



**Incidence and risk of sight loss and  
blindness in the UK**

Royal National Institute of Blind People

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# Glossary

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|      |  |
|------|--|
| AMD  | age-related macular degeneration         |
| CVI  | Certificate of Vision Impairment         |
| DR   | diabetic retinopathy                     |
| ONS  | Office for National Statistics           |
| RE   | refractive error                         |
| RNIB | Royal National Institute of Blind People |
| UK   | United Kingdom                           |
| VA   | visual acuity                            |

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# Acknowledgments

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# Executive summary

Deloitte Access Economics was commissioned by the Royal National Institute of Blind People (RNIB) to undertake analysis of the incidence of sight loss or blindness in the United Kingdom (UK) in 2016-17. RNIB has used the message that “100 people a day start to lose their sight” based on the number of people registering as partially sighted or blind in the UK.

The measure of 100 people a day is based on dated registration data, which captures a more severe definition of sight loss or blindness than alternative definitions. Consequently, this report investigates another approach to estimate the incidence of sight loss or blindness in the UK for 2016-17 using prevalence and mortality rates.

## Methodology

It is possible to estimate the incidence of sight loss or blindness from prevalence data based on three assumptions:

1. sight loss is permanent and irreversible;
2. mortality rates amongst people who are living with sight loss are equal to the mortality rates in the general population; and
3. sight loss is stable in the population, so there are no existing time trends for incidence rates.

Based on these assumptions, and UK demographic data from the Office for National Statistics (ONS, 2015), the incidence of permanent sight loss or blindness was estimated using the model developed by Leske et al (1981), which uses prevalence and mortality rates as inputs.

Prevalence rates were based on the total estimated prevalence of permanent sight loss or blindness from Deloitte Access Economics' 2014 report for RNIB, *The economic impact of sight loss and blindness in the UK adult population, 2013*, which estimated that more than 1.9 million adults in the UK were living with the consequences of sight loss and blindness in 2012-13, of which approximately 42% was from permanent causes.

Permanent sight loss or blindness was defined as visual acuity (VA) of <6/12 resulting from underlying eye conditions including age-related macular degeneration (AMD), diabetic retinopathy (DR), glaucoma and 'other' eye conditions, which are typically retinal or macular dystrophies, and ocular atrophies.<sup>1</sup>

The incidence estimates were based on prevalence rates by gender and (single year of) age, which were calculated from Deloitte Access Economics (2014) using a logistic regression curve.

## Results

**There were estimated to be 89,878 new cases of sight or blindness in 2016-17, representing 0.14% of the population.** The causes of these new cases were from either AMD, DR, glaucoma or other eye diseases, which are conditions that have lifelong health system, productivity and wellbeing impacts.

Alternatively, there were estimated to be 246 new cases of permanent sight loss or blindness each day, or almost 1 person every 5.8 minutes, in the UK in 2016-17.

Incidence rates increase with age as for prevalence rates (Chart i). People who are aged 65 years or older accounted for 90% of new cases of permanent sight loss in the UK in 2016-17; however, there were still almost 9,150 new cases in people of working age (defined as 15-64 years old) – equivalent to 25 people every day.

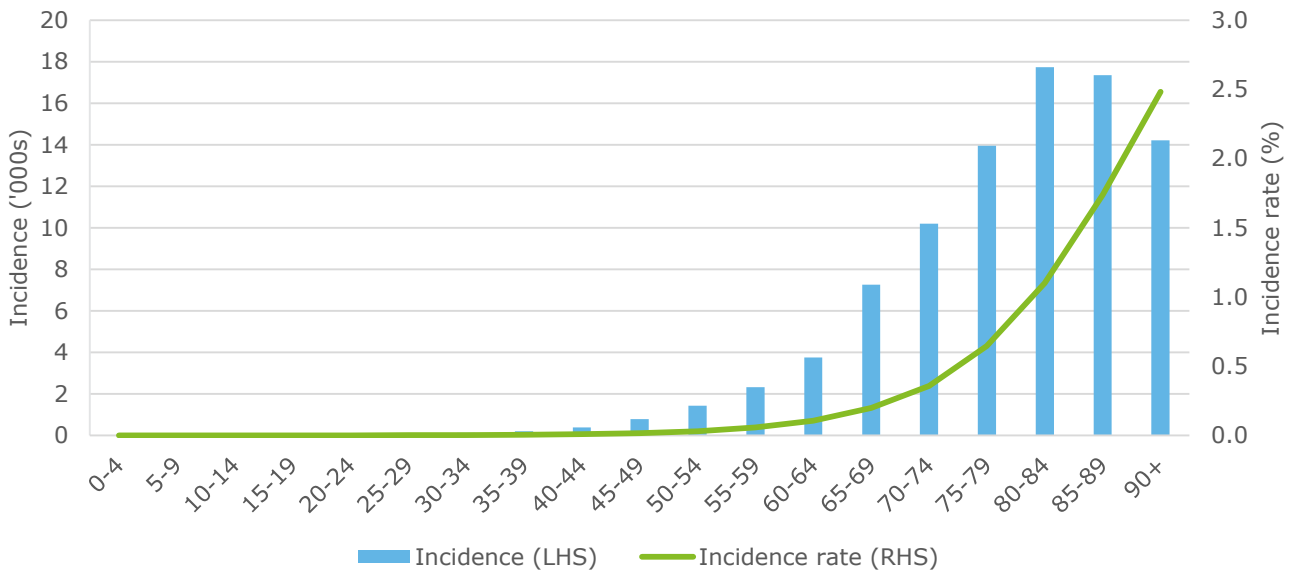
Females were more likely to experience sight loss or blindness due to both the higher incidence rate and underlying population in older age groups relative to their male counterparts.

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<sup>1</sup> Under-corrected refractive error (RE) and cataracts were excluded from permanent sight loss due to the success of correction and surgery for these conditions.

Taking a broader measure of sight loss or blindness – i.e. including treatable under-corrected RE and cataracts – it was estimated there were 167,434 new cases of sight loss or blindness during 2016-17 in the UK (almost 460 people per day), of which **54% was from permanent causes, while 46% was potentially reversible.**

Chart i: Incidence of permanent sight loss or blindness in the UK by age, 2016-17



Source: Deloitte Access Economics calculations.

The lifetime risk, which represents the probability or chance that someone born in 2016-17 would develop sight loss or blindness requiring intervention or treatment, was estimated to be:

- **18.2% for permanent sight loss or blindness, or nearly 1 in 5 people;** and
- **36.3% for any sight loss or blindness, or over 1 in 3 people.**

When considering causes of sight loss or blindness, AMD (13.8%), cataract (10.0%) and under-corrected RE (8.1%) were estimated to be the largest contributors to the expected lifetime risk for someone born in the UK in 2016-17.

This report found that incidence of permanent sight loss or blindness is around two and a half times greater than past measures based on registrations, which indicated there are around 100 new cases of sight loss or blindness each day. Although, when considering a more comparable measure of moderate or worse permanent sight loss (VA <6/18), the rates are similar – 103 compared to 100 new cases per day.<sup>2</sup>

Given the relative importance of incidence in RNIB awareness raising, this alternate approach provides a much needed update of the incidence of permanent sight loss in the UK for 2016-17.

**Deloitte Access Economics**

<sup>2</sup> The measures are still not directly comparable due to the inclusion of visual field restrictions.

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Introduction

# 1 Introduction

Deloitte Access Economics was commissioned by RNIB to undertake analysis of the incidence of sight loss or blindness in the UK in 2016-17. This report follows Deloitte Access Economics' 2014 report for RNIB, *The economic impact of sight loss and blindness in the UK adult population, 2013*, which estimated that more than 1.9 million adults in the UK were living with the consequences of sight loss and blindness – imposing an estimated £28.1 billion cost on society in 2012-13.

This report provides a description of the methodology, and provides summary statistics of the incidence and lifetime risk of permanent sight loss by age and gender, severity and cause.

## 1.1 Background to the work

RNIB has used a measure of incidence of sight loss and blindness which was based on the number of new blind or partially sighted registrations in a given year. This measure indicated that around "100 people a day start to lose their sight".

There has been a decline in new registrations over the last decade. In 2002-03, there were 29,610 newly registered blind or partially sighted people in England. In 2013-14, the number of new partially sighted or blind registrations had decreased to 21,095 (Health and Social Care Information Centre, 2014). A Certificate of Vision Impairment (CVI) is required for someone to be registered as blind or partially sighted (Department of Health, 2013).<sup>3</sup>

Due to the decline, there has been a growing lack of confidence in using registrations as a measure of incidence. A decline in either CVIs or new registrations does not align with evidence about risk factors in the population. For example, there is a growing number of older people living in the UK (Deloitte Access Economics, 2014; ONS, 2015) and the prevalence of diabetes is also rising (Diabetes UK, 2016). These are some of the primary risk factors for sight loss and blindness.

