than those having standard eye drops. Laser patients were also less likely to need treatment for glaucoma and cataracts.

Robot-assisted eye surgery

The first eye health research to determine whether robots can perform eye surgery safely and effectively has been acclaimed a success.

Carried out at Oxford's John Radcliffe Hospital, the study involved 12 patients. Six received robot-assisted surgery and the remaining six standard manual surgery to remove a membrane from the back of the eye.

Using the robot, the surgeon was able to perform the procedure as effectively or better than with the traditional manual approach.

In the trial's second phase, the team used the robot to insert a fine needle under the retina to dissolve blood in three patients who had age-related macular degeneration. All experienced an improvement in their vision as a result.

Robert MacLaren, Professor of ophthalmology, says: "This is a huge leap forward for delicate and technically difficult surgery, which in time should significantly improve the quality and safety of this kind of operation."

The trial was conducted by the University of Oxford, supported by the National Institute for Health Research Oxford Biomedical Research Centre. Results were published in *Nature Biomedical Engineering*.

The trial builds on earlier pioneering work at the John Radcliffe Hospital, which in 2016 carried out the world's first robotic eye operation.

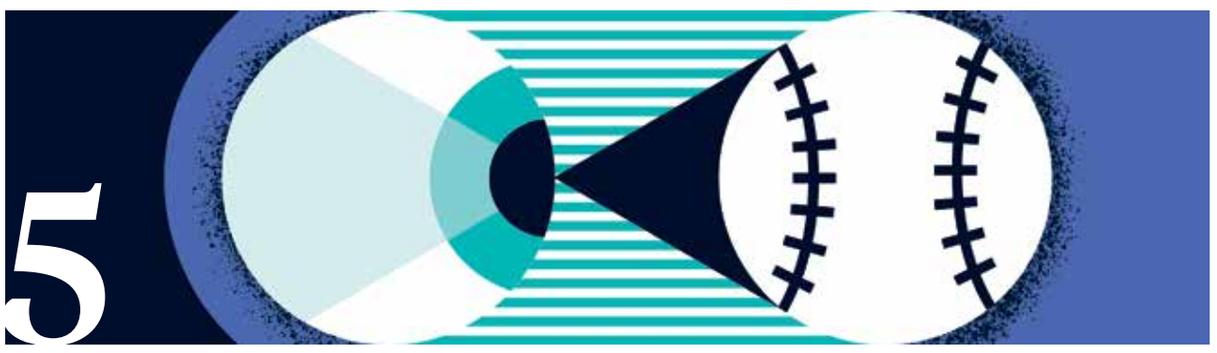
Gene therapy to fill a therapeutic vacuum

The first gene therapy for inherited blindness represents a potential triumph for retinal and eye research, but it is generating extensive global controversy. Recently approved for use in Europe, it had an initial US price tag of $850,000, making it one of the world's most expensive treatments.

Luxturna can restore vision in people with a rare RPE65 genetic mutation that causes progressive vision loss which begins in childhood. The RPE65 gene provides instructions for making a protein that is essential for normal vision. Most patients are blind by the time they become young adults. There is no other treatment for the disease. Treatment consists of injections of the RPE65 gene into the retina.

An estimated 337 people in the UK have inherited retinal disease. Mutations in both copies of the RPE65 gene are estimated to affect about one in 200,000 people.

Dr David Rind, of the US Institute for Clinical and Economic Review, says: "While the evidence is clear the therapy improves vision for patients over several years, the long-term duration of this benefit remains unknown. Assuming a ten to twenty-year benefit period, at list price the treatment does not meet standard cost-effectiveness thresholds."



Bionic eye

A five-year study of a bionic eye tested by five patients with little or no sight marks a big step forward in eye health research, according to preliminary reports.

But the researchers stress they are a long way from achieving full vision for their research subjects. For example, a patient may be able to see an object without knowing if it is a mug or a baseball.

William Bossing, assistant professor of neurosurgery at Baylor College of Medicine, in Houston, Texas, says the research was designed to enhance optimal interface between the Orion bionic eye and the brain to enable the research participants to see forms and shapes.

