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The economic impact of coronavirus (COVID-19) on sight loss and blindness in the UK

Specsavers Optical Group Limited

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Deloitte Access Economics

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Glossary

Acronym	Full name
A&E	Accident and emergency department
AMD	Age-related macular degeneration
COVID-19	Coronavirus disease 2019
CVI	Certificate of visual impairment
DMO	Diabetic macular oedema
DNA	Did Not Attend
DR	Diabetic retinopathy
FOI	Freedom of Information
GP	General practitioner
GOS	General Ophthalmic Service
NHS	National Health Service
ONS	Office for National Statistics
RE	Refractive error
RNIB	Royal National Institute of the Blindness
RRD	Rhegmatogenous retinal detachment
RVO	Retinal vein occlusions
UK	United Kingdom
VEGF	Vascular endothelial growth factor

Executive summary

Background

The spread of coronavirus disease 2019 (COVID-19) pandemic has led to major disruptions of health services, including routine hospital surgical procedures and services worldwide. This includes ophthalmic procedures (refers to surgeries and treatments) and services (refers to all other health service for eye care) in the United Kingdom (UK), comprising of England, Wales, Scotland and Northern Ireland. Where ophthalmic care is used in this report, this refers to procedures and services for eye care.

In 2019, the economic cost of sight loss and blindness was estimated to be £36.0 billion in the UK. However, lockdowns due to COVID-19 have resulted in a substantial lower use of ophthalmic care and it is possible this may have led to worse sight and health outcomes as a result.

Analysis of electronic health record data from the National Health Service (NHS) revealed approximately 1.5 million fewer surgeries were performed from 2020 compared to expected yearly surgical activity.[1] This is equivalent to a 34% decrease in all surgeries performed including ophthalmic surgeries such as cataract. This report estimates the change in healthcare system costs of sight loss and blindness and the impact of delayed and/or missed treatments resulting from COVID-19.

The estimated costs in the report reflect the impact of COVID-19 from March to December 2020. This report presents aggregated UK impacts resulting from:

- A reduction in the utilisation of health service in 2020, which led to a reduction in costs overall. These are quantified for inpatient hospitalisation, day surgeries, outpatient services, pharmaceuticals claim, as well as optometrist visits.
- The cost of fewer sight tests and associated delay in identification of eye disease including cataract, age-related macular degeneration (AMD), diabetic retinopathy (DR) and other eye conditions.
- A reduction in routine follow up visits and prescriptions for patients, which included a reduction in medications and also supplements to prevent the deterioration of the eye.
- The reduction in new detection, diagnoses and reduced referrals to eye specialists.

Findings

The findings show the reduction in utilisation of ophthalmic procedure and services reduced the cost of sight loss and blindness to the healthcare system by £778.3 million in 2020.

It is important to acknowledge, however, that this reduction may have serious and ongoing implications in the coming years, for major eye conditions including cataract, glaucoma, AMD and DR.

The findings from this report estimated 2,986 people experienced sight loss due to delayed sight tests and treatments in 2020.

Given an average annual cost of £16,867 per person living with sight loss and blindness in the UK, delayed tests and treatments mean that the incremental cost of sight loss and blindness may be £50.4 million higher each year between 2021 and 2024, compared to pre-COVID costs.[i]

[i] The estimate of three years (2021 to 2024) to clear the backlog is driven by the assumption that health services will ramp up activity by 11% to clear the backlog and reduce waitlist back to pre-COVID level.

The backlog of services is likely to impose significant costs for individuals living with vision threatening eye conditions. In part, these costs occur due to an increased risk of falls while waiting for services, but also because individuals may have a reduced quality of life while waiting.

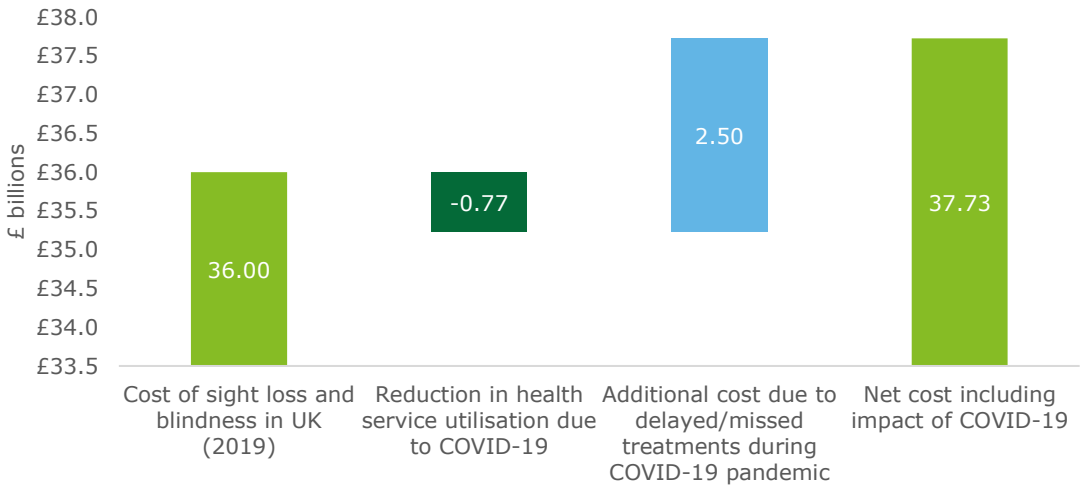
The additional economic cost of sight loss and blindness due to COVID-19 is estimated to be £2.5 billon between 2021 and 2024.

The key findings are summarised as follows:

- The additional wait time (due to the underutilisation of health services in 2020) for eye surgeries is expected to impose incremental costs of £2.3 billion between 2021 and 2024.[ii] Of these costs, £498.2 million were due to financial losses in the wider community such as productivity losses, with the remaining £1.8 billion due to lost wellbeing.
- The cost of fewer sight tests is expected to impose incremental costs of £75.7 million between 2021 and 2024.
- The cost of delayed treatment is expected to impose incremental cost of £125.7 million between 2021 and 2024.
- The cost of sight loss and blindness to the UK healthcare system declined by £778.3 million in 2020 due to underutilisation.
- It is estimated that 2,986 patients have lost sight as a result of COVID-19. Of these, 1,123 lost vision due to delayed sight tests and the associated delayed referrals for treatment, and 1,863 due to delays in scheduled treatment such as surgery for Glaucoma or anti-VEGF injections for AMD.
- Wait times for ophthalmic surgeries increased by 37 days (from 7.6 to 12.9 weeks or 69.7%) as a result of the pandemic, with over 235,000 necessary eye surgeries missed or delayed in 2020.
- If health services ramp up activity by 11%, it is expected that it will take just over three years to clear the additional backlog of ophthalmic surgeries caused by the pandemic.

The net impact on the cost of sight loss and blindness in the UK due to COVID-19 is therefore £1.7 billion (Chart i).

Chart i: Impact of COVID-19 on the economic cost of sight loss and blindness in the UK



[ii] These costs rely on an assumption that service volumes are increased by approximately 11% over that period, so there is a possibility the cost could be greater than this if the backlog takes longer to clear. Sensitivity around this assumption is provided in section 3.4.3.

Source: Deloitte Access Economics calculations.

COVID-19 continues to challenge the UK healthcare system. As such, the full extent of reduced ophthalmic care (referred to as any health service in relation to eye care) is still unclear. Continued data collection is required to assess the longer-term impact of the pandemic on the eye health of people living in the UK. Further challenges lie head for eye care in the UK as subsequent waves of the pandemic and ongoing disruptions to ophthalmic care are managed.

Deloitte Access Economics

1 Introduction

Sight loss and blindness imposes substantial costs on the UK each year. Deloitte Access Economics estimated the economic cost of sight loss and blindness to be £28.1 billion, and within this the loss of wellbeing due to sight loss and blindness was valued at £19.5 billion in 2013.[2]

1.1 Structure of the report

This report is structured in the following way:

- **Chapter 1** details the purpose and scope of this project, defines sight loss and blindness used in this project, describes the main causes of sight loss, and discusses the impact of COVID-19 on the UK healthcare system.
- **Chapter 2** provides an overview of the methodology used to update the prevalence of sight loss and blindness from 2019 through 2024, updates the economic cost of sight loss and blindness in the UK from 2013 to 2019, and estimates the change in service utilisation and impact on patient outcomes due to the COVID-19 pandemic.
- **Chapter 3** summarises the estimated prevalence of sight loss and blindness from 2019 through 2024, economic cost of sight loss and blindness in the UK in 2019, and estimates the change in service utilisation (including inpatient hospitalisation, day surgeries, outpatient services, pharmaceuticals and primary care optometry) and impact on inpatient outcomes (for cataract, AMD, DR and glaucoma) due to the COVID-19 pandemic.
- **Chapter 4** discusses the findings and the possible implications for the UK healthcare system and society.

1.2 Purpose and scope of this report

Specsavers Optical Group Limited (referred to as "Specsavers") engaged Deloitte Access Economics to: (1) update the 2013 Deloitte Access Economics report on the economic cost of sight loss and blindness, and (2) to estimate the potential impact of COVID-19 on sight loss and blindness in 2020 to 2024. The former analysis has been published in the report '*The economic impact of sight loss and blindness in the UK adult population, 2013'* (with findings published in a peer-reviewed journal)[2], and subsequently updated by the Royal National Institute of the Blindness (RNIB) and provided as part of the Sight Loss Data Tool.[3]

This report highlights the impact of COVID-19 on the sight loss and blind community, drawing on the latest available evidence on the utilisation of health services throughout 2020. These data sources have been combined with literature on the impact of a delay on patient outcomes to estimate the impact not only on cost in 2020 but also future expected cost and outcomes due to the COVID-19 pandemic.

The focus of the report estimates the change in healthcare system costs of sight loss and blindness, and the impact of delayed and/or missed treatments resulting from the COVID-19 pandemic. The estimated costs in the report reflect the impact of COVID-19 from March to December 2020. This report presents aggregated costs and impacts across the UK comprising of England, Scotland, Wales and Northern Ireland.

1.3 Defining sight loss and blindness

Sight loss and blindness can be broadly defined as a limitation in one or more functions of the eye or visual system, most commonly impairment of visual acuity (clarity of vision or sharpness), visual fields (the ability to detect objects to either side or above or below the direction in which the person is looking), contrast sensitivity and colour vision.[4]

Degrees of sight loss and blindness are measured similarly, where the first number in the measure is the furthermost distance at which the person can clearly see an object and the second number corresponds to the distance at which a person with standard vision could see the same object. For example, 6/60 vision means that the person can clearly see at six metres (but not more) an object

that a person with standard vision could see at 60 metres (but not more).[4] Standard vision is recorded as 6/6 in metric measures, which means that a person can see at six metres what a person with standard vision can see at six metres.

The extent of sight loss may differ between eyes, known as asymmetrical sight loss. Prevalence rates for sight loss may report the prevalence and severity of sight loss by either the better or worse eye in terms of the extent of the sight loss. When reporting prevalence rates, better eye measures would provide conservative estimates while worse eye measures may tend to overstate sight loss and costs. **This report estimates the prevalence of sight loss and blindness for the better eye.**

The legal definition of sight loss varies internationally[5], however it is generally accepted that sight loss refers to best-corrected visual acuity of <6/12 in developed countries.[6,7,8] Common definitions for visual acuity used in the UK and in this report are as follows:

- Blindness (severe sight loss) is defined as best-corrected visual acuity of <6/60 in the better-seeing eye.
- Sight loss is defined as best-corrected visual acuity of <6/12 to 6/60 in the better-seeing eye, and is categorised as:
  - Low vision: best-corrected visual acuity of <6/12 but better than or equal to 6/18; and
  - Partial sight: best-corrected visual acuity of <6/18 but better than or equal to 6/60.