While there is evidence which suggests a decline in some risk factors – such as newer forms of treatment for the wet form of AMD (Owen et al, 2012) and screening programs for DR (Diabetes UK, 2016) – it is possible that CVIs (or new registrations) may not be the most appropriate measure of incidence. Since CVIs are the only national data that regularly report on the eye health of the nation, quality assurance needs to be more rigorous so that this source provides reliable incidence data.

For example, a number of people may be eligible to register but are either not offered the chance or do not want to take it up (Owen et al, 2012). Moreover, there are people living with the consequences of sight loss and blindness who would not be eligible to register due to more stringent criteria – e.g. generally VA of <6/18 for CVI compared to VA of <6/12.

For the purposes of this report, sight loss or blindness was defined as best-corrected VA of <6/12 in the better-seeing eye, which while the legal definition varies internationally, it is a generally accepted definition in developed countries as this is the point where many functional limitations begin to occur (Dandona and Dandona, 2006; Taylor et al, 2005; Congdon et al, 2004; Deloitte Access Economics, 2014).

This report outlines an alternative approach to estimating incidence, which bases the number of new cases on the total number of people living with sight loss or blindness. This is a standard approach in epidemiology (e.g. see Owen et al, 2012; Leske et al, 1981).

The incidence of sight loss or blindness is important for policy as it provides an indication of the number of people who require intervention or treatment in a given year.

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<sup>3</sup> A person is classified as sight impaired (or severely sight impaired) if they have: VA of 3/60 to 6/60 with full field; VA of up to 6/24 with moderate contraction of the field, opacities in media or aphakia; or VA of up to 6/18 or even better if they have a gross defect, for example hemianopia, or if there is a marked contraction of the visual field, for example in retinitis pigmentosa or glaucoma (Department of Health, 2013).



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Methodology

# 2 Methodology

The methodology to estimate the incidence of sight loss and blindness in the UK follows the approach taken by Owen et al (2012) and Leske et al (1981). Briefly, it is possible to base incidence estimates on the prevalence of sight loss and blindness in the UK when population demographics are known (i.e. size of the population and mortality rates). Based on the approach taken by Leske et al (1981):

- a logistic regression curve was fitted to the five-year age and gender specific prevalence rate estimates from Deloitte Access Economics (2014) to estimate prevalence at any single year of age; and
- incidence rates of sight loss or blindness were calculated as the difference between (single year of) age and gender specific prevalence rates at the beginning and end of 2016-17, adjusted for the likelihood of death occurring during the period.

The detailed inputs and assumptions are provided in the following sections.

## 2.1 Estimating incidence from prevalence

Using prevalence to estimate incidence has been used a number of times in the past (e.g. Owen et al, 2012; Leske et al, 1981). Prevalence rates are used to estimate the probability of sight loss by age and gender, which can then be converted to incidence when combined with the age specific probability of death during a period.

Underlying this methodology, three key assumptions need to be made (Owen et al, 2012):

1. **sight loss is permanent and irreversible;**
  - The assumption is that once a person has sight loss or blindness, they will remain in this group of people for the rest of their lives. The assumption gives reason to exclude people with under-corrected RE and cataracts as both groups could receive interventions to improve their eye sight. AMD, glaucoma, DR and other eye conditions were included in the analysis<sup>4</sup>.
2. **mortality rates amongst people who are living with sight loss are equal to the mortality rates in the general population;** and
  - It has been observed that there is an increased risk of mortality for people who have sight loss or blindness (Deloitte Access Economics, 2014; McCarty et al, 2001). In this context, mortality rates are assumed to be approximately the same as for the general population. Recent evidence also suggests an increased mortality risk (e.g. see Zheng et al, 2014). However, these studies typically report elevated risk of mortality over a number of years. In the initial year with sight loss or blindness, it has been assumed that there would be a negligible increase in the risk of death.
3. **sight loss is stable in the population, so there are no existing time trends for incidence rates.**
  - There is evidence to suggest that some risk factors for sight loss are worsening – e.g. rising prevalence of diabetes (Diabetes UK, 2016). Conversely, improved drug treatment for wet-AMD may reduce the incidence over time (Owen et al, 2012). However, there is little evidence to assess the validity of this assumption despite the necessity of its use in the analysis.

Under these assumptions, Leske et al (1981) provide the following formulae to calculate the incidence of sight loss or blindness during a given period.<sup>5</sup>

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<sup>4</sup> Sight loss or blindness from other eye conditions predominately relates to retinal dystrophies, macular dystrophies or ocular atrophies (Foreman et al, 2016; Liew et al, 2014; Khawaja et al, 2013). Typically for dystrophies and atrophies, early treatment can be effective to prevent sight loss or blindness; however, there is little that can be done to reverse damage to the eye or optic nerves. Adjusting prevalence to remove other eye disease would have a relatively small effect on the final incidence rates, and was out of scope for this analysis.

<sup>5</sup> The number of new cases of permanent sight loss or blindness can also be approximated by applying the prevalence rates to the overall population by age and gender in 2016 and 2017 respectively, and adjusting for the expected number of deaths in those with sight loss. Using the approach taken by Leske et al (1981), the prevalence of permanent sight loss or blindness was approximately 800,000 and 820,000 in 2016 and 2017 respectively. During 2016-17, about 65,000 of those with sight loss were expected to die and a further 3,000 would have new sight loss or blindness before dying, hence there were approximately 88,000 new cases of sight loss or blindness. There would also be some new cases in any migration flows who

$$I_x = \frac{\ln(1-\Pi_x)}{\ln(1-q_x)+\ln(1-\Pi_x)} \cdot \frac{1-(1-\Pi_x)(1-q_x)}{1-0.5q_x}, \text{ where} \quad (1)$$

$$\Pi_x = \frac{P_{x+1}-P_x}{1-P_x} \quad (2)$$

$P_x$  = Prevalence rate for given age at the beginning of the age interval, and

$q_x$  = probability of dying during the age interval

### 2.1.1 Prevalence of sight loss or blindness

Prevalence rates were taken from Deloitte Access Economics (2014), which provides a full description of the approach taken to estimate prevalence by cause, age, and gender. The prevalence rates are shown in Table 2.1.<sup>6</sup>

Table 2.1: Prevalence of sight loss or blindness per 1,000 people in the UK, by age and cause

| Age            | AMD        |            | Cataract   |            | DR         |            | Glaucoma   |            | RE         |             | Other causes |            | All         |
|----------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|--------------|------------|-------------|
|                | M          | F          | M          | F          | M          | F          | M          | F          | M          | F           | M            | F          |             |
| 0-4            | -          | -          | -          | -          | -          | -          | -          | -          | 0.9        | 0.8         | 0.1          | 0.1        | 0.9         |
| 5-9            | -          | -          | -          | -          | -          | -          | -          | -          | 1.5        | 1.3         | 0.1          | 0.1        | 1.6         |
| 10-14          | -          | -          | -          | -          | -          | -          | -          | -          | 2.2        | 1.9         | 0.2          | 0.2        | 2.2         |
| 15-19          | -          | -          | -          | -          | -          | -          | -          | -          | 2.5        | 2.2         | 0.2          | 0.2        | 2.6         |
| 20-24          | -          | -          | -          | -          | 0.01       | 0.03       | -          | -          | 2.8        | 2.4         | 0.2          | 0.2        | 2.9         |
| 25-29          | -          | -          | -          | -          | 0.03       | 0.1        | -          | -          | 2.9        | 2.6         | 0.2          | 0.2        | 3.0         |
| 30-34          | -          | -          | -          | -          | 0.3        | 0.2        | -          | -          | 2.7        | 2.5         | 0.2          | 0.2        | 3.0         |
| 35-39          | -          | -          | -          | -          | 0.7        | 0.5        | -          | -          | 2.2        | 2.2         | 0.2          | 0.2        | 3.1         |
| 40-44          | -          | -          | 0.7        | 0.7        | 1.2        | 0.7        | 1.3        | 1.0        | 4.4        | 6.1         | 0.6          | 0.7        | 8.7         |
| 45-49          | -          | -          | 0.7        | 0.7        | 1.2        | 0.7        | 1.3        | 1.0        | 6.7        | 8.6         | 0.8          | 0.9        | 11.2        |
| 50-54          | -          | -          | 1.5        | 2.0        | 3.2        | 2.1        | 1.3        | 1.3        | 6.7        | 8.7         | 1.0          | 1.1        | 14.4        |
| 55-59          | 1.0        | 1.0        | 2.5        | 3.6        | 3.2        | 2.1        | 1.3        | 1.3        | 9.7        | 11.7        | 1.4          | 1.6        | 20.2        |
| 60-64          | 1.0        | 1.0        | 4.1        | 6.0        | 3.2        | 2.1        | 2.5        | 2.3        | 17.2       | 19.9        | 2.2          | 2.4        | 31.7        |
| 65-69          | 3.8        | 8.4        | 7.2        | 11.3       | 5.4        | 3.0        | 4.7        | 4.1        | 25.8       | 25.5        | 3.8          | 4.1        | 53.0        |
| 70-74          | 14.7       | 8.8        | 9.7        | 18.0       | 5.4        | 3.0        | 6.9        | 5.0        | 32.7       | 40.0        | 5.5          | 5.7        | 75.7        |
| 75-79          | 19.0       | 23.3       | 14.6       | 27.8       | 6.6        | 1.9        | 8.0        | 5.4        | 34.3       | 66.1        | 6.6          | 9.1        | 107.5       |
| 80-84          | 49.2       | 72.8       | 28.4       | 44.7       | 7.4        | 3.2        | 17.9       | 15.6       | 48.1       | 94.1        | 12.1         | 16.4       | 196.6       |
| 85-89          | 94.7       | 140.6      | 71.5       | 98.8       | 2.0        | 6.3        | 27.3       | 25.7       | 84.1       | 136.2       | 22.4         | 28.1       | 350.6       |
| 90+            | 191.0      | 265.6      | 114.4      | 119.2      | 0.3        | 3.0        | 9.6        | 36.6       | 76.3       | 250.0       | 31.3         | 41.8       | 524.3       |
| <b>Overall</b> | <b>4.4</b> | <b>9.4</b> | <b>3.7</b> | <b>7.5</b> | <b>1.7</b> | <b>1.1</b> | <b>2.0</b> | <b>2.4</b> | <b>9.9</b> | <b>14.0</b> | <b>1.7</b>   | <b>2.7</b> | <b>30.1</b> |