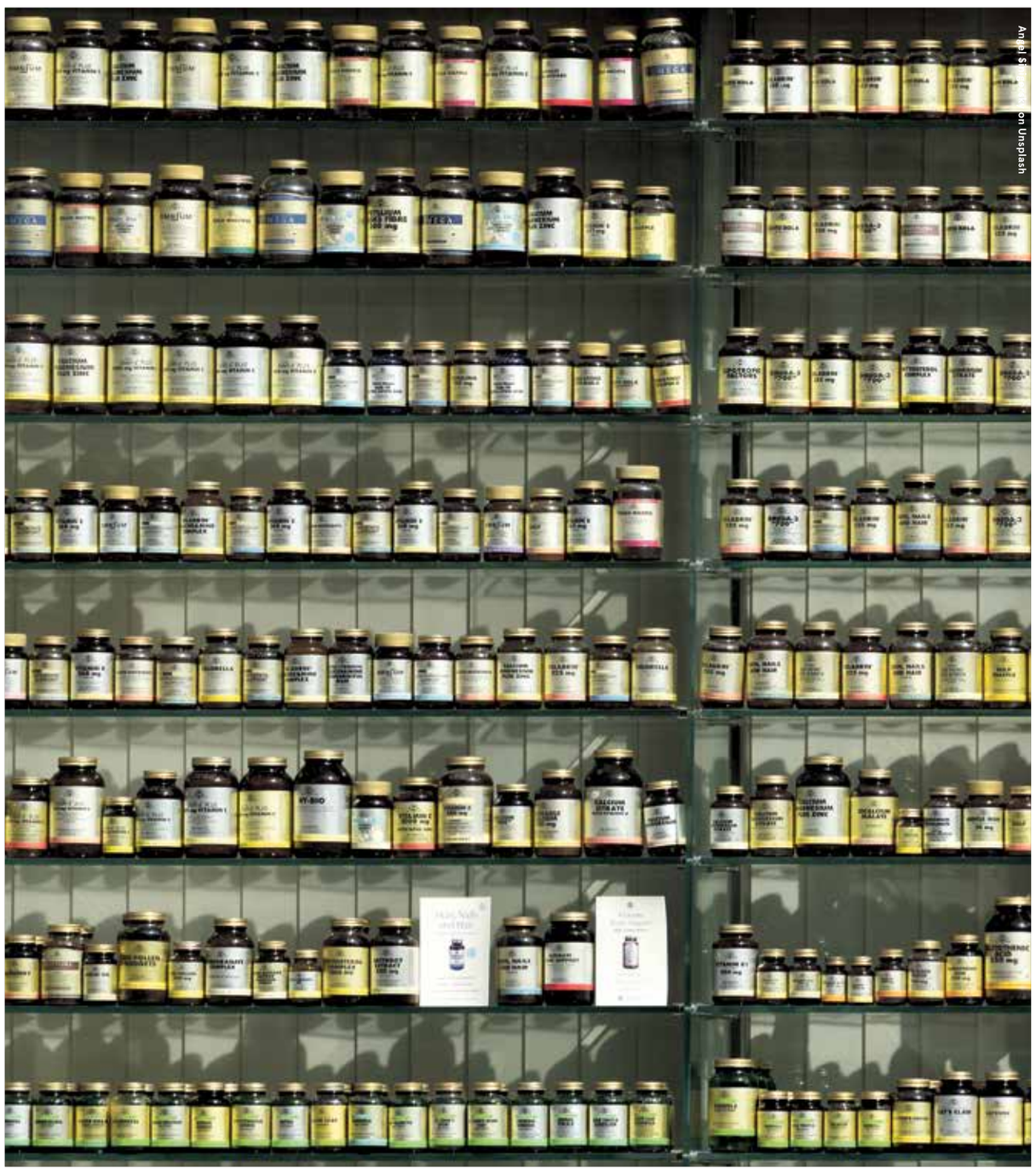
Surgically implanted in the brain, the Orion includes a camera mounted on a pair of image-capturing eyeglasses. It delivers patterns of stimulation directly to the visual part of the brain; in other words, it can bypass broken optical nerves.