1.4 Main causes of sight loss

This report estimates the prevalence and associated cost of five major causes of sight loss including:

- Age-related macular degeneration (AMD)
- Cataract
- Diabetic retinopathy (DR)
- Glaucoma
- Refractive error (RE) and other causes of sight loss.

A brief description of each of these causes of sight loss are provided in the following sections.

1.4.1 Age-related macular degeneration (AMD)

AMD is an incurable eye disease and a leading cause of blindness in older people. The macula is the part of the retina that enables central vision and the seeing of fine detail. Damage to the macula is characterised by a 'black spot' – losing the centre of the picture. In 'early AMD', small yellow deposits called drusen form under the macula. Vision is usually lost with more advanced stages of AMD. There are two types of 'late AMD', dry (geographic/atrophic) and wet (exudative/neovascular). Dry AMD accounts for approximately one third of late AMD cases, caused by thinning of the macular. Wet AMD accounts for the remaining two thirds of late AMD cases, caused by abnormal blood vessel growth under the retina and macula, which may bleed and leak fluid causing the macular to bulge or lift up.

Several risk factors of AMD have been identified. Age is the most significant factor with most cases of late AMD cases occurring in people older than 60 years. Smoking is considered to be the strongest modifiable risk factor of AMD. Other risk factors include diet, sunlight exposure, iris colour, alcohol consumption and family history of the condition.[9,10]

There are no approved therapeutics treatment for dry AMD, however, there are several in clinical trials.[11] Complement inhibition has been identified as a potential therapeutic intervention. These include drugs such as Eculizumab and Lampalizumab which have been tested in phase 2 and phase 3 clinical trials.[12,13]

Treatment of wet AMD is based on inhibition of the angiogenic protein VEGF, which is produced in the retina and induced by hypoxia and other conditions. In the UK, four anti-VEGF drugs, aflibercept (Eylea), bevacizumab (Avastin), brolucizumab (Beovu) and ranibizumab (Lucentis) are used for treatment of retinal conditions.[14] Bevacizumab is used off-label to treat wet AMD in the UK.[15] The Royal College of Ophthalmologists have published guidance which outlines the principles

and standard of care for AMD to decrease variation of care across AMD services in England and Wales.[16]

1.4.2 Cataract

A cataract is a cloudy area in the eye's lens that forms when proteins clump together. Over time, the cataract may grow larger and cloud more of the lens, making it hard to see. The most common symptoms are blurry vision, problems with light, 'faded' colours, double or multiple vision and the need for frequent changes in glasses or contact lenses.

The four main types of cataract are age-related (most common), congenital, secondary (e.g. due to diabetes or steroid use) and traumatic (e.g. due to eye injury). The development of cataracts is age-related in most cases. Genetic factors may also increase the risk of cataract alongside lifestyle factors such as sun exposure, smoking, diet and alcohol consumption.[17]

Visually significant cataracts are treated through the surgical removal of the cataractous lens and replacement with an intraocular lens. Cataract surgery is recommended where the sight loss is of sufficient severity to outweigh the potential risks of surgery. The outcome of cataract surgery is independent of preoperative visual acuity.[17]

1.4.3 Diabetic retinopathy (DR)

DR is a complication of diabetes mellitus, usually affecting both eyes, wherein microaneurysms develop on the tiny blood vessels inside the retina. As the disease progresses, some blood vessels that nourish the retina are blocked, causing sight loss through either proliferative retinopathy or macular oedema. Broadly, there are two stages of DR: non-proliferative DR and proliferative DR.[18] Non-proliferative DR represents the early stages of DR which is characterised by increased vascular permeability and capillary occlusion in the retinal vasculature. This can cause microaneurysms, haemorrhages and hard exudates. Proliferative DR represents the more advanced stage of DR and is characterised by neovascularisation which can lead to severe sight loss when the new abnormal vessels bleed into the vitreous haemorrhage or when tractional retinal detachment occurs.[19]

DR often has no early symptoms. Sometimes the person sees specks of blood, or spots 'floating' in their vision. Diagnosis can be made via a visual acuity test (Snellen chart), dilated sight test, retinal photography and/or fluorescein angiogram.[20]

Managing diabetes through controlling blood sugar levels, blood pressure and blood cholesterol will help prevent onset and progression of DR. Where metabolic control is insufficient, therapeutics which block VEGF may provide an effective treatment. Use of VEGF-neutralising antibodies, bevacizumab and ranibizumab, improves visual acuity by an average of one to two lines on a Snellen chart, with an improvement of three or more lines in approximately 25% of patients.[21]

1.4.4 Glaucoma

Glaucoma is a group of diseases that, while initially asymptomatic, can damage the eye's optic nerve and result in blindness. The optic nerve comprises nerve fibres that connect the retina with the brain. In the front of the eye is a space called the anterior chamber, leaving the chamber at the angle where the cornea and iris meet. Clear fluid flows in and out of this space through a spongy meshwork, like a drain, and leaves the eye. The types of glaucoma include:

- Primary open-angle glaucoma: most common type of glaucoma caused by fluid passing too slowly through the meshwork drain. The build-up of fluid causes the pressure inside the eye to rise, which can lead to damage of the optic nerve and cause sight loss if the pressure at the front of the eye is not controlled.
- Closed-angle glaucoma: fluid at the front of the eye is blocked from reaching the angle, resulting in a sudden increase in pressure, pain, redness and blurred vision.
- Congenital glaucoma: defects in the angle of the eye that slow fluid drainage, causing cloudy eyes, sensitivity to light and excessive tearing in children.
- Secondary glaucoma: develops as a complication of other medical conditions such as surgery, advanced cataract, eye injuries and use of corticosteroid drugs.

The primary risk factors for the development and progression of glaucoma are older age, intraocular pressure too high in relation to the pressure sensitivity of the optic nerve head, ethnic background, family history of glaucoma and high myopia.[22]

The only generally accepted treatment to reduce the risk of progression of glaucoma is to lower intraocular pressure. This can be achieved through drug therapy, laser therapy, or surgery.[23]

1.4.5 Refractive error (RE)

Refractive error (RE) is the most common cause of impaired vision in the UK. RE occurs when optical defects result in light not focusing properly on the retina. Myopia (near-sightedness with blurry distant vision) and hypermetropia (far-sightedness with close objects blurry) are the most well-known forms. Other common forms of REs include astigmatism (uneven focus) and presbyopia (age-related problem with near focus). RE is typically corrected with spectacles or contact lenses. Alternative treatments include refractive (laser) surgery and intraocular lens surgery.[24]

Optometrists, like other primary health care professions, are contracted to deliver NHS services. More than two thirds of primary eye care services which identify, detect and manage cases of refractive error and pathology, are funded by the NHS. These services are free at point of access, mainly under a General Ophthalmic Services (GOS) contract; in Scotland all eye tests are free at point of access under this contract. This NHS provision funds over 13 million sight tests annually in England alone and this figure does not include those who access tests through private health care.[25]

This is another mechanism, alongside screening, to pick up amblyopia or 'lazy eye' in children. Lack of visual development can lead to sub-optimal sight in one or both eyes and is also a factor, along with uncorrected RE, in education and social development.

As health is a devolved responsibility, each UK nation has its own structure to deliver these services in relation to their needs and to promote access to care. This has led to the commissioning of a variety of enhanced care models in optometry practices designed to improve access whilst reducing the burden on general practice and ophthalmology.[26]

1.4.6 Other causes of sight loss

There are many less common conditions that can impact lives as well as causing of sight loss and blindness in the UK. A listing of some of these conditions can be found on the RNIB website.[27]

These include neuro-ophthalmic disorders, a common cause of sight loss in children, and inherited disorders such as retinitis pigmentosa and other acquired conditions.

Treatments under investigation for inherited retinal conditions include gene therapy and stem cell therapy though at present there is no treatment to slow down disease progression.[28]

The majority of other causes of sight loss can be managed and treated more successfully if detected early. The network of eye care practitioners in the UK are well placed to do this.

1.5 Impact of COVID-19

The spread of the viral respiratory infection, COVID-19 has led to major disruptions of health services, including hospital surgeries and procedures, globally. Predictive epidemiological modelling has estimated close to 28.5 million operations would be cancelled or postponed worldwide as a result of the first wave of COVID-19 in the immediate months of the pandemic.[29] The decision to cancel elective and non-urgent surgeries and procedures has been in the interest of patient safety and to reduce hospital pressures, preserve personal protective equipment supplies and to redeploy medical staff and resources to treat patients with COVID-19.

In early 2020, the public health bodies across the UK recommended eye units to suspend all elective operations and postpone non-urgent outpatient clinics to prepare for the surge of COVID-19 cases. Analysis of electronic health record data from the NHS revealed approximately 1.5 million fewer surgeries were performed in 2020 compared to expected yearly surgical activity.[1] This is equivalent to a 34% decrease in all surgeries performed across England and Wales,

including ophthalmic surgeries such as cataract. Although urgent and essential eye services at NHS trusts continued to provide face-to-face consultations and eye care for urgent cases, there was still substantial reduction in the volume of emergency surgeries across the UK.[1]

It should be noted that the impact of COVID-19 on elective surgeries varies considerably across countries, and even within each country. For example, across the UK, elective surgeries and non-urgent care were cancelled in mid-March 2020 with hospitals restarting elective surgeries in July 2020. However, in response to the influx of hospitalisation rates in the third wave of the COVID-19 pandemic, hospitals in England and Scotland were again cancelling planned non-urgent surgeries in July 2021.[30,31] The reduction in hospital activity also varies between regions. Across all specialties, the North and the Midlands of England had larger reductions in hospital activity than the South and the East of England, with some parts of the country reporting a 40% reduction in elective admissions between March and December 2020, compared to the same period in 2019.[32]

Hospital care is not the only service to be impacted by the COVID-19 pandemic, with similar pattern being observed for other medical services such as primary care (general practitioner [GP] care) and optometrist care. In England, the volume of patients visits to GPs dropped by 30% in March 2020 compared to March 2019.[33] It is estimated that the cessation of all ophthalmic services such as routine sight testing and General Ophthalmic Service in April 2020 coupled with strict physical distancing, implementation of infection control measures and reduced patient capacity would result in approximately two million sight tests missed during the peak of the pandemic from March to September 2020 in the UK.[34] The decrease in ophthalmic care consequently resulted in a decrease in the number of sight impairment and severe sight impartment certifications (CVI) registrations in the months immediately following the first wave of the pandemic.[35,36]

Cancellation of scheduled ophthalmic procedures (including elective surgeries) and the implication of lockdown orders throughout the UK may have a substantial impact on patients and the healthcare system. This is particularly true for older people where the prevalence of eye conditions such as AMD and glaucoma are the highest, and who are considered 'clinically vulnerable' to the COVID-19 virus. Individuals aged 70 years and older were instructed to strict home isolation during the peak of the pandemic, and as a result, experienced the greatest drop in elective admissions per-capita.[32] The accumulation of a large backlog of ophthalmic surgeries and procedure from the pandemic will require additional time and resources to clear, resulting in a substantial cost to the UK healthcare system in coming years.[37]

Most importantly, delayed ophthalmic care may lead to worsening quality of life and irreversible vision impairment. The impacts of delayed ophthalmic care on the health and patient outcomes varies by eye condition. For example, a delay in providing timely cataract surgery is likely to lead to increased costs from a risk in falls and may also lead to increased cost of treatment during surgery.[38,39,40]

In patients with AMD, a delay in diagnosis and/or treatment (injection of anti–VEGF therapy) of the condition may lead to irreversible sight loss.[41] For DR, receiving timely diagnosis of the condition is important to prevent the progression to the proliferative form.[42] While glaucoma usually progresses slowly, prognosis is generally favourable if patients are concordant with treatment to prevent further damage of the optic nerve.[43] The impact of lock-down and restrictions in the UK has already shown that some conditions are presenting at accident and emergency department (A&E) with more advanced or severe disease, suggesting that patients demonstrate reluctance to seek ophthalmic care due to exposure of COVID-19.[44]

2 Methodology

This chapter provides an overview of the methodology adopted in this report to estimate the prevalence and economic cost of sight loss and blindness, and quantify the impact of COVID-19 on sight loss and blindness.