Source: Deloitte Access Economics (2014). M = male, F = female, P = person.

may leave or enter the UK before 2017. The migration flows would account for some of the difference between 89,878 estimated using the approach taken by Leske et al (1981) (as in chapter 3) and the alternate approach presented here.

<sup>6</sup> As noted in Deloitte Access Economics (2014), prevalence data for people who are aged between 0 and 39 years old must be used with caution. This is due to limited and variable data for this age range. It was outside the scope of this report to update the underlying prevalence estimates. Therefore, incidence estimates for this age range should also be used with caution. At the time of writing this report, RNIB is supporting a National Eye Health Survey to update prevalence estimates for the UK.

As noted by Leske et al (1981), estimating incidence rates based on 5-year age groups would result in non-standard age intervals. As such, Leske et al (1981) fitted a logistic regression curve to their prevalence data to estimate prevalence at any age, and subsequently, incidence for specified single year age and gender groups. The logistic regression curve used in this analysis was the same as Leske et al (1981) and Owen et al (2012), where:

$$P_x = \frac{1}{1 + e^{-a-bx}}, \text{ where } x \text{ is the age interval} \quad (2)$$

### 2.1.2 Demographic data

Population and mortality data for 2016-17 were derived from the ONS (2015). The ONS provides population projections by single-year age and gender for the UK. The principal population projections also provide estimates of the number of deaths that will occur in each year, which were converted to the probability of death during each age interval ( $q_x$  in equation 1). The population at the beginning of 2016-17 and the estimated mortality throughout 2016-17 are shown in Table 2.2.

Table 2.2: Population ('000s) and mortality (per 1,000 people) in the UK, by age and gender

| Age            | Population 2016 ('000s) |                 |                 | Mortality per 1,000 people, 2016-17 |            |            |
|----------------|-------------------------|-----------------|-----------------|-------------------------------------|------------|------------|
|                | Male                    | Female          | Person          | Male                                | Female     | Person     |
| 0-4            | 2,047.9                 | 1,947.4         | 3,995.2         | 0.3                                 | 0.2        | 0.2        |
| 5-9            | 2,060.0                 | 1,963.4         | 4,023.4         | 0.1                                 | 0.1        | 0.1        |
| 10-14          | 1,848.5                 | 1,762.2         | 3,610.7         | 0.1                                 | 0.1        | 0.1        |
| 15-19          | 1,928.8                 | 1,831.7         | 3,760.5         | 0.3                                 | 0.2        | 0.2        |
| 20-24          | 2,189.6                 | 2,089.4         | 4,279.0         | 0.5                                 | 0.2        | 0.4        |
| 25-29          | 2,287.8                 | 2,242.6         | 4,530.4         | 0.6                                 | 0.3        | 0.4        |
| 30-34          | 2,193.6                 | 2,209.8         | 4,403.4         | 0.8                                 | 0.4        | 0.6        |
| 35-39          | 2,074.4                 | 2,094.0         | 4,168.4         | 1.2                                 | 0.7        | 0.9        |
| 40-44          | 2,059.9                 | 2,099.2         | 4,159.1         | 1.8                                 | 1.0        | 1.4        |
| 45-49          | 2,270.0                 | 2,337.1         | 4,607.1         | 2.4                                 | 1.6        | 2.0        |
| 50-54          | 2,275.4                 | 2,347.1         | 4,622.5         | 3.6                                 | 2.5        | 3.1        |
| 55-59          | 2,003.1                 | 2,056.8         | 4,059.9         | 5.8                                 | 4.0        | 4.9        |
| 60-64          | 1,727.7                 | 1,799.2         | 3,526.9         | 9.1                                 | 6.1        | 7.5        |
| 65-69          | 1,763.6                 | 1,870.6         | 3,634.2         | 14.2                                | 9.6        | 11.8       |
| 70-74          | 1,359.8                 | 1,491.8         | 2,851.6         | 22.9                                | 15.5       | 19.1       |
| 75-79          | 991.7                   | 1,166.3         | 2,158.0         | 38.3                                | 27.2       | 32.3       |
| 80-84          | 696.9                   | 914.1           | 1,611.0         | 66.3                                | 50.2       | 57.2       |
| 85-89          | 383.0                   | 615.1           | 998.1           | 116.6                               | 93.6       | 102.4      |
| 90+            | 172.1                   | 400.8           | 572.9           | 211.3                               | 190.6      | 196.8      |
| <b>Overall</b> | <b>32,333.9</b>         | <b>33,238.5</b> | <b>65,572.4</b> | <b>8.5</b>                          | <b>8.7</b> | <b>8.6</b> |

Source: ONS (2015). Note: components may not sum to totals due to rounding.

## 2.2 Estimating lifetime risk

The lifetime risk represents the probability, or the chance, that someone born at a given time will experience a given outcome. Lifetime risk is a statistic that is commonly also used for cancer statistics. The lifetime risk is often reported as the chance of developing a condition, or the ratio of occurrences to the total population – e.g. 1 in every 2 people.

For someone who was born today, the chance they will have sight loss at any given age is based on the observed cases for people who are that given age today. For example, the chance sight loss or blindness will occur in 50 years' time for someone who is born today was assumed to be the same as the annual incidence rate in people who are 50 years old today. Therefore, such lifetime risk analysis implicitly embeds a continuation of current age-gender incidence patterns.

It is also possible to estimate lifetime risk of sight loss or blindness for someone born today by projecting known trends in the incidence for each condition over time, and then estimating the expected incidence for a single cohort of people born in 2016-17. In the absence of trend information, the lifetime risk was estimated by assuming that there will be no change in the rate of incidence over time – as per assumption 3 in section 2.1.

To estimate lifetime risk, it is also necessary to account for the probability of death at each year of age. Deaths were assumed to be evenly distributed across each year, so that 50% of deaths occur in the first and second half of the year, respectively. Sight loss may also occur in the same year as a death.

In summary, the approach to estimate lifetime risk is based on the life table approach.<sup>7</sup> The lifetime risk of sight loss or blindness is estimated using the probability of having sight loss and mortality rates for a given population. The lifetime risk for someone who is born today is the sum of the probabilities of sight loss or blindness in any given year after accounting for the probability of death occurring. Conceptually, **lifetime risk is the same as the total number of cases that occur for a cohort who are born today over all future years, divided by the total number of years lived by the same cohort** – again, adjusted for mortality.

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<sup>7</sup> More details on the methods to estimate the lifetime risk are available in Esteve et al (1994).

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Results

# 3 Results

This chapter outlines the incidence of permanent sight loss or blindness, and provides a measure of overall incidence of any sight loss or blindness in the UK for 2016-17. The lifetime risk of sight loss or blindness are also derived from the incidence rates.