Daniel Yoshor, Baylor professor of neurosurgery, explains: When you think of vision, you think of the eyes, but most of the work is being done in the brain. Impulses of light projected on to the retina are converted into neural signals that are transmitted along the optic nerve to parts of the brain."

SUPPLEMENTS

Truth behind eye health vitamins

The vitamins and supplements market can be a crowded and confusing place for patients in search of products to aid eye health


Angel S… on Unsplash

$2.9bn

projected sales value of eye health supplements in 2024

30% US revenue share of the global eye health supplements market by 2024

6% compound annual growth rate in Europe's eye health supplements market

Persistence Market Research 2019

Marina Gerner

There are many claims about food. According to one, Royal Air Force pilots ate blueberry jam during the Second World War, which supposedly improved their vision on night flights. But a counter view says the pilots were testing new and improved radar equipment during this time. It's the latter that explains their success, but our enthusiasm for promising nutrients continues.

Walk into any health food shop and you will find eye health vitamins that promise to "protect your cells" with ingredients such as "special berries native to Northern Europe". Are such vitamins an essential part of eyecare or are they simply a marketing ploy?

Ageing populations and healthier lifestyles have spurred sales of vitamin supplements over the last decade. More than half of Americans regularly take vitamins or mineral supplements, according to a 2013 Gallup poll. Among those aged over 65, consumption is the highest at 68 per cent.

The upshot is a thriving consumer market. In 2018, revenues from vitamin and nutritional supplements reached $31 billion in the United States, according to research company Statista. In the UK, sales of supplements reached a record £442 million in 2018, according to Mintel. And it's an upward trend.

Do optometrists ever recommend eye health vitamins? "It's common practice to recommend supplements for people who have age-related macular degeneration (AMD)," says Roshni Kanabar, clinical adviser at the UK's Association of Optometrists. She says they are not typically recommended for cataracts.

AMD is caused by damage to the macular region of the eye, which is the part of the retina that provides detailed and central vision. There are two main types of AMD: dry and wet. Ms Kanabar explains that the common treatment for wet AMD consists of eye injections, while there is no effective treatment for the dry AMD, but supplements are often recommended.

This recommendation is largely based on two influential American studies. In 2001, a large-scale study called Age-Related Eye Disease Study (AREDS) found that people who already have AMD lowered the risk of a more advanced stage by 25 per cent when they took a combination of vitamin C, vitamin E, beta-carotene and zinc.

In 2013, there was a follow-up AREDS2 study. This time, the researchers made two changes: they added omega-3 fatty acids to the equation, but found this had no effect on the formulation. And they swapped beta-carotene for the antioxidants lutein and zeaxanthin, which appeared to be a safe and effective alternative. The motivation for this second change was that prior studies found beta-carotene posed an increased risk of lung cancer if it is taken by smokers.

Crucially, the study notes that for people without any AMD, "the nutrients did not provide an apparent benefit". Eye health vitamins do not, therefore, help with prevention for the general population, says Susan Blakeney, clinical adviser at the London-based College of Optometrists.

> **As much as we all want to know the outcome, these studies are very difficult to conduct**

The two AREDS studies had a robust sample size and were sponsored by the US National Eye Institute. But later studies have failed to reproduce the same benefits, which is how scientists test whether research results are reliable.

According to a 2017 Cochrane Review: "Supplements containing lutein and zeaxanthin are heavily marketed for people with age-related macular degeneration, but our review shows they may have little or no effect on the progression of AMD." Another one was more positive, it concluded: "taking an antioxidant multivitamin supplement may slow down the progression of AMD."

Dr Blakeney says: "As much as we all want to know the outcome, these studies are very difficult to conduct." They require thousands of people to make up a sample for observations over multiple years. Then there are many other risk factors, like what did they eat or drink during that time? Also, with older people, it's harder to narrow down all the influences due to their longevity.

People who take vitamins tend to be wealthier, healthier and better educated, and this can skew the results of some research as cause and effect get tangled in a web of circumstances.

What's more, several studies include disclaimers, such as: "Although generally regarded as safe, vitamin supplements may have harmful effects." With all vitamins, the wrong combination or a high dosage can cause side effects.