2.1 Estimating prevalence

This report adopts a prevalence approach to measure the number of people living with sight loss and blindness in the UK. Prevalence approaches measure the number of people with sight loss and blindness in a given year.

A number of sources were used to estimate the prevalence of sight loss and blindness. These sources are detailed in Appendix A. In estimating the prevalence of sight loss and blindness in the UK, the prevalence has been considered by the following disaggregation:

- Age: five-year groupings from 0-5 years to 90+ years
- Sex: male and female
- Country: England, Scotland, Wales and Northern Ireland
- Conditions: AMD, cataract, glaucoma, DR, uncorrectable RE and other causes.

Prevalence rates by age, sex and condition were applied to the latest available data from the Office for National Statistics (ONS). Population projections were used to estimate prevalence for 2019 to 2022.[45]

2.2 Estimating cost components

The cost of sight loss and blindness in the UK has been estimated previously for 2013.[2] This report largely uses the unit costs of sight loss and blindness as estimated in 2013 and updated for inflation and demographic changes. Given the recency of the previous cost of sight loss and blindness, it is expected that the inputs remain relevant in the present. The distribution of costs across productivity, wellbeing and other costs was assumed to remain consistent with the previous estimate.

Included in the costs of vision loss are the following components:

- **Health system costs** comprising of hospital inpatient and outpatient expenditure, prescribing expenditure, GOS, expenditure associated with injurious falls, research and development costs, residential care and community services costs and capital and administration costs.
- **Productivity costs** including a reduced likelihood of attaining employment, the costs of absenteeism[iii], presenteeism[iv] and the costs of informal carers.
- **Other costs** include the costs of aids and modifications for the person's sight loss, and other economic inefficiencies known as deadweight losses. An example of deadweight losses include increasing taxation on society to fund public health system services.
- **Wellbeing costs** representing a person's reduced quality of life due to their sight loss or blindness. This is captured through the reduced years of healthy life lost due to disability and the years of life lost due to premature death.

Costs related to the healthcare system were re-estimated to account for the likely changes in the utilisation of anti-VEGF treatments as well as cataract surgery over the last eight years. Anti-VEGF treatments have changed the treatment landscape for people with AMD and diabetic macular oedema (DMO) with a significant amount of research supporting its use.[46,47]

[iii] Absenteeism represents the cost of additional days off work due to the person's sight loss or blindness.
[iv] Presenteeism represents the cost of reduced productivity while a person is at work due to the person's sight loss or blindness.

Healthcare system costs for England in 2019 were estimated using the National Cost Collection for the NHS.[48] This included activity data for elective surgery, inpatient hospitalisations, outpatient services and anti-VEGF treatments. Anti-VEGF treatments included High Cost Drugs ranibizumab, bevacizumab and aflibercept.[v,vi] The unit cost of each activity were available from the National Cost Collection data.[48] Multiplying the total activity by the unit costs yielded the total cost for each of elective surgery, inpatient hospitalisations, outpatient services and anti-VEGF treatments. Due to data limitations, the percentage growth in England's health system costs compared to 2013 was applied to each of Northern Ireland, Scotland and Wales. This assumes that changes to health system utilisation have been broadly consistent across the UK.

2.3 Quantifying the impact of COVID-19

The public health response to prevent the rapid spread of the COVID-19 virus was to implement lockdowns across the UK to limit transmission of the virus as part of a multi-layered approach. The lockdowns impacted the ability for people to access ophthalmic care, with many services limited during the lockdown periods and only available to those with urgent or essential needs. As a consequence, it is expected that ophthalmic services utilisation decreased in 2020 and as such, the total cost of ophthalmic care in the UK would also decrease in the same year.

The impact of lockdowns and decreased service utilisation in 2020 will mean that there will be an increased demand for ophthalmic services in subsequent years. This is primarily driven by the backlog of procedures which were unable to be performed due to cancellations and delays. Increased demand for ophthalmic care in subsequent years will attribute additional costs to the healthcare system as more resources and staff time are required to address the backlog of procedures.

Patients who miss treatment or receive delayed treatment may experience some impact to their vision health. Lockdowns resulted in patients with scheduled procedures waiting longer to receive this care.

For patients who did not receive a sight test, it was assumed that cases which otherwise would have been an urgent referral may have been at risk of permanent sight loss from their condition. In other words, conditions were stratified by risk (urgent vs non-urgent). Data on referral urgency has been drawn from Specsavers UK database on referrals from optometrists to tertiary care centres such as hospitals.

For patients who either cancelled an appointment with their ophthalmologist or had their appointment cancelled, it was assumed there is a risk of progressing to sight loss due to delayed treatment. Evidence from literature was used to inform the risk of progression given treatment compared to no treatment for the period of the delay for anti-VEGF injections. For glaucoma surgeries, it was assumed that each patient is at risk of progression immediately as a result of the cancelled procedures.

The change in costs attributed to cataract during COVID-19 is driven by the change in wait time for surgery. The estimated number of cataract surgeries missed during the first wave of lockdown (March to December 2020) is determined by using data from NHS Digital Hospital Episode Statistics.[49] This was used to estimate the additional number of people waiting for an ophthalmological day surgery. The wait time pre-COVID-19 (before March 2020) is compared to the average wait time by December 2020. The additional wait time in the December 2020 period was multiplied by the average daily costs. The cost of delayed care is calculated by applying the additional days with disease (additional wait time) with the daily cost to each cost category (preventable healthcare system [e.g. due to increased risk of falls], productivity losses, informal carer costs, other costs, efficiency losses and loss of wellbeing). A similar approach is applied to other ophthalmic surgeries which were delayed due to the pandemic.

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[v] A High Cost Drug is an expensive prescribed item and represents a disproportionate cost relative to the total cost of the relevant episode in terms of volume and cost (source: https://datadictionary.nhs.uk/nhs_business_definitions/high_cost_drug.html).

[vi] Beovu was commercially available in the UK in late 2020 so this has been excluded in the updated economic cost of sight loss and blindness for 2019.

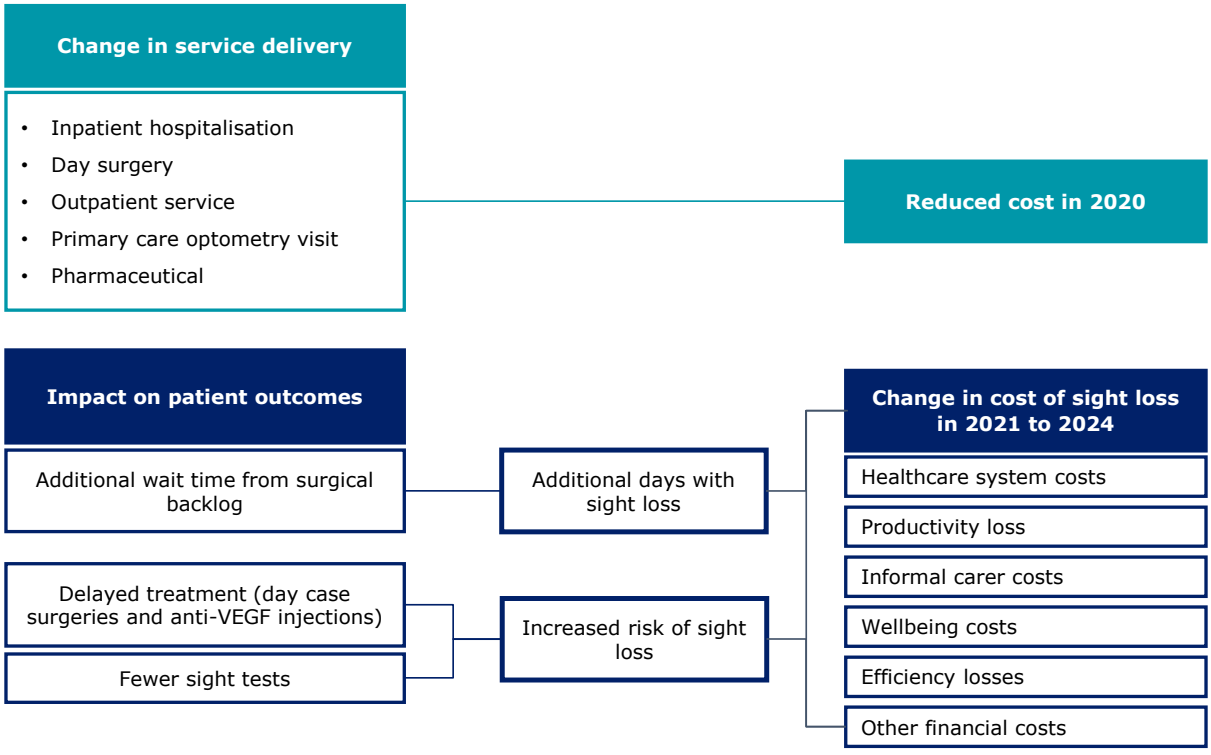
The change in wait times for ophthalmic procedures was obtained from the NHS consultant-led referral to treatment waiting times dataset.[50] Data on the changes in primary care optometry services were obtained through desktop research.[51]

Several leading ophthalmic health professionals across the UK were consulted to gather information on the impact of the COVID-19 and subsequent lockdowns on eye care services and to discuss the impacts on patient outcomes. The inputs from the ophthalmic health professionals were used to inform some assumptions and logic used in the modelling.

Freedom of Information (FOI) data requests were submitted to several trusts and boards across the UK to gather information on the impact of COVID-19 and lockdowns on ophthalmic procedure and services. Data requested included monthly and condition-specific disaggregation of ophthalmic procedure and service activity in inpatient and outpatient setting. FOI data was not used to inform the inputs of the modelling but have been used to support the overall trend observed in service activity during the COVID period, and in write-up of this report. Reference to FOI data requests has been indicated in this report where necessary.

A high-level overview of the modelling pathway for the impact of COVID-19 on the healthcare system and patient outcomes is shown in Figure 2.1.

Figure 2.1: Overview of modelling pathway for the impact of COVID-19 on the healthcare system and patient outcomes



Source: Deloitte Access Economics.

3 Findings

This chapter provides details on the prevalence and economic cost of sight loss and blindness in the UK. It further details the impact of COVID-19 on ophthalmic care utilisation and patient outcomes due to delayed and/or missed treatments.

3.1 Prevalence of sight loss and blindness

The prevalence rates estimated in Appendix A (Table A.1) were applied to each country's population data to provide estimated prevalence of people with sight loss and blindness in England, Wales, Scotland and Northern Ireland between 2019 to 2022. The estimate of people with sight loss and blindness in the UK is the summation of country level estimate. Estimates for prevalence for each country between 2019 to 2022 are shown in Appendix A (Table A.2).

In 2019, the prevalence of sight loss and blindness is estimated to be 2.13 million people in the UK population (Table 3.1). Prevalence of sight loss and blindness is higher in females (1.29 million; 61%) compared to males (0.84 million; 39%).

The estimated prevalence of sight loss and blindness in the UK was estimated until 2022 by applying the prevalence rate to the projected population by age and sex from ONS (2019).[45] Table 3.1 shows the total projected prevalence of sight loss and blindness in the UK, from 2019 to 2022. By 2022, there will be an estimated 2.2 million people with sight loss and blindness in the UK.