## 3.1 Incidence of sight loss or blindness

### 3.1.1 Incidence of permanent sight loss or blindness

Incidence rate estimates developed based on the approach by Leske et al (1981) and Owen et al (2012) were applied to the population at the beginning of 2016-17 (excluding existing cases) to estimate the number of new cases of sight loss or blindness during 2016-17. **There were estimated to be 89,878 new cases of permanent sight loss or blindness in the UK in 2016-17, representing 0.14% of the population** (Table 3.1). Alternatively, **there were estimated to be 246 new cases of permanent sight loss or blindness each day, or 1 person every 6 minutes**. This represents people who had permanent sight loss from either AMD, DR, glaucoma or other eye diseases, which are conditions that have lifelong health system, productivity and wellbeing impacts.

Table 3.1: Incidence of permanent sight loss or blindness in the UK, by age and gender, 2016-17

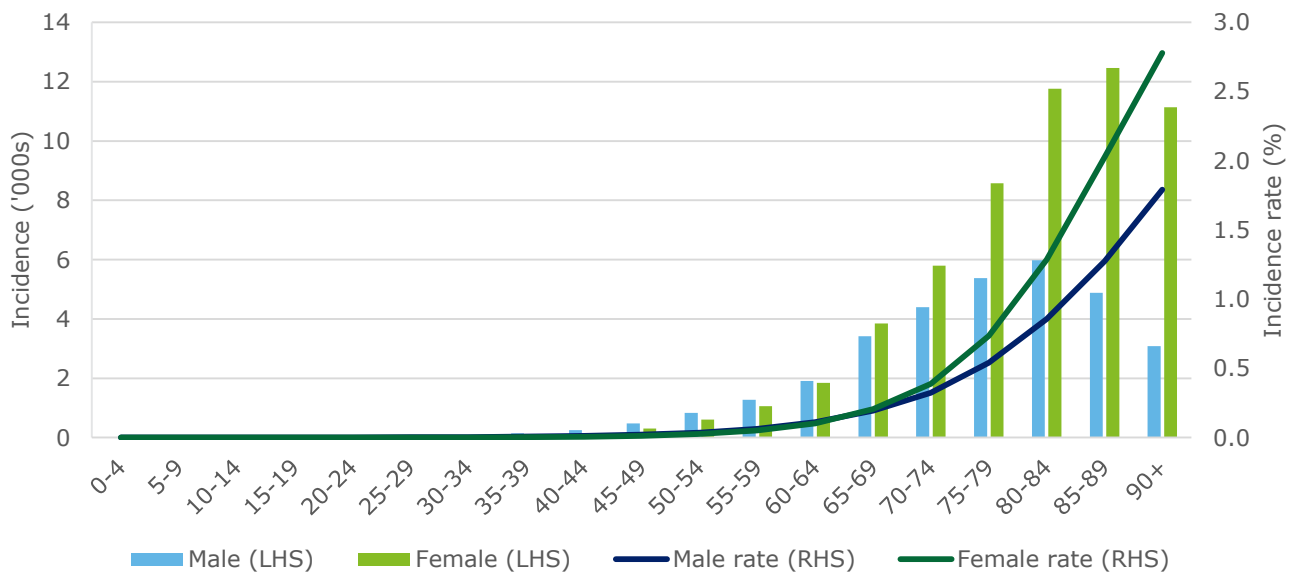
| Age            | Incidence ('000s) |               |               | Incidence per 100,000 people |              |              |
|----------------|-------------------|---------------|---------------|------------------------------|--------------|--------------|
|                | Male              | Female        | Person        | Male                         | Female       | Person       |
| 0-4            | 3                 | 0             | 3             | 0.1                          | 0.03         | 0.1          |
| 5-9            | 5                 | 1             | 6             | 0.2                          | 0.05         | 0.1          |
| 10-14          | 7                 | 2             | 9             | 0.4                          | 0.1          | 0.3          |
| 15-19          | 14                | 4             | 17            | 0.7                          | 0.2          | 0.5          |
| 20-24          | 27                | 8             | 36            | 1.3                          | 0.4          | 0.8          |
| 25-29          | 50                | 18            | 68            | 2.2                          | 0.8          | 1.5          |
| 30-34          | 84                | 36            | 120           | 3.9                          | 1.6          | 2.7          |
| 35-39          | 140               | 67            | 207           | 6.7                          | 3.2          | 5.0          |
| 40-44          | 247               | 138           | 385           | 12.0                         | 6.6          | 9.2          |
| 45-49          | 475               | 304           | 780           | 20.9                         | 13.0         | 16.9         |
| 50-54          | 831               | 608           | 1,439         | 36.5                         | 25.9         | 31.1         |
| 55-59          | 1,273             | 1,059         | 2,332         | 63.6                         | 51.5         | 57.5         |
| 60-64          | 1,915             | 1,848         | 3,763         | 110.8                        | 102.7        | 106.7        |
| 65-69          | 3,420             | 3,845         | 7,265         | 193.9                        | 205.6        | 199.9        |
| 70-74          | 4,397             | 5,801         | 10,198        | 323.4                        | 388.8        | 357.6        |
| 75-79          | 5,373             | 8,574         | 13,947        | 541.8                        | 735.1        | 646.3        |
| 80-84          | 5,978             | 11,757        | 17,735        | 857.8                        | 1,286.2      | 1,100.9      |
| 85-89          | 4,884             | 12,463        | 17,347        | 1,275.3                      | 2,026.1      | 1,738.0      |
| 90+            | 3,083             | 11,137        | 14,221        | 1,791.8                      | 2,778.5      | 2,482.2      |
| <b>Overall</b> | <b>32,206</b>     | <b>57,672</b> | <b>89,878</b> | <b>99.6</b>                  | <b>173.5</b> | <b>137.1</b> |

Source: Deloitte Access Economics calculations based on Deloitte Access Economics (2014), Leske et al (1981), and Owen et al (2012). Note: components may not sum to totals due to rounding.

As AMD, DR, and glaucoma are strongly associated with ageing, incidence was predominately expected to occur in the older population. **People who are aged 65 years old or older accounted for 90% of the total incidence in 2016-17.** However, **there were still 9,148 new cases of sight loss or blindness in people of working age (defined as 15-64 years old) who experienced its associated productivity impacts. This was equivalent to 25 people every day, or 1 in 10 of all new cases.**

Chart 3.1 presents the age and gender breakdown of the incidence of sight loss or blindness in the UK in 2016-17. As with prevalence rates, incidence rates increase with age. Females were more likely to experience sight loss or blindness due to both the higher incidence rates and underlying population in older age groups.

Chart 3.1: Incidence of permanent sight loss or blindness in the UK in 2016-17, by age and gender



Source: Deloitte Access Economics calculations based on Deloitte Access Economics (2014), Leske et al (1981), and Owen et al (2012).

Incidence rates from Table 3.1 were then applied to the demographic data of each country in the UK – England, Wales, Scotland and Northern Ireland – to estimate the share of incidence across countries. This is shown in Table 3.2 and Chart 3.2.

- England (84%) was estimated to comprise most new cases of sight loss or blindness in line with its larger underlying population. This was followed by Scotland (8%), Wales (5%) and Northern Ireland (2%).
- The population demographics for each country have relatively small variance for each age and gender group. As such, these shares are stable across most age and gender groups (Chart 3.2).

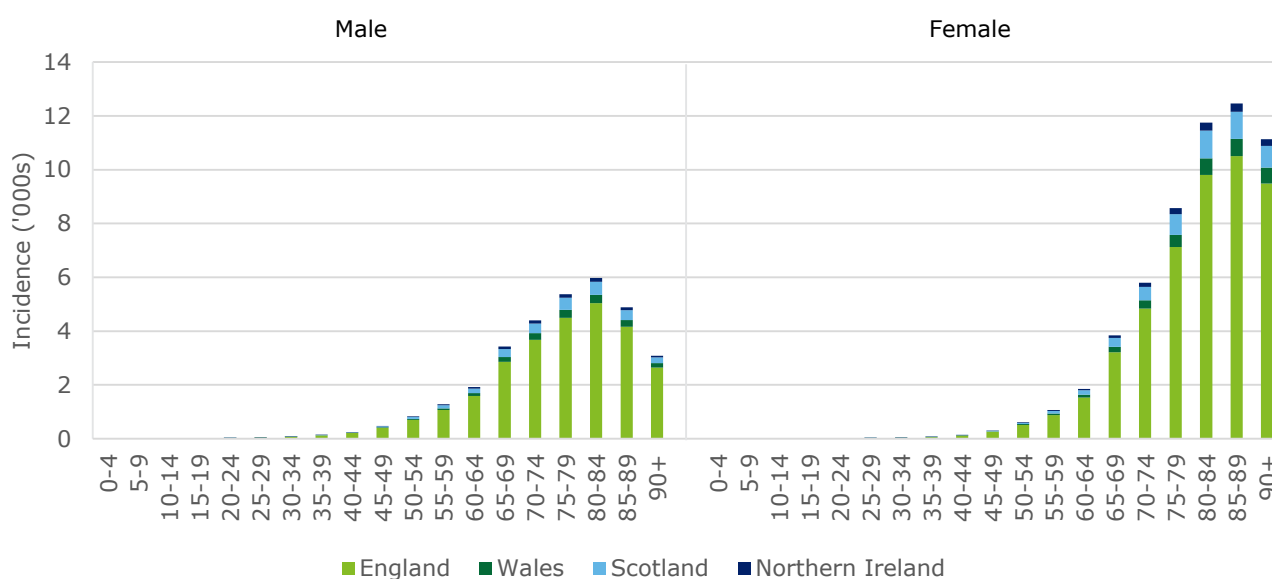


Table 3.2: Incidence of permanent sight loss or blindness in the UK, by age and country, 2016-17