Many robust studies have shown that vitamin-rich foods, such as vegetables and fruit, improve our health. But that doesn't necessarily mean we can condense the benefits of broccoli into a green pill.

"It's not what people want to hear, but the main thing to protect their eye sight is to stop smoking," says Dr Blakeney. "We know it increases the risk of AMD significantly.

"It helps to have a healthy diet, maintain a healthy weight and protect yourself from sunshine by wearing sunglasses or a hat with a brim.

"It's worth having regular check-ups. They won't prevent you from having eye disease, but spotting conditions early can help keep you healthier for longer. Even though there is no good evidence that the general population should be taking eye health vitamins, it's worth asking your optometrist if you fall within the part of the population which could benefit from them."

Ms Kanabar at the Association of Optometrists emphasises that smoking can increase the risk of AMD four-fold. "It's not too late to stop," she says. "If a person stops smoking, the risk level goes down and, after five years, it's almost the same as that of a non-smoker."

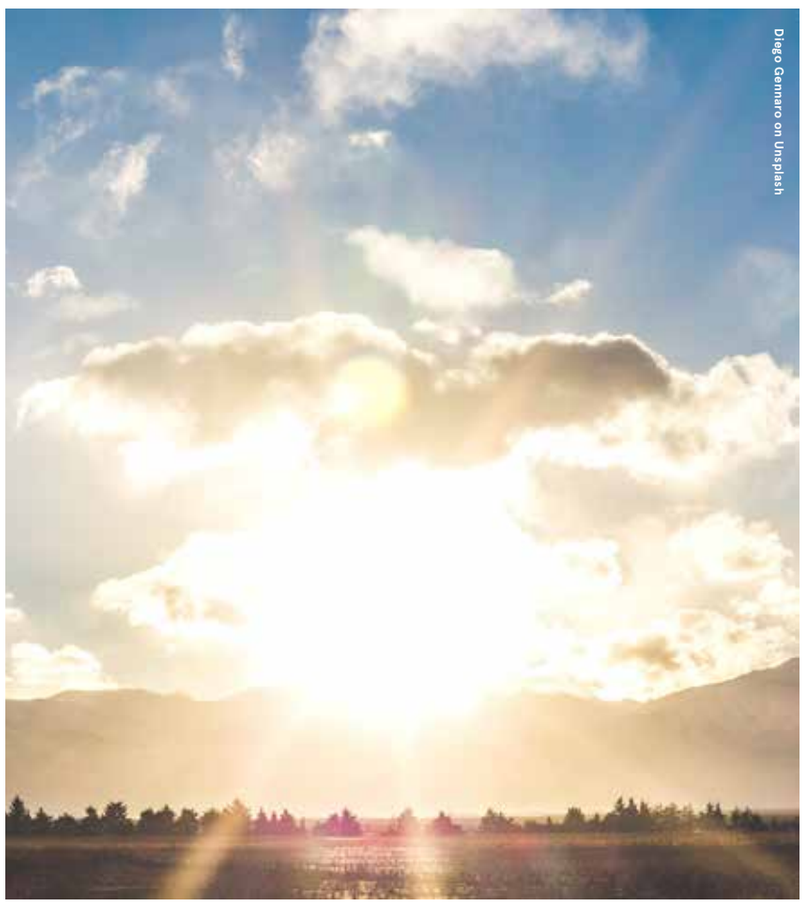
But does eating carrots improve your eyesight? "Yes, carrots are beneficial," says Ms Kanabar, "but so are other vegetables." ●

LIFESTYLE

Surprising lifestyle factors that impact eye health

As medical knowledge advances and new technologies develop, our understanding of the eye and how best to treat it are constantly improving

Mikaela Aitken


Diego Gennaro on Unsplash

Working on the frontline of eye health and providing healthy lifestyle tips is opthamologist Dr Daya Sharma from Eye & Laser Surgeons in Sydney.

"My advice for patients is not to rely on information they find on the internet," he says. "It's important not to ignore symptoms and for adults to schedule routine eye checks. Prevention is always better than treatment."