Table 3.1: Estimated prevalence of sight loss and blindness in the UK from 2019 to 2022

	2019	2020	2021	2022
Male	838,959	850,174	869,993	887,502
Female	1,292,850	1,303,447	1,324,070	1,345,862
All	**2,131,808**	**2,153,621**	**2,194,063**	**2,233,364**

Source: Deloitte Access Economics calculations and ONS population estimates and projections.[45] Note: components may not sum to totals due to rounding.

3.2 Economic cost of sight loss and blindness

The economic cost of sight loss and blindness was estimated at £36.0 billion in the UK in 2019. This included £3.4 billion in healthcare system costs, £7.8 billion in productivity losses and other financial costs, and £24.8 billion in reduced wellbeing. The financial cost of sight loss and blindness was estimated to be £16,867 per person with sight loss and blindness. The breakdown of these cost components are provided in Table 3.2.

Deloitte Access Economics previously estimated the cost of sight loss and blindness to be £28.1 billion in the UK in 2013. The increase in costs over time is largely driven by demographic changes, there was an estimated 2.1 million people living with sight loss and blindness in 2019 compared to 1.9 million people in 2013. Furthermore, health cost inflation has led to increasing costs over time.

Table 3.2: Cost of sight loss and blindness in the UK by cost component, 2019

	Cost (£ billions)	Cost per person (£)
Healthcare system costs	3.4	1,604
Productivity losses	6.2	2,902
Other costs	1.6	747
Loss of wellbeing	24.8	11,613
Total costs	**36.0**	**16,867**
Total financial costs	**11.2**	**5,254**

Source: Deloitte Access Economic calculations. Note: components may not sum to totals due to rounding.

3.3 Change in service delivery and cost reduction

During the first lockdown between March and June 2020, most ophthalmic procedures and services were halted or experienced a substantial reduction. Ophthalmic care was still available to people requiring urgent and essential eye care, albeit with a reduced capacity due to additional health and safety measures.

The reduction in utilisation of ophthalmic procedure and services reduced healthcare system costs of sight loss and blindness by an estimated £513.9 million in 2020, as summarised in Section 3.3.1 to 3.3.5.

Table 3.3: Impacts of the reduction in service delivery and cost on the healthcare system in 2020 (£m)

Cost component	Reduction in healthcare system costs (£m)
Inpatient hospitalisations	15.8
Day surgeries	
Cataract day surgeries	132.8
Other day surgeries	107.5
Outpatient services	332.5
Primary care optometry visits	97.8
Pharmaceuticals	
Anti-VEGFs	77.6
Other ophthalmic drugs	14.3
Total	**778.3**

Source: Deloitte Access Economics calculations.

3.3.1 Inpatient hospitalisations

Although hospitals and A&E could continue operation during the lockdown, it was primarily available for people requiring urgent or essential eye care. This was to reduce the volume of face-to-face consultations in the hospital setting. The pandemic induced significant changes in day-to-day life, resulting in a decline in hospitalisation in 2020 compared to the same period in 2019.

Data were available from the NHS national cost collection to calculate the number of inpatient hospitalisations by ophthalmology procedure for the March 2019 to December 2019 period.[48] Service utilisation data obtained from NHS digital (2021) shows that there was a 38% reduction in inpatient ophthalmology services delivered between March to December 2020 when compared to the same period in 2019 (Table 3.4).[48] It is noted that no disaggregation by procedure type were

available for 2020 and it was therefore assumed that the 38% reduction applied to all ophthalmology inpatient hospitalisations.

Table 3.4: Number of inpatient hospitalisations, March to December of 2019 and 2020

Procedure	Mar - Dec 2019	Mar - Dec 2020	Change
Cataract or lens procedures	714	443	
Cornea or sclera procedures	1,354	839	
Glaucoma or iris procedures	1,223	758	
Vitreous retinal procedures	10,114	6,270	
Orbit or lacrimal procedures	774	480	
Oculoplastics procedures	2,374	1,472	
Total	**16,553**	**10,262**	**-38%**

Source: Deloitte Access Economics calculations based on NHS digital data (2021).[48]

3.3.2 Day surgeries

As elective surgeries were restricted during the lockdown between March to June 2020, the number of ophthalmic day surgeries declined significantly. NHS digital data suggests day surgery volume declined by 45% in 2020 compared to the same period in 2019 (Table 3.5).[49]

Table 3.5: Number of day surgeries performed March to December of 2019 and 2020

Procedure	Mar - Dec 2019	Mar - Dec 2020	Change
Cataract or lens procedures	295,392	161,454	
Cornea or sclera procedures	12,516	6,841	
Glaucoma or iris procedures	24,397	13,335	
Vitreous retinal procedures	119,038	65,063	
Orbit or lacrimal procedures	11,758	6,426	
Oculoplastics procedures	56,160	30,696	
Total	**519,260**	**283,815**	**-45%**

Source: Deloitte Access Economics calculations based on NHS digital data (2021).[48]

When restrictions in the UK were eased in June 2020, the number of day surgeries gradually increased in later months of 2020. For example, in April 2020 day surgery volume was reduced by 89%. By July, day surgery capacity was at 50% of pre-COVID levels.

In 2019, there were 519,260 ophthalmic same day procedures performed between March to December 2019.[48] A 45% reduction occurred over a ten-month period, which resulted in 283,815 same day procedures performed from March to December 2020.[49] This resulted in an estimated 235,445 fewer services provided in 2020 compared to the same period in 2019. The unit cost of these services was determined based on the weighted average cost[vii] for each of the procedures listed in Table 3.5 based on the NHS cost data collection.[48] Applying the unit cost to each missed procedure resulted in an estimated £240.3 million reduction in healthcare system costs due to the pandemic. This means £240.3 million additional expenditure will be required to clear the backlog

[vii] Weighted average cost is calculated by multiplying the total units of activity by the unit cost of each surgery type and then by dividing by the total activity. High volume surgeries thus have a greater influence on the average cost.

over a four-year period from 2021 to the end of 2024, which is before health price inflation or any cost premiums to provide an increased volume of services are considered.

3.3.3 Outpatient services

Similar to day case surgeries, outpatient services declined due to lockdowns across the UK. Data from the NHS indicates that outpatient attendances for ophthalmology decreased by 36%.[49] It was assumed that this reflected the decrease in outpatient procedures for all procedures except anti-VEGF injections for AMD. A 10% reduction in procedure delivery for anti-VEGF injections for AMD was assumed (discussed further in section 3.3.5). From March to December 2019, there were 1.2 million ophthalmic outpatient services performed. Taking into account the reduction in service utilisation, it was estimated that there were approximately 894,000 ophthalmic outpatient procedures from March to December 2020.

The unit cost of outpatient services was estimated using the weighted average cost for each procedure listed in Table 3.6 based on the NHS cost data collection.[48] Applying the unit cost to the reduction in outpatient services yielded an estimated £68.5 million reduction in healthcare system costs due to the pandemic.

NHS digital data indicates that 2.4 million ophthalmology outpatient attendances were missed from March to December 2020.[49] The unit cost of these ophthalmology outpatient attendances was £108 based on the NHS national cost collection.[48] Applying the total missed attendances by the unit cost resulted in a total reduction in ophthalmology outpatient attendance utilisation of £264.0 million.

It was assumed that these outpatient services were services foregone – in other words services which would not be made up for. For example, missed anti-VEGF injections would not be made up for, rather patients were assumed to recommence normal treatment after the COVID period (i.e. no additional dosage is required to compensate for the missed treatment during lockdown). Thus, there was no assumed increase in expenditure to clear a backlog in outpatient services from 2021 to 2024. However, the reduction in services contributed to poorer patient outcomes as discussed in Section 3.4.

Table 3.6: Number of outpatient procedures performed March to December of 2019 and 2020

Procedure	Mar - Dec 2019	Mar - Dec 2020	Change
Cataract or lens procedures	51,300	33,037	
Cornea or sclera procedures	32,115	20,682	
Glaucoma or iris procedures	46,266	29,795	
Vitreous retinal procedures	1,058,770	782,806	
Orbit or lacrimal procedures	14,962	9,635	
Oculoplastics procedures	34,224	22,040	
Total	**1,237,637**	**897,997**	**-27%**

Source: Deloitte Access Economics calculations based on NHS digital data.[48]

3.3.4 Primary care optometry visits

As with elective surgeries, primary care ophthalmic services such as visits to optometrists and opticians were also largely restricted during the first lockdown between March to June 2020 and capacity constraints and infectious control measures persisted beyond June 2020.

Data from Specsavers' Hindsight Report (2021) indicates that Specsavers UK would deliver 8.6 million sight tests in a normal year.[52] As Specsavers carries out 46% of eye checks in the UK, it is estimated that approximately 18.7 million sight tests would be delivered in a normal year across the UK. Over March to September 2020, Specsavers missed an estimated 2 million sight tests due to the lockdown.[52] Applying the Specsavers market share estimate, it was estimated that 4.3

million sight tests were not delivered in 2020 compared to the 2019 level in the UK. This represents a 23% decline when compared to services administered in 2019.

At an average cost of approximately £22.5 per service,[53] health expenditure on primary care optometry in 2020 was reduced by an estimated £97.8 million. It is noted this excludes any other reductions in primary care optometry, for example, any expenditure on glasses or contact lenses.

3.3.5 Pharmaceutical claims

Restrictions to ophthalmic services during the pandemic, coupled with patient hesitancy to see specialists and receive treatments, led to a decline in the number of pharmaceutical claims.

The NHS national cost collection data indicates approximately 595,000 anti-VEGF injections were delivered in the period of March to December 2019 in the UK.[48] The decline in outpatient activity obtained from NHS digital outpatient data was used to estimate the number of anti-VEGF injections missed during the same period in 2020 due to lockdown. Anti-VEGF injections are administered in the outpatient setting and therefore any decrease in treatment activity would be captured in the outpatient activity data.[49] It was estimated in section 3.3.3 that the reduction in outpatient activity was 36%.

The Royal College of Ophthalmologists COVID review team advised to maintain anti-VEGF injections for AMD patients. As such it is expected that most anti-VEGF injections for AMD patients continued, and that the 36% calculated in Section 3.3.3 would not be reflective of these procedures. However, there is little publicly available data to inform the appropriate reduction. An FOI response from the NHS Greater Glascow and Clyde in Scotland indicated no discernible decline in anti-VEGF procedures from March to December 2020 compared to the same period in 2019.[54] However, insight from a consultant ophthalmologist and lead for the intravitreal injection service in an NHS Trust in England indicated patients were reluctant to attend treatments due to the pandemic, citing a 20% 'Did Not Attend' (DNA) for AMD patients requiring anti-VEGF treatment during the initial lockdown.[55] This has been reported by data from Moorfields Eye Hospital NHS Foundation Trust, which indicated despite limiting services to high-risk AMD patients, the average DNA rate increased to 25%.[44]

Hospitals undertook various initiatives to allay patient concerns, and therefore it is likely DNA rates may have decreased towards the end of the lockdown period. Other studies have reported high levels of mental health, loneliness and anxiety related to hospital visits which may have contributed to patient decisions to delay treatment.[56] Based on this evidence it was estimated that an average of 10% of anti-VEGF injections for AMD were delayed during the March 2020 to December 2020 period.

The Royal College of Ophthalmologists COVID review team advised deferral of anti-VEGF injections for patients with retinal vein occlusions (RVO)/DMO patients. Many clinics deferred treatment for DMO/RVO for the first four months of lockdown (March to June 2020).[55] Given this decision it was assumed that the 36% decline in outpatient activity developed in Section 3.3.3 would be appropriate to apply to DMO/RVO anti-VEGF treatment.

Approximately two thirds of anti-VEGF injections were assumed to be delivered for AMD.[57] Based on the 2019 data for anti-VEGF injections, this equates to approximately 395,000 injections in the March to December 2020 period.[48] It was estimated there were around 63,130 expected patients receiving anti-VEGF treatment for AMD.[viii] However, after applying the 10% reduction in anti-VEGF injections for AMD, it was estimated that 6,313 patients did not receive treatment from March to December 2020.