| Age          | England       | Wales        | Scotland     | Northern Ireland | UK            |
|--------------|---------------|--------------|--------------|------------------|---------------|
| 0-4          | 3             | 0            | 0            | 0                | 3             |
| 5-9          | 5             | 0            | 0            | 0                | 6             |
| 10-14        | 8             | 0            | 1            | 0                | 9             |
| 15-19        | 15            | 1            | 1            | 1                | 17            |
| 20-24        | 30            | 2            | 3            | 1                | 36            |
| 25-29        | 58            | 3            | 5            | 2                | 68            |
| 30-34        | 102           | 5            | 9            | 3                | 120           |
| 35-39        | 176           | 9            | 16           | 6                | 207           |
| 40-44        | 326           | 17           | 31           | 11               | 385           |
| 45-49        | 656           | 36           | 66           | 22               | 780           |
| 50-54        | 1,204         | 69           | 126          | 41               | 1,439         |
| 55-59        | 1,938         | 116          | 212          | 67               | 2,332         |
| 60-64        | 3,120         | 197          | 343          | 104              | 3,763         |
| 65-69        | 6,057         | 394          | 634          | 179              | 7,265         |
| 70-74        | 8,511         | 555          | 857          | 275              | 10,198        |
| 75-79        | 11,617        | 752          | 1,218        | 360              | 13,947        |
| 80-84        | 14,835        | 941          | 1,518        | 441              | 17,735        |
| 85-89        | 14,663        | 891          | 1,377        | 416              | 17,347        |
| 90+          | 12,134        | 742          | 1,030        | 315              | 14,221        |
| <b>Total</b> | <b>75,457</b> | <b>4,729</b> | <b>7,448</b> | <b>2,244</b>     | <b>89,878</b> |

Source: ONS (2015) and Deloitte Access Economics calculations. Note: components may not sum to totals due to rounding.

Chart 3.2: Incidence of permanent sight loss or blindness in the UK, by age, gender and country, 2016-17



Source: Deloitte Access Economics calculations based on Deloitte Access Economics (2014), Leske et al (1981), and Owen et al (2012).

Table 3.3 shows the incidence estimates by severity for VA of <6/12, <6/18 and <6/60, respectively. Approximately 42% of incident cases of permanent sight loss or blindness were for moderate or worse VA (<6/18), and 25% were classified as blindness (VA of <6/60). Each day, that was approximately 103 new people who had moderate or worse sight loss, of which 61 were newly blind.

Table 3.3: Incidence of permanent sight loss or blindness in the UK, by age and severity, 2016-17

| Age                   | VA <6/12      |               | VA <6/18      |               | VA <6/60     |               |
|-----------------------|---------------|---------------|---------------|---------------|--------------|---------------|
|                       | Male          | Female        | Male          | Female        | Male         | Female        |
| 0-4                   | 3             | 0             | 1             | 0             | 0            | 0             |
| 5-9                   | 5             | 1             | 1             | 0             | 0            | 0             |
| 10-14                 | 7             | 2             | 2             | 0             | 0            | 0             |
| 15-19                 | 14            | 4             | 3             | 1             | 0            | 0             |
| 20-24                 | 27            | 8             | 7             | 2             | 0            | 0             |
| 25-29                 | 50            | 18            | 13            | 5             | 1            | 0             |
| 30-34                 | 84            | 36            | 24            | 10            | 3            | 1             |
| 35-39                 | 140           | 67            | 48            | 21            | 10           | 2             |
| 40-44                 | 247           | 138           | 79            | 39            | 23           | 8             |
| 45-49                 | 475           | 304           | 145           | 84            | 36           | 14            |
| 50-54                 | 831           | 608           | 323           | 241           | 128          | 94            |
| 55-59                 | 1,273         | 1,059         | 488           | 530           | 293          | 345           |
| 60-64                 | 1,915         | 1,848         | 838           | 1,045         | 454          | 584           |
| 65-69                 | 3,420         | 3,845         | 1,640         | 2,173         | 938          | 1,243         |
| 70-74                 | 4,397         | 5,801         | 2,006         | 2,847         | 1,164        | 1,615         |
| 75-79                 | 5,373         | 8,574         | 2,335         | 3,653         | 1,387        | 2,078         |
| 80-84                 | 5,978         | 11,757        | 2,502         | 4,461         | 1,536        | 2,587         |
| 85-89                 | 4,884         | 12,463        | 2,004         | 4,423         | 1,292        | 2,673         |
| 90+                   | 3,083         | 11,137        | 1,297         | 4,193         | 913          | 2,807         |
| <b>Total</b>          | <b>32,206</b> | <b>57,672</b> | <b>13,756</b> | <b>23,727</b> | <b>8,178</b> | <b>14,050</b> |
| <b>Number per day</b> | <b>88</b>     | <b>158</b>    | <b>38</b>     | <b>65</b>     | <b>22</b>    | <b>38</b>     |

Source: Deloitte Access Economics calculations based on Deloitte Access Economics (2014), Leske et al (1981), and Owen et al (2012). Note: components may not sum to totals due to rounding.

### 3.1.2 Incidence of any sight loss or blindness

The incidence estimates from Table 3.1 were broadened to include any sight loss or blindness, which included under-corrected RE and cataracts in addition to the initial conditions. This measure provides an indication of the total number of people who will require treatment or intervention due to sight loss or blindness. The overall prevalence rate of any sight loss or blindness was estimated to be 3.0% across all age groups, increasing substantially in older age groups (Deloitte Access Economics, 2014).

The methodology to estimate the incidence of any sight loss or blindness by age and gender was the same as for permanent sight loss or blindness. As outlined in section 2.1, a key assumption of the methodology used by Owen et al (2012) is that sight loss is permanent and irreversible. Under-corrected RE and cataracts are both reversible through appropriate prescription glasses and eye surgery, respectively. Intervention or treatment may occur within a given year.

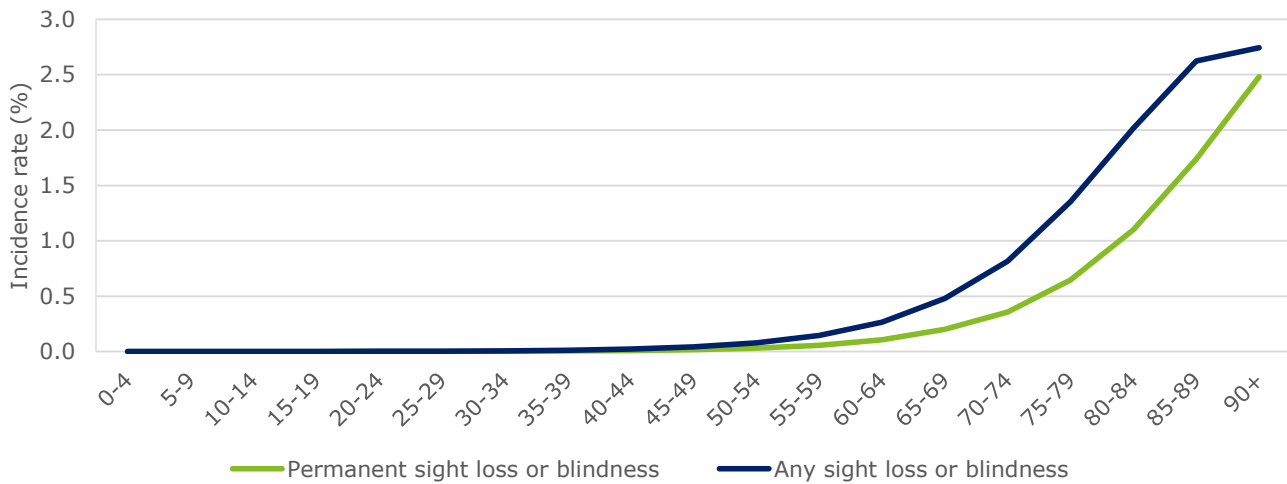
Consequently, the results should be used with some caution as taking the same approach violates the assumption that sight loss is permanent or irreversible, and therefore the true incidence is likely larger because

in the absence of treatment or intervention, prevalence will be higher and therefore more new cases will occur in any given year.