Communication remains key in combating misinformation among the general public. Here's ten common lifestyle factors that can harm eye health:

UV exposure

Awareness around the importance of protecting the skin against ultraviolet (UV) rays has grown. However, the effect of these harmful rays is less understood. Studies have found UV damage can occur from as early as nine years old, with even annual summer or snow holidays heightening damage. "We don't have a good public understanding of sunglasses for eye protection rather than fashion," says Dr Sharma. He recommends the use of wrap-around sunglasses to completely limit the amount of UV filtering through to the eyes.

Screen time

Extended screen time is drastically increasing dry eyes and is thought to be causing subsequent cases of myopia in both children and adults. Evidence now suggests that safe UV-free exposure to bright natural light and exercising long-range sight regularly will help counteract the increase in myopia. "A really basic tip is to follow the 20 20 20 rule: for every 20 minutes spent looking at a screen, spend 20 seconds looking at something 20 feet away," says optometrist and clinical advisor Daniel Hardiman-McCartney from The College of Optometrists.

Poor contact lens hygiene

There are millions of contact lens wearers worldwide. However, with most starting young, a sense of complacency around hygiene often creeps in. Practices such as topping up contact lens solution with tap water or not changing the lenses on time creates a significantly higher risk of bacterial and fungal infections. Acanthamoeba keratitis, which can cause blindness, is also on the rise. "We need to be careful of patients purchasing lenses online and encourage them to seek yearly eye checks in-between orders," says Dr Sharma.

Smoking

The deadly consequences of smoking on our overall health are widely understood. Yet there's concern among the optometrist and ophthalmologist community that public understanding of the impacts of smoking on eye health remain largely unpublicised. "A lot of people aren't aware of how bad smoking is for the long-term maintenance of vision," says Dr Sharma. Blindness due to a retinal artery occlusion and retinal disease are just two severe consequences smoking can have on the eyes.

Poor diet

A lacklustre diet might not be as strongly linked to deteriorating eye health as it is to conditions such as heart disease and osteoporosis. However, evidence suggests a balanced diet helps abate the onset of macular degeneration, which can affect people aged over 65 in particular. "Poor diet may also lead to high blood pressure, which we know is bad for the eyes and can lead to sight loss," says Dr Hardiman-McCartney. When consumed over extended periods, green leafy vegetables, nuts and oily fish, including tuna and salmon, are beneficial.

Alternative and natural treatments

"Crazy ideas are becoming harder and harder to counter," says Dr Sharma, referring to the rise of alternative and natural treatments. "This misinformation is becoming increasingly prevalent and there are lots of eye diseases that are chronic and low-grade irritation." While all wellness crazes aren't harmful, and supplements can sometimes prove helpful, increasingly people are running the risk of adopting potentially damaging alternate remedies before seeking advice from optometrists or doctors.

Harmful tools, chemicals and lights

A cavalier approach to the use of safety equipment and protective eyewear can inflate the number of otherwise avoidable eye injuries and acute eye damage. The culprits for such damage can range from everyday exposure to household cleaning chemicals, more powerful lights including a photographer's halogen flood lamp or a welder's torch, or use of hand tools. High-quality safety goggles and eyeguards are recommended.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Complacency and inaction

One of the biggest misconceptions of eye health is the assumption that people suffering glaucoma will be alerted to the condition through experiencing symptoms. "We call glaucoma the silent thief of sight," says Dr Sharma. The same can also be said of cataracts. Early detection and treatment are paramount in safeguarding sight and consequent independence in old age.


pogrebkov / Getty Images

Old make-up

Bacteria can build up in old or out-of-date make-up, such as foundation, mascara, eyeliner and eyeshadow, risking eye infections. The cosmetics industry recommends make-up should be replaced every three months and that application should be with brushes which are thoroughly washed regularly in hot soapy water.

Chronic eye-rubbing

As school and workplace dependence on screens increases or allergens become evident, the reflex to rub your eyes becomes more pronounced. "It may seem like a harmful reflex, but frequent eye rubbing is a sign that things might not be right," says Dr Hardiman-McCartney. This seemingly benign, but intrinsically habitual, behaviour can affect the eye pressure and damage the cornea.