The remaining one third of anti-VEGF injections were delivered for DMO/RVO, or approximately 200,000 injections in the March to December 2020 period. It was estimated there were around

[viii] AMD patients were assumed to receive an average of approximately 6.2 injections over this period, given mean time between injections is 8 weeks. Source: The Royal College of Ophthalmologists, 'New Guidance for Commissioning Age Related Macular Degeneration Services' <https://www.rcophth.ac.uk/2021/07/commissioning-amd-services/>.

24,111 expected patients receiving anti-VEGF injections for DMO/RVO.[ix] However, after applying the 36% reduction in anti-VEGF injections for DMO/RVO, it was estimated that 8,680 patients with DMO/RVO did not receive treatment from March to December 2020.[x,xi]

It was assumed the change in costs of other ophthalmic drugs were in line with the change in anti-VEGF costs. The total cost of anti-VEGF treatments was £77.6 million. It was assumed a further £14.0 million in other ophthalmic drug costs were incurred.[xii] The total expenditure on ophthalmic pharmaceuticals could be expected to be £91.8 million lower over March to December 2020, largely driven by reductions in activity for anti-VEGF treatments.

3.4 Impact on patient outcomes

The data suggests COVID-19 had a substantial impact on patient outcomes in 2020 and it is expected this will continue for many years due to the delay in eye care provision for many people. As discussed in Section 2.3, data showing the potential impact on patient outcomes is presented throughout this chapter. There are three main paths through which this has occurred, including:

- **Impact of fewer sight tests:** The reduction in new detection, diagnoses and reduced referrals to eye specialists.
- **Impact of delayed treatment (day case surgeries and anti-VEGF injections):** The reduction in routine follow up care for patients, which included a reduction in prescriptions for certain medications, notably anti-glaucoma medications and also anti-VEGF treatment to prevent the progression of AMD.
- **Impact of additional wait time from surgical backlog:** The delay in the provision of specialist care and surgical interventions, including day case procedures such as cataract surgery.

The impacts are not uniform across eye conditions and some of these effects will likely lead to enduring consequences and worse vision health in the UK for many years. Despite what is now known about the impacts, further data collection and evidence generation is required to understand the true extent of the impact of COVID-19 on sight loss and blindness in the UK.

The potential impacts between 2021 and 2024 have been modelled based on changes in care received for cataract, glaucoma, AMD and DR in 2020. The modelling suggests the net cost of sight loss and blindness will be £1.7 billion higher due to the pandemic compared to 2019. Of this, the cost of additional wait time (due to the underutilisation of health services in 2020) for eye surgeries, fewer sight tests and delayed treatment is expected to impose incremental costs of £2.3 billion, £75.7 million and £122.3 million, respectively, between 2021 and 2024. This represents an average cost of £632.5 million per year over a four-year period from 2021 to 2024. The cost breakdown of the impact on sight loss and blindness from 2021 to 2024 is shown in Table 3.7, and further detail of each cost component are provided in Section 3.4.1 to 3.4.3.

[ix] DMO/RVO patients were assumed to receive an average of approximately 8.3 injections over this period, given mean time between injections is 1.5 months. Source: Kevin Blinder et al, 'Anti-VEGF treatment of diabetic macular oedema in clinical practice: effectiveness and patterns of use (ECHO Study Report 1)' (2017) 11 393.
[x] It is possible that patients still receive treatments but with a longer time interval between treatments. The available data does not provide sufficient granularity to determine where treatment time intervals have been extended.
[xi] Beovu was commercially available in the UK in late 2020, but comparative data prior to the pandemic was not available so this has been excluded from the analysis.
[xii] Source is not publicly available derived from a Deloitte Access Economics report.

Table 3.7: Estimated impact on the total cost of sight loss and blindness, 2021 to 2024

Measure	Total cost (£m)
Impact of fewer sight tests	75.7
Impact of delayed treatment (day case surgeries and anti-VEGF injections)	125.7
Impact of additional wait time from surgical backlog	2,328.4
Total	**2,529.8**

Source: Deloitte Access Economics calculations.

3.4.1 Impact of fewer sight tests

During 2020, there were several driving factors reducing the number of primary care optometry services which were provided in the UK. In part, there was a preference of UK people to stay home rather than to seek eye care because of fear of catching or spreading the virus. In addition, there were capacity constraints imposed following initial lockdowns, which were put in place to reduce the spread of the virus. The first national lockdown meant that more than 4.3 million fewer optometry services were provided (Section 3.3.4). Consequently, a standard diagnostic and referral pathway no longer occurred for a period of time, with triage processes implementation to reduce face-to-face consultation in the healthcare setting, with health services operational for urgent or essential eye care only.

During this period there were amendments to existing and creation of new pathways in enhanced services to allow community optometrists to manage cases in the community that may have otherwise presented to general practice or ophthalmology.

The reduction in sight tests due to COVID-19 will mean a reduction in the number of new cases being diagnosed, but there could also be existing cases of eye disease that progressed during this period and went unnoticed.

There is little data on the clinical outcomes associated with the reduction in services, not only in the UK, but also internationally. To attempt to understand the possible impact of the delay in identification of eye conditions, special data request in relation to referral data from Specsavers in the UK has been used.[xiii]

The Specsavers special data request, which provides urgency status of referrals, indicates there were approximately 513,000 referrals to ophthalmologists from March to December 2019. Data from Specsavers shows there was a 28% decrease in referrals (a decrease of approximately 145,000) over the same period in 2020. Specsavers was estimated to account for approximately 46% of the UK market for referrals. If these data are indicative of referral patterns in the UK, this suggests that approximately 316,000 referrals were missed in the UK from March to December 2020.[xiv] Of the 316,000 missed referrals, 14% are for glaucoma, 2% are for diabetic retinopathy, 16% are for cataract, 3% for medical retina and 65% are for other conditions. It is noted that these percentages are based on the raw number of missed referrals and are not indicative of the relative decrease in referrals for each condition. For example, the Specsavers data shows that glaucoma related referrals dropped by 32% from 2019 to 2020, whereas medical retina referrals dropped by 17%. This suggests that referrals for eye conditions which are slower progressing (e.g. glaucoma) were more affected by COVID-19 lockdowns.

Each of these cases are at an increased risk of developing sight loss, since in the absence of COVID-19, they would have been referred to an ophthalmologist for review and treatment.

[xiii] Specsavers special data request.
[xiv] 145,000/46% = 316,000. Note that this calculation assumes that Specsavers referral data is representative of the total referrals market.

There were 43,000 missed referrals for Glaucoma. It was assumed that only people with referrals which would have been categorised as 'urgent hospital eye service' or 'priority hospital eye service' were at risk of developing sight loss due to glaucoma. This corresponded to approximately 2,600 of the 43,000 missed glaucoma referrals. Data suggests that with treatment 5% of urgent glaucoma cases might progress to worse visual outcomes within one year, but this increases to 7.8% without treatment.[58] While glaucoma is a slow progressing eye condition, it is possible that urgent cases of glaucoma would warrant immediate surgery, which may have been missed and therefore led to irreversible sight loss. This suggests 76 additional people likely developed sight loss from glaucoma in 2020 (Table 3.8).

Similarly, there were 6,133 missed referrals for DR – which was assumed that all would require care due to the importance of capturing DR as early as possible given there are no early signs for the condition. With treatment 2.1% will progress to worse visual outcomes, which increases to 3.8% without treatment (Table 3.8).[59] This suggests that an additional 106 people likely developed sight loss from DR due to missed referral during the pandemic.

There were 10,820 missed referrals for wet AMD (Table 3.8).[xv] Modelling analysis by Thomas et al (2020)[60] suggests that a three-month delay in commencing treatment would mean an additional 8.7% progress to sight loss, equivalent to 941 people.

Combined, across these three conditions, an estimated 1,123 people likely developed sight loss due to delayed eye examinations in 2020. At an average cost of £16,867 per person, the annual cost in subsequent years is estimated to be £18.9 million, resulting in an increase of around £75.7 million in total cost between 2021 and 2025.

Table 3.8: Estimated impact of delayed identification of eye disease in 2020

Measure	AMD	DR	Glaucoma
Estimated number impacted	10,820	6,133	2,634
Probability of sight loss with treatment	26.4%	2.1%	5.0%
Probability of sight loss without treatment	35.1%	3.8%	7.8%
Difference	**8.7%**	**1.7%**	**2.9%**
Number of people progressing to sight loss	**941**	**106**	**76**

Source: Deloitte Access Economics calculations, using Specsavers special request. Note: Difference in percentages may not sum due to rounding.

3.4.2 Impact of delayed treatment (day case surgeries and anti-VEGF injections)

As with the delay in identifying and diagnosing new vision threatening eye conditions, it is also possible to estimate the impact on outcomes given a reduction in the number of interventions provided (Table 3.9).

Based on NHS data on the reduction in day case surgeries, 11,062 fewer glaucoma follow up treatments were delivered between March and December 2020 than in the same period in 2019 (Table 3.5 shows the reduction in day surgeries for glaucoma and iris procedures).[49] As noted already, data suggests that with treatment 5% of glaucoma cases might progress to worse visual outcomes within one year, but this increases to 7.8% without treatment[58] – meaning 318 additional people likely developed sight loss from glaucoma.

When comparing to past trends in anti-VEGF treatments, it was estimated that 8,680 fewer patients received injections for DR.[xvi] With treatment 2.1% of DR cases will progress to worse

[xv] It is noted that some AMD referrals may have been missed in the Specsavers data request as there are multiple point of entry to local services (e.g. not all referrals are electronic and as such some referrals are missed). As such this estimate of missed AMD referrals should be interpreted with caution.
[xvi] See section 3.3.5 for the methodology behind the estimated 8,680 patients.

visual outcomes, which increases to 3.8% without treatment.[59,xvii] This suggests an additional 149 people likely developed sight loss from DR due to missed treatments during the pandemic.

It was estimated that there were 6,313 fewer patients receiving injections for AMD.[xviii] Data provided in Teo et al (2020)[61] suggests that a delay in anti-VEGF injections for AMD would mean an additional 22% progress to sight loss, equivalent to 1,395 people with AMD.

Table 3.9: Estimated impact of reduction in number of interventions in 2020

Measure	AMD	DR	Glaucoma
Estimated number impacted	6,313	8,680	11,062
Probability of sight loss with treatment	69.7%	2.1%	5.0%
Probability of sight loss without treatment	91.8%	3.8%	7.8%
Difference	**22.1%**	**1.7%**	**2.9%**
Number of people progressing to sight loss	**1,395**	**149**	**318**

Source: Deloitte Access Economics calculations. Note: Difference in percentages may not sum due to rounding.

Combined, across these three conditions, an estimated 1,863 people may have lost vision due to delayed treatment in 2020. At an average cost of £16,867 per person, the annual cost in subsequent years is estimated to be £31.4 million, equivalent to an increase of approximately £125.7 million in total cost between 2021 and 2024

3.4.3 Impact of additional wait time from surgical backlog

Alongside the impact of delayed detection and reduced treatment of sight threatening eye disease, there is an impact of increased wait times for surgeries on people with sight loss. This largely applies to people with sight loss from cataract, as these represent the majority of elective surgeries provided.