Chart 3.3 presents a comparison between the incidence of any sight loss and the incidence of permanent sight loss in the UK in 2016-17. The key findings are as follows:

- there were 167,400 new cases of sight loss or blindness from any cause during 2016-17 in the UK, of which **54% of new cases were from permanent causes, while 46% of new cases were potentially reversible;**
- **460 new cases of sight loss or blindness per day, or 1 person every 3.1 minutes;** and
- almost **23,000 (13.7%) new cases of sight loss or blindness occurred in people of working age (defined as 15-64 years old), equivalent to 63 people every day** – the higher proportion of working age relative to total incidence of sight loss or blindness compared to permanent sight loss reflects the greater impact of under-corrected RE in younger age groups.

Chart 3.3: Incidence of any sight loss or blindness in the UK in 2016-17, by age



Source: Deloitte Access Economics calculations based on Deloitte Access Economics (2014), Leske et al (1981), and Owen et al (2012).

### 3.2 Lifetime risk of sight loss or blindness

The probability of developing sight loss and mortality rates for each age and gender group (section 3.1) were applied to people who are born today to estimate the number of people who are expected to live with sight loss or blindness. The total expected number of cases was then divided by the expected total number of years lived by people who are born today, which provides the lifetime risk for someone living with sight loss or blindness.

**The lifetime risk of permanent sight loss or blindness was estimated to be 18.2%. In other words, nearly 1 in every 5 people are expected to live with permanent sight loss or blindness.** Similarly, the lifetime risk of any sight loss or blindness was estimated to be 36.3%, or over 1 in 3 people. The lifetime risk estimates are shown in Table 3.4 and Table 3.5.

The lifetime risk was estimated to be greatest for AMD (13.8%), followed by cataract (10.0%), under-corrected RE (8.1%) and other causes (2.3%). The lifetime risk was greatest for females – 46.8% compared with 26.5% for males, or nearly 1 in 2 females compared to approximately 1 in 4 males (Table 3.5).

Table 3.4: Lifetime risk of permanent sight loss or blindness in the UK, %

| Gender/<br>severity | AMD  | Cataract | DR   | Glaucoma | RE   | Other<br>causes | All causes | Permanent<br>causes |
|---------------------|------|----------|------|----------|------|-----------------|------------|---------------------|
| <b>VA &lt;6/12</b>  |      |          |      |          |      |                 |            |                     |
| Male                | 9.3  | 7.6      | 0.3  | 1.2      | 6.3  | 1.8             | 26.5       | 12.6                |
| Female              | 18.4 | 12.8     | 0.3  | 2.5      | 10.0 | 2.8             | 46.8       | 24.0                |
| Person              | 13.8 | 10.0     | 0.3  | 1.9      | 8.1  | 2.3             | 36.3       | 18.2                |
| <b>VA &lt;6/18</b>  |      |          |      |          |      |                 |            |                     |
| Male                | 3.5  | 1.2      | 0.2  | 0.4      | 1.4  | 1.1             | 7.7        | 5.2                 |
| Female              | 6.2  | 2.2      | 0.2  | 0.9      | 1.8  | 1.6             | 12.9       | 8.9                 |
| Person              | 4.8  | 1.7      | 0.2  | 0.7      | 1.6  | 1.3             | 10.2       | 7.0                 |
| <b>VA &lt;6/60</b>  |      |          |      |          |      |                 |            |                     |
| Male                | 2.3  | 0.3      | 0.06 | 0.3      | 0.1  | 0.4             | 3.5        | 3.1                 |
| Female              | 3.9  | 0.6      | 0.03 | 0.6      | 0.1  | 0.4             | 5.6        | 5.0                 |
| Person              | 3.0  | 0.4      | 0.05 | 0.5      | 0.1  | 0.4             | 4.5        | 4.0                 |

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

Table 3.5: Lifetime risk of permanent sight loss or blindness in the UK, 1 in every X people

| Gender/<br>severity | AMD | Cataract | DR    | Glaucoma | RE    | Other<br>causes | All causes | Permanent<br>causes |
|---------------------|-----|----------|-------|----------|-------|-----------------|------------|---------------------|
| <b>VA &lt;6/12</b>  |     |          |       |          |       |                 |            |                     |
| Male                | 11  | 13       | 343   | 80       | 16    | 55              | 4          | 8                   |
| Female              | 5   | 8        | 342   | 41       | 10    | 36              | 2          | 4                   |
| Person              | 7   | 10       | 343   | 53       | 12    | 44              | 3          | 5                   |
| <b>VA &lt;6/18</b>  |     |          |       |          |       |                 |            |                     |
| Male                | 28  | 86       | 630   | 224      | 73    | 93              | 13         | 19                  |
| Female              | 16  | 46       | 624   | 117      | 55    | 61              | 8          | 11                  |
| Person              | 21  | 60       | 631   | 153      | 64    | 75              | 10         | 14                  |
| <b>VA &lt;6/60</b>  |     |          |       |          |       |                 |            |                     |
| Male                | 44  | 301      | 1,576 | 321      | 1,490 | 240             | 29         | 33                  |
| Female              | 26  | 177      | 3,336 | 161      | 1,575 | 224             | 18         | 20                  |
| Person              | 33  | 224      | 2,175 | 212      | 1,538 | 247             | 22         | 25                  |

Source: Deloitte Access Economics calculations.

### 3.3 Summary and comparison

The estimated incidence of permanent sight loss or blindness is around two and a half times greater than other measures based on registrations and CVIs, which indicated that there are around 100 new cases of sight loss each day. Primarily this reflects a broader definition of sight loss or blindness – i.e. VA of <6/12 rather than VA of <6/18 with visual field restriction (Department of Health, 2013). Moreover, the measure of incidence in this report also captures people who are eligible for a CVI, but do not receive one. When considering a more restrictive measure of moderate or worse sight loss (VA <6/18), the rates are comparable – 103 compared to 100 new cases per day (Table 3.3). However, due to the inclusion of visual field restrictions, the two measures are not directly comparable.

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# Appendix A: Supplementary tables

Table A.1: Incidence of sight loss or blindness by condition, age and gender, VA <6/12

| Age/ gender   | AMD    | Cataract | DR    | Glaucoma | RE     | Other causes | All causes |
|---------------|--------|----------|-------|----------|--------|--------------|------------|
| <b>Male</b>   |        |          |       |          |        |              |            |
| 0-4           | -      | -        | -     | -        | 3      | 3            | 5          |
| 5-9           | -      | -        | -     | -        | 5      | 5            | 9          |
| 10-14         | -      | -        | -     | -        | 7      | 7            | 15         |
| 15-19         | -      | -        | 4     | -        | 14     | 10           | 28         |
| 20-24         | -      | -        | 22    | -        | 29     | 5            | 57         |
| 25-29         | -      | -        | 37    | -        | 54     | 13           | 104        |
| 30-34         | -      | -        | 57    | -        | 94     | 28           | 178        |
| 35-39         | -      | 15       | 65    | 31       | 144    | 43           | 299        |
| 40-44         | -      | 26       | 56    | 136      | 262    | 55           | 535        |
| 45-49         | -      | 70       | 92    | 257      | 497    | 126          | 1,042      |
| 50-54         | 150    | 167      | 113   | 357      | 842    | 211          | 1,840      |
| 55-59         | 453    | 345      | 112   | 409      | 1,222  | 300          | 2,840      |
| 60-64         | 880    | 679      | 116   | 484      | 1,689  | 435          | 4,283      |
| 65-69         | 1,932  | 1,529    | 134   | 642      | 2,650  | 712          | 7,599      |
| 70-74         | 2,878  | 2,316    | 110   | 600      | 2,867  | 808          | 9,580      |
| 75-79         | 3,941  | 3,112    | 81    | 509      | 2,716  | 841          | 11,201     |
| 80-84         | 4,734  | 3,413    | 56    | 396      | 2,149  | 793          | 11,539     |
| 85-89         | 4,066  | 2,366    | 28    | 231      | 1,098  | 559          | 8,349      |
| 90+           | 2,639  | 872      | 11    | 108      | 305    | 325          | 4,260      |
| Total         | 21,673 | 14,910   | 1,095 | 4,160    | 16,648 | 5,279        | 63,764     |
| <b>Female</b> |        |          |       |          |        |              |            |
| 0-4           | -      | -        | -     | -        | 2      | 0            | 2          |
| 5-9           | -      | -        | -     | -        | 3      | 1            | 4          |
| 10-14         | -      | -        | -     | -        | 5      | 2            | 7          |
| 15-19         | -      | -        | 1     | -        | 11     | 3            | 14         |
| 20-24         | -      | -        | 6     | -        | 23     | 2            | 32         |
| 25-29         | -      | -        | 12    | -        | 47     | 6            | 65         |
| 30-34         | -      | -        | 20    | -        | 89     | 15           | 124        |
| 35-39         | -      | 29       | 27    | 14       | 129    | 26           | 226        |
| 40-44         | -      | 75       | 39    | 46       | 232    | 52           | 445        |
| 45-49         | -      | 182      | 69    | 110      | 463    | 125          | 949        |