Data on wait time for ophthalmic surgeries has shown the average wait time was 7.6 weeks in 2019.[50] Wait times increased significantly from March 2020 to August 2020, averaging more than 17 weeks. From September 2020 to March 2021 the average wait time was 12.9 weeks. This report has captured the impact of increased waiting times for people waiting for surgery in 2021 and over subsequent years. As such the average wait time over the September 2020 to March 2021 period was used as this data reflected consistent wait times (wait times ranged from 14.8 to 11.1 weeks over this period) reflective of the waiting time for surgery at the start of 2021. The analysis assumes surgical backlog will begin to clear at an increased capacity from October 2021 and uses the average wait time of 12.9 weeks as a conversative estimate of the wait time for procedures. Based on an increase in wait times from 7.6 to 12.9 weeks (or 69.7%), it was assumed the wait time increased by 37 days for all procedures commencing in 2021.[xix]

It was assumed that the distribution of the waiting list was equivalent to the distribution of day-surgery services provided by the NHS. Table 3.5 outlines the distribution of ophthalmology procedures. For example, day surgery for cataracts accounted for 57% of missed surgeries in 2020, so it was assumed that 57% of the additional people on the wait list were waiting for cataract surgery. For analysis it has been assumed that anyone waiting for treatment has at least some symptoms of sight loss that have an impact on their daily life. For this reason, as

[xvii] It is noted that this is the same probability of progressing to sight loss that was used for patients who received no referral (as discussed in 3.4.1). While there may be small differences in the likelihood of progressing to vision loss based on whether the patient had been receiving treatment previously (and their care has been subsequently delayed), there was insufficient literature evidence to quantify this.
[xviii] See Section 3.3.5 for the methodology behind the 6,313 patients.
[xix] It is possible that wait time differed across ophthalmology procedure types. However, the available data does not provide sufficient granularity to determine whether and how wait time differed by procedure type.

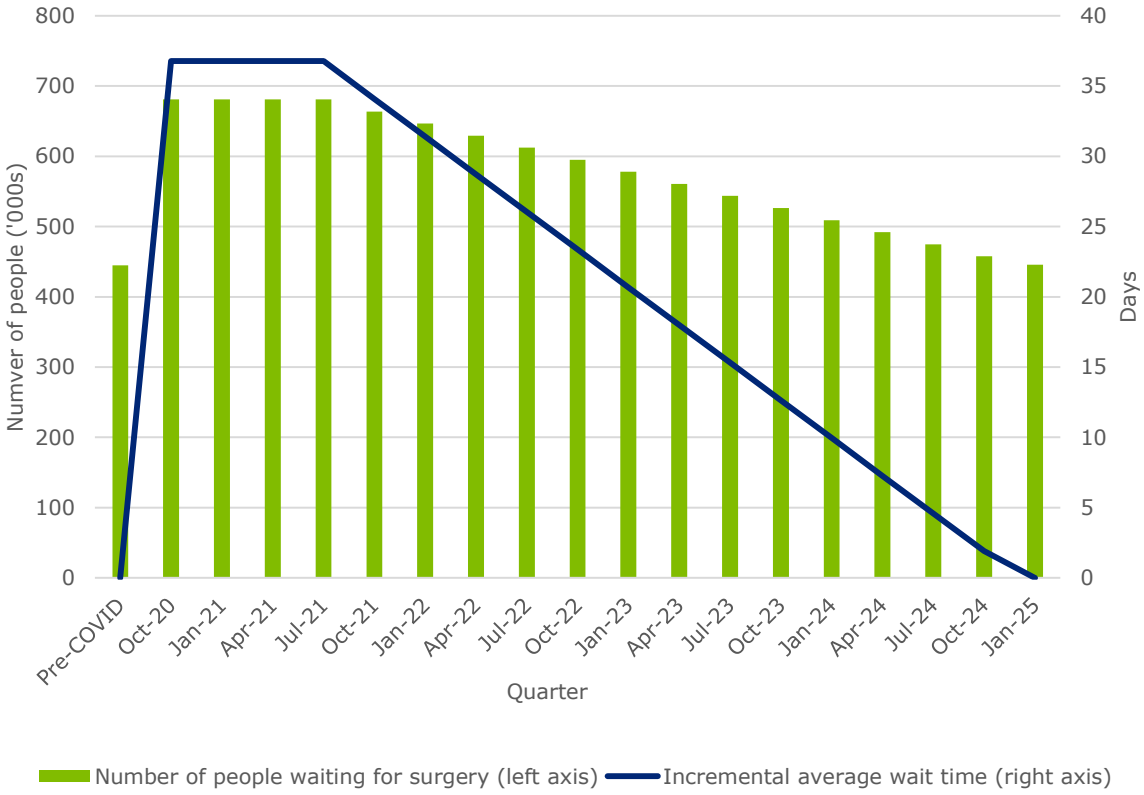
oculoplastic procedures may be performed for comfort and cosmetic reasons rather than impact on sight loss, these procedures were excluded from the wait time costs.

There are potential costs involved from delaying surgeries – for example, some with sight loss from cataract may be more likely to have a fall which could lead to a fracture and further costs within the healthcare system. They will be at higher risk of this until they have had their surgery and recovered. Further, the individual may also experience a lower quality of life until they have had surgery – for example, because they are unable to drive until the surgery occurs.

To quantify the potential costs of the increased wait times, the average cost of sight loss per person was converted to an average daily cost. On average, someone with sight loss will incur an additional daily cost of £41 until they have their surgery. This daily cost excludes all healthcare system treatment costs except for those which may occur due to increased wait times (such as falls), and also excludes any loss of economic efficiency as a result of healthcare system treatment costs. Rather this cost is reflective of the reduction in wellbeing due to their sight loss and productivity costs such as a lower probability of attaining employment.

The increased wait time applies not only to those surgeries which were cancelled, but all existing surgeries that are cleared each period until the point in time at which the wait list is the same as it was prior to the pandemic. As noted in Section 2.3, this was estimated to occur over a period of four years, in 2024. For simplicity, it was assumed the wait time proportionally decreases (from 37 days) in line with the reduction in the number of surgeries waiting for treatment – such that when 50% of the backlog has been removed (within about two years assuming an 11% increase in service volume each month) the incremental wait time would also be reduced by 50% (to 18.5 days). The relationship used in the model is shown in Chart 3.1.

Chart 3.1: Assumed relationship between the number of people waiting for ophthalmic surgery and the increased average wait time for services



Source: Deloitte Access Economics calculations.

The data presented in Section 3.3 show there were 235,000 surgeries not provided over a 10-month period in 2020. For this analysis, it was assumed that ophthalmology procedure volumes would increase by 11% compared to the surgery activity rate in 2019 until the backlog is resolved, meaning 17,000 additional ophthalmology surgeries are being provided each quarter from the start of September 2021 in the model. The backlog is considered to be cleared after all 235,000 additional services have been provided.

The modelling results indicate people waiting for ophthalmic surgery will have to wait an additional 57.2 million days in aggregate due to the backlog accumulated during COVID-19. Thus, the expected additional cost imposed by longer wait times was estimated to be around £2.3 billion. This cost was incurred over a four-year period from January 2021 to December 2024 which is equivalent to approximately £582.1 million per year. Excluding quality of life, the increased wait time is still expected to result in financial costs (productivity losses and the cost of falls) of roughly £498.2 million, or approximately £124.5 million per year between 2021 and 2024.

The additional cost imposed by longer wait times are largely driven by the time taken to clear the backlog. It has been assumed that the NHS will increase capacity from September 2021 in the modelling. If the NHS takes a longer period of time to actively start clearing the backlog, then costs will rise significantly. For example, if the NHS increases capacity by 5% (instead of the assumed 11%), waiting time costs could exceed £4 billion. Conversely, faster increases to surgical capacity such as a 15% increase from September would result in waiting time costs less than £2 billion. This highlights that costs could vary significantly based on the UK healthcare system's response and ability to clear the backlog of ophthalmology procedures over the next few years.

4 Discussion

The impact of the COVID-19 pandemic has resulted in the cancellation of thousands of elective surgeries and procedures, and the reduction in referrals to ophthalmology services. In England alone, the treatment of 400,000 patients with COVID-19 had a significant impact on the NHS, with thousands of routine surgeries and procedures cancelled to redirect staff and resources to treat these patients.[62] As a result, there are now 4.7 million people in England waiting for surgeries, which will require several years to clear this backlog. The cost associated with clearing the backlog is substantial and may continue to climb as the number of COVID-19 cases in subsequent waves of the pandemic continues to increase. The NHS is expected to receive £3 billion to clear the elective backlog and cut waiting lists and ease existing pressures in the NHS caused by the pandemic.[63]

The cost of these impacts on individuals living with sight loss and their families, government and broader community is significant. With the best available data in the UK, the findings in this report suggest the healthcare system cost of sight loss and blindness was £778.3 million lower in 2020 than in 2019. Further, findings from this report estimated that 2,986 patients have lost sight as a result of COVID-19. Of these, 1,123 lost vision due to delayed sight tests and the associated delayed referrals for treatment, and 1,863 due to delays in scheduled treatment such as surgery for Glaucoma or anti VEGF injections for AMD in 2020. Due to backlog of ophthalmic procedures and services incurred due to lockdowns and the impact on health outcomes, the total increase in the cost of sight loss and blindness in subsequent years is estimated to be £2.5 billion between 2021 and 2024, above what would otherwise have happened.

It should be noted that our modelling assumes that given the decrease in ophthalmic service utilisation in 2020, the costs attributed to these services are completely removed from the total healthcare system cost estimates. However, this may not always be true, particularly in a hospital setting, where costs may still be incurred in the form of staff salary and overhead costs, although the service may not be received.

There may be further impacts on people with sight loss due to the pandemic as there are other services required by people living with sight loss and blindness which have not been considered. For example, low vision services (provided through hospital eye services, high street optometrists and charities) which provide or sell low vision aids, such as magnifiers, lighting and eye shields to help people with everyday tasks had either closed completely during the lockdown while others continued to provide some level of services remotely.[64] This may have prevented people with sight loss, who depend on low vision aids, from accessing everyday services such as healthcare.

The number of CVIs substantially decreased in the months immediately after lockdown was introduced in March 2020.[35,36] Improvement in the pandemic situation shows the number of CVIs increased to pre-pandemic levels by September 2020, but numbers dropped to about 80% of pre-pandemic levels in January to February 2021.[35] This indicates there remains a large backlog of people not offered certification during the lockdowns, which is reflective of the decrease in utilisation of ophthalmic services in this period. This means fewer people with sight loss and blindness who are entitled to concessions (e.g. transportation) and state benefits (e.g. Disability Living Allowance) were not provided with this support during the pandemic.[65] Existing evidence also indicates that mean visual acuity was worse for those certified in the period after the onset of the lockdown compared to the same period in 2019.[36]

Despite what has been uncovered through the research in this report and elsewhere,[66,67] the full impact of COVID-19 on the UK healthcare system remains yet to be quantified and ongoing monitoring and research is required to fully understand the implications of delayed vision care. This is partly due to the lack of available and complete data, but also because the pandemic is ongoing, imposing subsequent lockdowns and causing ongoing disruptions across the healthcare system. Early literature exists indicating some patients are presenting with worse visual acuity and may have experienced a loss in their functional vision, leading to irreversible damage due to the

pandemic.[36,44] The true impact of the pandemic on the incidence of sight loss and blindness may not be known for several years.

What is known is that the pandemic impacted on service utilisation and service wait times. For example, emergency eye departments and hospital eye appointments volumes dropped in the months following the first wave of the pandemic.[57,68] It is likely that service utilisation for patients with AMD were less impacted by the lockdown compared to patients with RVO/DMO, as guidelines advised maintaining anti-VEGF treatment for AMD patients and deferring those with RVO/DMO.[57] However, some patients may have delayed treatment to reduce their risk of exposure to COVID-19. The backlog of surgeries and procedures, and subsequently the increased wait times will require several years to return to pre-pandemic levels. The impact of wait times on ophthalmic procedures will require ongoing monitoring as parts of the UK go into subsequent lockdowns to prevent the spread of the pandemic.

In the height of the pandemic, ophthalmic healthcare services aimed to minimise the number of patients physically visiting GP surgeries and secondary care facilities, allowing clinicians to focus on more urgent eye-care. While this resulted in a reduction in inpatient and outpatient attendances as summarised in this report, this led to an increase in the use of telemedicine and video consultations to continue to provide ophthalmic care where possible.[69,70]

Moorfields Eye Hospital NHS Trust Foundation rolled out emergency and outpatient ophthalmology video consultations from March 2020 to continue to provide care for patients whose vision might suffer from prolonged lack of follow-up and identify and manage the most critical emergencies or patients who would be rapidly experience sight loss if not treated while minimising hospital visits.[69] The clinical impact of video consultations indicated 79% of patients were able to avoid a hospital visit. Across the UK, virtual- or tele-consultations appointments have reported to increase for ophthalmic care during the COVID period compared to the same period in 2019.[70,71]

Beyond what has been presented, there are impacts on individuals and the community which have not been considered in this report. For example:

- Survey data from Ting et al (2021) found that lockdown negatively impacted on access to care and hospital service in people living with eye diseases in the UK due to the impacts of the pandemic.[56] Further, people living with eye disease were fearful of further sight loss due to delayed review/treatment. This may have reduced individual's quality of life which may have been exacerbated with further lockdowns across the UK.
- The pandemic caused additional impacts for certain eye conditions such as Charles Bonnet syndrome, where some people had exacerbated visual hallucinations during the COVID-19 pandemic.[72] Further, analysis from the UK found that there was a statistically significant increase in rhegmatogenous retinal detachment (RRD) cases presenting with proliferative vitreoretinopathy (a major complication of RRD) in the 2-months following lockdown compared to the 5-months prior to lockdown.[73] COVID-19, through delayed presentation may have caused increased prevalence of proliferative vitreoretinopathy, where these patients will likely require complex surgeries and experience worse visual outcomes.
- The pandemic may cause an increase in myopia in children, due to decreased time spent playing outdoors and consequently increased exposure to near vision activity including prolonged time spent on screens, reading or writing, which may contribute to eye strain and possibly resulting in myopia.[74] Similar impact may be seen in the adult population. Survey data from Fight for Sight, an eye health charity, indicated that approximately 50% of British adults reported using screens more since the pandemic and 38% believed their eyesight had worsened due to this.[75]
- People with disabilities are disproportionately impacted by COVID-19 and are at greater risk of morbidity and mortality. Given that sight loss and blindness primarily impact older adults, the pandemic placed these people at increased risk of negative health outcomes, including worse mental health.[76]
- Ocular complications in intensive care patients are common, with 20 to 42% of patients developing damage to the corneal surface of the eye.[77] This can lead to secondary complications and irreversible sight loss. The surge in intensive care unit admissions during the pandemic may increase the number of people with irreversible sight loss, due to increased

exposure to risk factors including non-invasive ventilation, mechanical ventilation and prone positioning.[78]

- The pandemic caused closure of vision screening services for subgroups of the population, such as school children and people living with conditions such as diabetes.[79] For example, orthoptic-led vision screening for school children at the age of four to five years identifies amblyopia, a condition more commonly known as 'lazy eye' where vision in one or both eyes doesn't develop properly, were severely affected with many children have had vision screening postponed or missed. As vision screening is aimed at children between four to five years, providing this screening test at a later date is inappropriate, and therefore could result in thousands of children going through school with vision defects, and if left undetected can result in irreversible sight loss.[80] Further, diabetic retinal screening services were suspended for most people expect those considered priority groups such as pregnancy women and those with pre-proliferative retinopathy.[81] As screening is important to reduce the risk of sight loss by early detection and treatment, with some screening services delivered outside of optometrist services and by private providers, it is possible the full cost implication of lockdowns were not captured and therefore the impact of COVID-19 on sight loss and blindness for people with DR have been conservatively estimated in this study.

In summary, COVID-19 continues to challenge the UK healthcare system across England, Wales, Scotland and Northern Ireland. The full extent of the impact of cancelled and delayed ophthalmic care is still unclear. Continued data collection is required to assess the longer-term impact of the pandemic on the eye health of people living in the UK. While vaccination of the UK population will go some way to ease the burden on the healthcare system, further challenges lie ahead as it continues to address subsequent waves of the pandemic and ongoing disruptions to ophthalmic care services.

Endnotes

[1] Thomas Dobbs et al, 'Surgical activity in England and Wales during the COVID-19 pandemic: a nationwide observational cohort study', (2021) 127(2) *British Journal of Anaesthesia* 196.

[2] Lynne Pezzullo et al, 'The economic impact of sight loss and blindness in the UK adult population' (2018) 18 *BMC Health Services Research* 63.

[3] Royal National Institute of Blind People, 'Sight Loss Data Tool' <https://www.rnib.org.uk/professionals/knowledge-and-research-hub/key-information-and-statistics/sight-loss-data-tool>.

[4] Deloitte Access Economics, The economic impact of sight loss and blindness in the UK adult population 2013 (report commissioned by Royal National Institute of Blind People, December 2014) <https://www.rnib.org.uk/professionals/knowledge-and-research-hub/research-reports/general-research/economic-impact-sight-loss>.

[5] World Health Organization, 'World report on vision' <https://www.who.int/docs/default-source/documents/publications/world-vision-report-accessible.pdf?sfvrsn=223f9bf7_2>.

[6] Lalit Dandona L & Rakhi Dandona, 'Revision of visual impairment definitions in the International Statistical Classification of Diseases', (2006) 4(7) *BMC Medicine* 1.

[7] Hugh Taylor et al, 'Vision loss in Australia' (2005) 182(11) *Medical Journal of Australia* 565.

[8] Nathan Congdon et al, 'Causes and Prevalence of Partial sight and blindness among adults in the United States' (2004) 122(4) *Archives of Ophthalmology* 477.

[9] Paul Mitchell et al, 'Age-related macular degeneration' (2018) 392(10153) *The Lancet* 1147.

[10] Humma Shahid et al, 'Age-related macular degeneration: the importance of family history as a risk factor' (2012) 96(3) *British Journal of Ophthalmology* 427.

[11] David Boyer et al, 'The pathophysiology of geographic atrophy secondary to age-related macular degeneration and the complement pathway as a therapeutic target' (2017) 37(5) *Retina* 819.

[12] Vohar Yehoshua et al, 'Systemic complement inhibition with eculizumab for geographic atrophy in age-related macular degeneration: the COMPLETE study' (2014) 121(2) *Ophthalmology* 693.

[13] Brian Yaspan et al, 'Targeting factor D of the alternative complement pathway reduces geographic atrophy progression secondary to age-related macular degeneration' (2017) 9(395) *Science Translational Medicine* 1443.

[14] Ahmed Shalaby et al, 'Licence to save: a UK survey of anti-VEGF use for the eye in 2015' (2016) 30(11) *Eye (Lond)* 1404.

[15] Deborah Cohen, 'CCGs win right to offer patients Avastin for wet AMD' (2018) 362 *BMJ* 1.

[16] The Royal College of Ophthalmologists, 'New Guidance for Commissioning Age Related Macular Degeneration Services' <https://www.rcophth.ac.uk/2021/07/commissioning-amd-services/>.

[17] Yu-Chi Liu et al, 'Cataracts' (2017) 390 (10094) *The Lancet* 600.

[18] Wei Wang et al, 'Diabetic Retinopathy: pathophysiology and treatments' (2018) 19(6) *International Journal of Molecular Sciences* 1816.

[19] Michael Stewart et al, 'Current management of diabetic tractional retinal detachments' (2018) 66(12) *Indian Journal of Ophthalmology* 1751.

[20] Borja Corcostegui et al, 'Update on diagnosis and treatment of diabetic retinopathy: a consensus guideline of the Working Group of Ocular Health (Spanish Society of Diabetes and Spanish Vitreous and Retina Society)' (2017) *Journal of Ophthalmology* 1.

[21] David Antonetti et al 'Diabetic Retinopathy' (2012) 366(13) *New England Journal of Medicine* 1227.

[22] Jost Jonas et al, 'Glaucoma' (2017) 390(10108) *The Lancet* 2183.

[23] Khushwant Yadav et al, 'Glaucoma: Current treatment and impact of advanced drug delivery systems' (2019) 221 *Life Sciences* 362.

[24] Ahmed Abdelghany & Jorge Alio, 'Surgical options for correction of refractive error following cataract surgery' (2014) 1(2) Eye and Vision 1

[25] NHS Digital, 'General Ophthalmic Services Activity Statistics England, year ending 31 March 2020' <https://digital.nhs.uk/data-and-information/publications/statistical/general-ophthalmic-services-activity-statistics/england-year-ending-31-march-2020>.

[26] The College of Optometrists, 'How UK eye care services are delivered' (2021) < https://www.college-optometrists.org/the-college/how-uk-eye-care-services-are-delivered.html>.

[27] RNIB, 'Eye conditions' (2021) <https://www.rnib.org.uk/eye-health/eye-conditions>.

[28] RNIB, 'Eye health and sight loss stats and facts' (2021) <https://www.rnib.org.uk/health-social-care-and-education-professionals/knowledge-and-research-hub/research-reports/general-research/eye-health-and-sight-loss-stats-and-facts>.

[29] COVIDSurg Collaborative, 'Elective surgery cancellations due to the COVID-19 pandemic: global predictive modelling to inform surgical recovery plans' (2020) British Journal of Surgery 107(11):1440.

[30] The Guardian, 'NHS hospitals forced to cancel operations again by unfolding third wave' <https://www.theguardian.com/world/2021/jul/08/nhs-hospitals-forced-to-cancel-operations-again-by-unfolding-third-wave>.

[31] Edinburgh News, 'Covid Scotland: NHS Lothian cancel operations due to pressure caused by increasing numbers of patients and staff infected with coronavirus' <https://www.edinburghnews.scotsman.com/health/coronavirus/covid-scotland-nhs-lothian-cancel-operations-due-to-pressure-caused-by-increasing-numbers-of-patients-and-staff-infected-with-coronavirus-3301568>.

[32] Institute for Fiscal Studies, 'What happened to English NHS hospital activity during the COVID-19 pandemic?', May 2021.

[33] The Health Foundation, 'How might COVID-19 have affected people's ability to see their GP?' <https://www.health.org.uk/news-and-comment/charts-and-infographics/how-might-covid-19-have-affected-peoples-ability-to-see-GP>.

[34] The College of Optometrists, 'Deep impact: the legacy of the pandemic for eye care' <https://www.college-optometrists.org/acuity-resource/deep-impact-the-legacy-of-the-pandemic-for-eye-care.html>.

[35] The Royal College of Ophthalmologists, 'Sight impairment and severe sight impairment certifications and registrations update' <https://www.rcophth.ac.uk/2021/03/sight-impairment-and-severe-sight-impairment-certifications-and-registrations-update/>.

[36] Johnathan Jackson et al, 'COVID-19: The regional impact of COVID-19 on the certification of vision impairment in Northern Ireland', (2021) 41 *The Journal of the College of Optometrists* 136.

[37] Andrew Carr and Jenny Camaradou, 'Growing backlog of planned surgery due to covid-19', (2021) 372 *BMJ* n339.

[38] Anna Palagyi et al, 'While we waited: incidence and predictors of falls in older adults with cataract' (2016) 57(14) *Investigative ophthalmology & visual science* 6003.

[39] William Hodge et al, 'The consequences of waiting for cataract surgery: a systematic review' (2007) 176(9) *CMAJ* 1285.

[40] Mats Lundström et al, 'Immediate versus delayed sequential bilateral cataract surgery: an analysis of costs and patient value' (2009) *Acta Ophthalmologica* 87(1): 33-8.