| Age/ gender   | AMD           | Cataract      | DR           | Glaucoma      | RE            | Other causes  | All causes     |
|---------------|---------------|---------------|--------------|---------------|---------------|---------------|----------------|
| 50-54         | 127           | 390           | 88           | 184           | 824           | 209           | 1,823          |
| 55-59         | 481           | 721           | 81           | 233           | 1,261         | 264           | 3,042          |
| 60-64         | 984           | 1,309         | 93           | 362           | 1,891         | 410           | 5,049          |
| 65-69         | 2,335         | 2,745         | 124          | 650           | 3,270         | 736           | 9,861          |
| 70-74         | 3,890         | 3,976         | 121          | 839           | 3,958         | 951           | 13,735         |
| 75-79         | 6,230         | 5,174         | 113          | 1,047         | 4,285         | 1,185         | 18,033         |
| 80-84         | 9,033         | 5,424         | 100          | 1,232         | 3,790         | 1,392         | 20,970         |
| 85-89         | 9,903         | 3,359         | 72           | 1,169         | 2,010         | 1,319         | 17,832         |
| 90+           | 8,864         | 192           | 46           | 1,049         | 128           | 1,178         | 11,458         |
| Total         | 41,847        | 23,577        | 1,013        | 6,934         | 22,422        | 7,878         | 103,670        |
| <b>Person</b> | <b>63,520</b> | <b>38,487</b> | <b>2,107</b> | <b>11,093</b> | <b>39,070</b> | <b>13,157</b> | <b>167,434</b> |

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

Table A.2: Incidence of sight loss or blindness by condition, age and gender, VA <6/18

| Age/ gender   | AMD   | Cataract | DR  | Glaucoma | RE    | Other causes | All causes |
|---------------|-------|----------|-----|----------|-------|--------------|------------|
| <b>Male</b>   |       |          |     |          |       |              |            |
| 0-4           | -     | -        | -   | -        | 1     | 1            | 1          |
| 5-9           | -     | -        | -   | -        | 1     | 1            | 2          |
| 10-14         | -     | -        | -   | -        | 2     | 2            | 4          |
| 15-19         | -     | -        | 1   | -        | 4     | 3            | 7          |
| 20-24         | -     | -        | 6   | -        | 7     | 1            | 14         |
| 25-29         | -     | -        | 10  | -        | 14    | 3            | 27         |
| 30-34         | -     | -        | 16  | -        | 27    | 8            | 51         |
| 35-39         | -     | 5        | 22  | 11       | 49    | 15           | 102        |
| 40-44         | -     | 8        | 18  | 44       | 85    | 18           | 172        |
| 45-49         | -     | 21       | 28  | 79       | 153   | 39           | 320        |
| 50-54         | -     | 82       | 58  | 167      | 343   | 98           | 748        |
| 55-59         | -     | 235      | 93  | 227      | 566   | 168          | 1,289      |
| 60-64         | 316   | 295      | 82  | 217      | 583   | 222          | 1,716      |
| 65-69         | 1,005 | 418      | 77  | 223      | 653   | 335          | 2,710      |
| 70-74         | 1,329 | 491      | 63  | 198      | 624   | 414          | 3,121      |
| 75-79         | 1,645 | 538      | 48  | 162      | 551   | 480          | 3,424      |
| 80-84         | 1,839 | 539      | 33  | 122      | 448   | 507          | 3,488      |
| 85-89         | 1,517 | 404      | 17  | 69       | 273   | 400          | 2,681      |
| 90+           | 1,001 | 245      | 7   | 31       | 131   | 259          | 1,672      |
| Total         | 8,652 | 3,281    | 580 | 1,550    | 4,513 | 2,974        | 21,550     |
| <b>Female</b> |       |          |     |          |       |              |            |
| 0-4           | -     | -        | -   | -        | 0     | 0            | 1          |
| 5-9           | -     | -        | -   | -        | 1     | 0            | 1          |

| Age/ gender   | AMD           | Cataract     | DR           | Glaucoma     | RE            | Other causes | All causes    |
|---------------|---------------|--------------|--------------|--------------|---------------|--------------|---------------|
| 10-14         | -             | -            | -            | -            | 1             | 0            | 2             |
| 15-19         | -             | -            | 0            | -            | 3             | 1            | 4             |
| 20-24         | -             | -            | 2            | -            | 6             | 1            | 8             |
| 25-29         | -             | -            | 3            | -            | 12            | 2            | 17            |
| 30-34         | -             | -            | 6            | -            | 25            | 4            | 35            |
| 35-39         | -             | 9            | 8            | 4            | 40            | 8            | 69            |
| 40-44         | -             | 21           | 11           | 13           | 66            | 15           | 126           |
| 45-49         | -             | 50           | 19           | 30           | 128           | 35           | 262           |
| 50-54         | -             | 190          | 42           | 95           | 315           | 103          | 745           |
| 55-59         | -             | 557          | 73           | 219          | 584           | 237          | 1,672         |
| 60-64         | 424           | 632          | 70           | 247          | 620           | 303          | 2,296         |
| 65-69         | 1,316         | 829          | 75           | 323          | 751           | 458          | 3,752         |
| 70-74         | 1,851         | 914          | 69           | 356          | 772           | 572          | 4,534         |
| 75-79         | 2,523         | 971          | 61           | 377          | 763           | 692          | 5,388         |
| 80-84         | 3,230         | 985          | 52           | 382          | 722           | 796          | 6,168         |
| 85-89         | 3,320         | 817          | 37           | 318          | 560           | 749          | 5,800         |
| 90+           | 3,237         | 636          | 23           | 249          | 402           | 683          | 5,231         |
| Total         | 15,901        | 6,612        | 552          | 2,615        | 5,771         | 4,659        | 36,110        |
| <b>Person</b> | <b>24,553</b> | <b>9,893</b> | <b>1,132</b> | <b>4,165</b> | <b>10,285</b> | <b>7,633</b> | <b>57,660</b> |

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

Table A.3: Incidence of sight loss or blindness by condition, age and gender, VA <6/60

| Age/ gender | AMD | Cataract | DR | Glaucoma | RE | Other causes | All causes |
|-------------|-----|----------|----|----------|----|--------------|------------|
| <b>Male</b> |     |          |    |          |    |              |            |
| 0-4         | -   | -        | -  | -        | 0  | 0            | 0          |
| 5-9         | -   | -        | -  | -        | 0  | 0            | 0          |
| 10-14       | -   | -        | -  | -        | 0  | 0            | 0          |
| 15-19       | -   | -        | 0  | -        | 0  | 0            | 0          |
| 20-24       | -   | -        | 0  | -        | 0  | 0            | 1          |
| 25-29       | -   | -        | 1  | -        | 1  | 0            | 2          |
| 30-34       | -   | -        | 2  | -        | 3  | 1            | 6          |
| 35-39       | -   | 1        | 5  | 2        | 10 | 3            | 21         |
| 40-44       | -   | 2        | 5  | 13       | 24 | 5            | 50         |
| 45-49       | -   | 5        | 7  | 19       | 37 | 9            | 78         |
| 50-54       | -   | 41       | 23 | 78       | 83 | 27           | 252        |
| 55-59       | -   | 163      | 53 | 214      | 19 | 26           | 475        |
| 60-64       | 142 | 186      | 49 | 218      | 21 | 46           | 661        |
| 65-69       | 706 | 143      | 29 | 145      | 15 | 59           | 1,096      |
| 70-74       | 915 | 146      | 24 | 131      | 15 | 95           | 1,325      |