[41] Kelvin Teo et al, 'Extended intervals for wet AMD patients with high retreatment needs: informing the risk during COVID-19, data from real-world evidence' (2020) *Eye*: 1.

[42] Peter Scanlon et al, 'Delay in diabetic retinopathy screening increases the rate of detection of referable diabetic retinopathy' (2014) 31(4) *Diabetic medicine* 439.

[43] Laura Cohen and Louis Pasquale, 'Clinical characteristics and current treatment of glaucoma' (2014) 4(6) *Cold Spring Harbor perspectives in medicine* a017236.

[44] Louisa Wickham et al, 'The impact of COVID policies on acute ophthalmology services—experiences from Moorfields Eye Hospital NHS Foundation Trust' (2020) 34 *Eye* 1189.

[45] Office for National Statistics 'National population projections: 2018-based' <https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based>.

[46] Shyamanga Borooah et al, 'Long-term visual outcomes of intravitreal ranibizumab treatment for wet age-related macular degeneration and effect on blindness rates in south-east Scotland' (2015) 29(9) *Eye* 1156.

[47] Sophie J Bakri et al 'Safety and efficacy of anti-vascular endothelial growth factor therapies for neovascular age-related macular degeneration: a report by the American Academy of Ophthalmology' (2019) 126(1) *Ophthalmology* 55.

[48] National Health Service 'National Cost Collection for the NHS' <https://www.england.nhs.uk/national-cost-collection/>.

[49] NHS Digital, 'Hospital Episode Statistics' <https://digital.nhs.uk/data-and-information/data-tools-and-services/data-services/hospital-episode-statistics>.

[50] NHS, 'Consultant-led Referral to Treatment Waiting Times' <https://www.england.nhs.uk/statistics/statistical-work-areas/rtt-waiting-times/>.

[51] Specsavers, 'Specsavers Hindsight Report' <https://www.specsavers.co.uk/hindsight>.

[52] Becky McCall, 'Deep impact: the legacy of the pandemic for eye care' (2021) *Acuity*.

[53] Specsavers, 'Ask the expert' <https://www.specsavers.co.uk/help-and-faqs/how-much-is-an-eye-test>.

[54] FOI data request provided by NHS Greater Glascow and Clyde.

[55] Insight received from consultant ophthalmologist based in England.

[56] Darren Ting et al, 'Psychosocial impact of COVID-19 pandemic lockdown on people living with eye diseases in the UK' (2021) 35(7) *Eye(Lond)* 2064.

[57] Lydia Stone et al, 'Macula service evaluation and assessing priorities for anti-VEGF treatment in light of COVID-19' (2020) 258(12) *Graefe's Archive for Clinical and Experimental Ophthalmology* 2639.

[58] JM Burr et al, 'The clinical effectiveness and cost-effectiveness of screening for open angle glaucoma: a systematic review and economic evaluation' (2007) *Health Technol Assess;11*(41).

[59] Rohit Varma et al. 'Visual impairment and blindness avoided with ranibizumab in Hispanic and non-Hispanic whites with diabetic macular edema in the United States' (2015) *Ophthalmology 122*(5): 982-9.

[60] Darren Thomas et al. 'Estimating excess visual loss in people with neovascular age-related macular degeneration during the COVID-19 pandemic' (2020) *MedRxiv*.

[61] Kelvin Teo et al. 'Extended intervals for wet AMD patients with high retreatment needs: informing the risk during COVID-19, data from real-world evidence' (2020) *Eye*: 1-9.

[62] BBC News, '4.7 million waiting for operations in England' <https://www.bbc.com/news/health-56752599>.

[63] Abi Rimmer, 'News Covid-19: NHS will get £3bn of "recovery" funding to tackle pandemic fallout', (2020) 371 *BMJ* m4651.

[64] Royal National Institute of Blind People, 'Written evidence submitted by the Royal National Institute of Blind People (DEL0236) <https://committees.parliament.uk/writtenevidence/4579/pdf/>.

[65] Department of Health, 'Certificate of Vision Impairment. Explanatory Notes for Consultant Ophthalmologists and Hospital Eye Clinic Staff in England' <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/637590/CVI_guidance.pdf>.

[66] Chiun-Ho Hou et al, 'Effect of the time interval between cataract surgery for both eyes on mental health outcome: a cohort study of 585,422 patients' (2021) *BMC ophthalmology 21*(1): 1-8.

[67] Weilin Song et al, 'The effect of delay in care among patients requiring intravitreal injections' (2021) *Ophthalmology Retina*.

[68] Alicia Poyser et al, 'Impact of COVID-19 pandemic and lockdown on eye emergencies' (2020) *European Journal of Ophthalmology* 1.

[69] UK Ophthalmology Alliance, 'How did Moorfields Eye Hospital implement emergency and outpatient ophthalmology video consultation services during COVID-19?' <https://uk-oa.co.uk/wp-content/uploads/2020/06/UKOA-MEH-video-guide.docx.pdf>.

[70] Glaucoma UK, 'The impact of COVID-19 on glaucoma care, in numbers' <https://glaucoma.uk/covid-19-impact/>.

[71] Darren Ting et al, 'The impact of COVID-19 pandemic on ophthalmology services: are we ready for the aftermath?' (2020) 12 *Therapeutic Advances in Ophthalmology* 1.

[72] Lee Jones et al, 'Exacerbation of visual hallucinations in Charles Bonnet syndrome due to the social implications of COVID-19' (2021) 6 *BMJ Open Ophthalmology* e000670.

[73] Mary Awad et al, 'Delayed presentation and increased prevalence of proliferative vitreoretinopathy for primary rhegmatogenous retinal detachments presenting during the COVID-19 pandemic lockdown' (2020) 29 *Eye(Lond)* 1.

[74] BBC News, 'Coronavirus: Opticians advise screen breaks for children in lockdown' <https://www.bbc.com/news/uk-wales-52584203>.

[75] BBC News, 'Covid: Eyesight risk warning from lockdown screen time' <https://www.bbc.com/news/health-55620100>.

[76] Social Development Direct, 'People with disabilities are disproportionately impacted by COVID-19. They must be included meaningfully in the response and recovery' <https://www.sddirect.org.uk/media/2097/disability-inclusion-helpdesk-evidence-digest-issue-5-covid-19.pdf>.

[77] Benjamin Hearne et al, 'Eye care in the intensive care unit' (2018) 19(4) *Journal of the Intensive Care Society* 345.

[78] Stafford Sansome and Pei-Fen Lin, 'Eye care in the intensive care unit during the COVID-19 pandemic' (2020) 81(6) *British Journal of Hospital Medicine* 1.

[79] GOV.UK, 'Recovery of vision screening services across England as schools return' <https://phescreening.blog.gov.uk/2021/05/07/recovery-of-vision-screening-services-across-england-as-schools-return/>.

[80] British and Irish Orthoptic Society, 'Vision Screening' <https://www.orthoptics.org.uk/policy-and-campaigns/vision-screening/>.

[81] The Royal College of Ophthalmologists, 'Diabetic eye screening services- Initial technical guidance to support regional commissioners during the coronavirus (Covid-19) pandemic' < https://www.rcophth.ac.uk/wp-content/uploads/2020/04/DES-COVID-19-technical-guidance-FINAL-080420-1.docx>.

Appendix A Prevalence rates

A.1. Literature used to estimate prevalence of sight loss and blindness

The following sources were used to inform the derivation of prevalence rates and the continued appropriateness of the prevalence table from Deloitte Access Economics (2014)[2]:

- Bourne et al (2020) conducted a systematic review and meta-analysis of population-based datasets relevant to global vision impairment and blindness from 1980.
- Evans et al (2002) helped inform the prevalence of sight loss for those ages 75+ in the UK.
- Evans et al (2004) informed the prevalence of vision impairment and blindness in older people in UK (75+), with a breakdown of prevalence by major causes of sight impairment.
- Owen et al (2006) informed trends of the prevalence of being treated for glaucoma and ocular hypertension.
- Coffey et al (1993) was used to inform the glaucoma split by region across the UK.

The detailed description of methods used to inform prevalence rates is available in section 2.2 of the Deloitte Access Economics 2013 report. In particular, table 2.8 outlines the prevalence rates of sight loss and blindness for people aged 75+, table 2.9 shows prevalence rates for ages 55-74 and table 2.10 provides prevalence rates for ages <55.

Table A.1: Prevalence of sight loss or blindness per 1,000 people in the UK by age, sex and condition

Age	AMD		Cataract		DR		Glaucoma		RE		Other	
	M	F	M	F	M	F	M	F	M	F	M	F
0-4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.8	0.1	0.1
5-9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	1.4	0.1	0.1
10-14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	2.0	0.2	0.2
15-19	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5	2.3	0.2	0.2
20-24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.8	2.5	0.2	0.2
25-29	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	2.9	2.6	0.2	0.2
30-34	0.0	0.0	0.0	0.0	0.3	0.2	0.0	0.0	2.7	2.4	0.2	0.2
35-39	0.0	0.0	0.0	0.0	0.7	0.5	0.0	0.0	2.2	2.2	0.2	0.2
40-44	0.0	0.0	0.7	0.7	1.2	0.7	1.3	1.0	4.4	5.9	0.6	0.7
45-49	0.0	0.0	0.7	0.7	1.2	0.7	1.3	1.0	6.7	8.3	0.8	0.9
50-54	0.0	0.0	1.5	2.0	3.2	2.1	1.3	1.3	6.7	8.5	1.0	1.1
55-59	1.0	1.0	2.5	3.6	3.2	2.1	1.3	1.3	9.7	11.5	1.4	1.6
60-64	1.0	1.0	4.1	6.0	3.2	2.1	2.5	2.3	17.2	19.1	2.2	2.4
65-69	3.8	8.4	7.2	11.3	5.4	3.0	4.7	4.1	25.8	24.1	3.8	4.1
70-74	14.7	8.8	9.7	18.0	5.4	3.0	6.9	5.0	32.7	35.9	5.5	5.7
75-79	19.0	23.3	14.6	27.8	6.6	1.9	8.0	5.4	34.3	55.5	6.6	9.1
80-84	49.2	72.8	28.4	44.7	7.4	3.2	17.9	15.6	48.1	68.2	12.1	16.4
85-89	94.7	140.6	71.5	98.8	2.0	6.3	27.3	25.7	84.1	79.5	22.4	28.1
90+	191.0	265.6	114.4	119.2	0.3	3.0	9.6	36.6	76.3	97.9	31.3	41.8

Source: Deloitte Access Economics calculations. Note: M = male; F = female.

Table A.2: Estimated prevalence of sight loss and blindness by country and sex in 2019 to 2022

	2019	2020	2021	2022
England				
Male	706,355	715,727	732,830	747,712
Female	1,085,024	1,094,056	1,111,895	1,130,436
All	*1,791,380*	*1,809,784*	*1,844,726*	*1,878,148*
Wales				
Male	43,367	43,966	44,817	45,654
Female	66,609	67,139	67,939	68,982
All	*109,976*	*111,105*	*112,756*	*114,636*
Scotland				
Male	67,990	68,844	70,145	71,400
Female	108,038	108,638	110,041	111,641
All	*176,029*	*177,482*	*180,186*	*183,041*
Northern Ireland				
Male	21,246	21,636	22,201	22,735
Female	33,178	33,614	34,195	34,804
All	*54,424*	*55,250*	*56,396*	*57,539*

Source: Deloitte Access Economics calculations and ONS population estimates and projections.[45] Note: components may not sum to totals due to rounding.

Limitation of our work

General use restriction

This report is prepared solely for the use of Specsavers Optical Group Limited. This report is not intended to and should not be used or relied upon by anyone else and we accept no duty of care to any other person or entity. The report has been prepared for the purpose of estimating the economic impact of COVID-19 on sight loss and blindness in the UK. You should not refer to or use our name or the advice for any other purpose.

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