| Age/ gender   | AMD           | Cataract     | DR         | Glaucoma     | RE         | Other causes | All causes    |
|---------------|---------------|--------------|------------|--------------|------------|--------------|---------------|
| 75-79         | 1,114         | 139          | 18         | 110          | 14         | 145          | 1,540         |
| 80-84         | 1,236         | 123          | 12         | 85           | 12         | 202          | 1,670         |
| 85-89         | 1,023         | 82           | 7          | 50           | 7          | 212          | 1,381         |
| 90+           | 692           | 43           | 3          | 23           | 4          | 195          | 960           |
| Total         | 5,827         | 1,075        | 235        | 1,088        | 266        | 1,027        | 9,519         |
| <b>Female</b> |               |              |            |              |            |              |               |
| 0-4           | -             | -            | -          | -            | 0          | 0            | 0             |
| 5-9           | -             | -            | -          | -            | 0          | 0            | 0             |
| 10-14         | -             | -            | -          | -            | 0          | 0            | 0             |
| 15-19         | -             | -            | 0          | -            | 0          | 0            | 0             |
| 20-24         | -             | -            | 0          | -            | 0          | 0            | 0             |
| 25-29         | -             | -            | 0          | -            | 1          | 0            | 1             |
| 30-34         | -             | -            | 1          | -            | 2          | 0            | 3             |
| 35-39         | -             | 1            | 1          | 0            | 5          | 1            | 8             |
| 40-44         | -             | 4            | 2          | 3            | 13         | 3            | 25            |
| 45-49         | -             | 8            | 3          | 5            | 21         | 6            | 44            |
| 50-54         | -             | 67           | 11         | 42           | 57         | 41           | 218           |
| 55-59         | -             | 249          | 21         | 174          | 18         | 149          | 612           |
| 60-64         | 187           | 266          | 19         | 207          | 20         | 171          | 870           |
| 65-69         | 885           | 218          | 13         | 193          | 17         | 152          | 1,477         |
| 70-74         | 1,207         | 228          | 11         | 227          | 17         | 170          | 1,861         |
| 75-79         | 1,621         | 233          | 10         | 260          | 18         | 187          | 2,329         |
| 80-84         | 2,088         | 232          | 8          | 290          | 18         | 200          | 2,837         |
| 85-89         | 2,219         | 193          | 6          | 270          | 15         | 179          | 2,882         |
| 90+           | 2,390         | 157          | 4          | 254          | 13         | 159          | 2,976         |
| Total         | 10,596        | 1,856        | 110        | 1,927        | 236        | 1,418        | 16,143        |
| <b>Person</b> | <b>16,424</b> | <b>2,931</b> | <b>345</b> | <b>3,015</b> | <b>503</b> | <b>2,444</b> | <b>25,662</b> |

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

Table A.4: Incidence of sight loss or blindness per 100,000 population by condition, age and gender, VA <6/12

| Age/ gender | AMD | Cataract | DR  | Glaucoma | RE  | Other causes | All causes |
|-------------|-----|----------|-----|----------|-----|--------------|------------|
| <b>Male</b> |     |          |     |          |     |              |            |
| 0-4         | -   | -        | -   | -        | 0.1 | 0.1          | 0.3        |
| 5-9         | -   | -        | -   | -        | 0.2 | 0.2          | 0.5        |
| 10-14       | -   | -        | -   | -        | 0.4 | 0.4          | 0.8        |
| 15-19       | -   | -        | 0.2 | -        | 0.7 | 0.5          | 1.5        |
| 20-24       | -   | -        | 1.0 | -        | 1.3 | 0.2          | 2.6        |
| 25-29       | -   | -        | 1.6 | -        | 2.4 | 0.6          | 4.6        |
| 30-34       | -   | -        | 2.6 | -        | 4.3 | 1.3          | 8.1        |

| Age/ gender   | AMD         | Cataract    | DR         | Glaucoma    | RE          | Other causes | All causes   |
|---------------|-------------|-------------|------------|-------------|-------------|--------------|--------------|
| 35-39         | -           | 0.7         | 3.1        | 1.5         | 6.9         | 2.1          | 14.4         |
| 40-44         | -           | 1.3         | 2.7        | 6.6         | 12.7        | 2.6          | 26.0         |
| 45-49         | -           | 3.1         | 4.1        | 11.3        | 21.9        | 5.5          | 45.9         |
| 50-54         | 6.6         | 7.4         | 5.0        | 15.7        | 37.0        | 9.3          | 80.9         |
| 55-59         | 22.6        | 17.2        | 5.6        | 20.4        | 61.0        | 15.0         | 141.8        |
| 60-64         | 50.9        | 39.3        | 6.7        | 28.0        | 97.7        | 25.2         | 247.9        |
| 65-69         | 109.6       | 86.7        | 7.6        | 36.4        | 150.3       | 40.4         | 430.9        |
| 70-74         | 211.7       | 170.3       | 8.1        | 44.2        | 210.9       | 59.4         | 704.5        |
| 75-79         | 397.4       | 313.8       | 8.2        | 51.4        | 273.9       | 84.8         | 1,129.5      |
| 80-84         | 679.3       | 489.7       | 8.0        | 56.8        | 308.4       | 113.8        | 1,655.9      |
| 85-89         | 1,061.5     | 617.7       | 7.4        | 60.2        | 286.7       | 146.1        | 2,179.7      |
| 90+           | 1,533.5     | 506.9       | 6.7        | 62.7        | 177.0       | 189.0        | 2,475.7      |
| Overall       | 67.0        | 46.1        | 3.4        | 12.9        | 51.5        | 16.3         | 197.2        |
| <b>Female</b> |             |             |            |             |             |              |              |
| 0-4           | -           | -           | -          | -           | 0.1         | 0.03         | 0.1          |
| 5-9           | -           | -           | -          | -           | 0.2         | 0.05         | 0.2          |
| 10-14         | -           | -           | -          | -           | 0.3         | 0.1          | 0.4          |
| 15-19         | -           | -           | 0.1        | -           | 0.6         | 0.1          | 0.8          |
| 20-24         | -           | -           | 0.3        | -           | 1.1         | 0.1          | 1.5          |
| 25-29         | -           | -           | 0.5        | -           | 2.1         | 0.3          | 2.9          |
| 30-34         | -           | -           | 0.9        | -           | 4.0         | 0.7          | 5.6          |
| 35-39         | -           | 1.4         | 1.3        | 0.7         | 6.2         | 1.3          | 10.8         |
| 40-44         | -           | 3.6         | 1.8        | 2.2         | 11.0        | 2.5          | 21.2         |
| 45-49         | -           | 7.8         | 2.9        | 4.7         | 19.8        | 5.4          | 40.6         |
| 50-54         | 5.4         | 16.6        | 3.8        | 7.9         | 35.1        | 8.9          | 77.7         |
| 55-59         | 23.4        | 35.1        | 3.9        | 11.3        | 61.3        | 12.9         | 147.9        |
| 60-64         | 54.7        | 72.8        | 5.2        | 20.1        | 105.1       | 22.8         | 280.6        |
| 65-69         | 124.8       | 146.7       | 6.6        | 34.7        | 174.8       | 39.4         | 527.1        |
| 70-74         | 260.8       | 266.5       | 8.1        | 56.2        | 265.3       | 63.7         | 920.7        |
| 75-79         | 534.2       | 443.6       | 9.6        | 89.7        | 367.4       | 101.6        | 1,546.2      |
| 80-84         | 988.2       | 593.4       | 10.9       | 134.7       | 414.6       | 152.3        | 2,294.1      |
| 85-89         | 1,609.9     | 546.1       | 11.7       | 190.0       | 326.8       | 214.4        | 2,899.0      |
| 90+           | 2,211.5     | 48.0        | 11.6       | 261.6       | 32.0        | 293.9        | 2,858.5      |
| Overall       | 125.9       | 70.9        | 3.0        | 20.9        | 67.5        | 23.7         | 311.9        |
| <b>Person</b> | <b>96.9</b> | <b>58.7</b> | <b>3.2</b> | <b>16.9</b> | <b>59.6</b> | <b>20.1</b>  | <b>255.3</b> |

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

Table A.5: Incidence of sight loss or blindness per 100,000 population by condition, age and gender, VA &lt;6/18

| Age/ gender   | AMD   | Cataract | DR   | Glaucoma | RE   | Other causes | All causes |
|---------------|-------|----------|------|----------|------|--------------|------------|
| <b>Male</b>   |       |          |      |          |      |              |            |
| 0-4           | -     | -        | -    | -        | 0.03 | 0.03         | 0.1        |
| 5-9           | -     | -        | -    | -        | 0.1  | 0.1          | 0.1        |
| 10-14         | -     | -        | -    | -        | 0.1  | 0.1          | 0.2        |
| 15-19         | -     | -        | 0.05 | -        | 0.2  | 0.1          | 0.4        |
| 20-24         | -     | -        | 0.3  | -        | 0.3  | 0.1          | 0.7        |
| 25-29         | -     | -        | 0.4  | -        | 0.6  | 0.1          | 1.2        |
| 30-34         | -     | -        | 0.7  | -        | 1.2  | 0.4          | 2.3        |
| 35-39         | -     | 0.2      | 1.1  | 0.5      | 2.4  | 0.7          | 4.9        |
| 40-44         | -     | 0.4      | 0.9  | 2.1      | 4.1  | 0.9          | 8.4        |
| 45-49         | -     | 0.9      | 1.2  | 3.5      | 6.7  | 1.7          | 14.1       |
| 50-54         | -     | 3.6      | 2.5  | 7.3      | 15.1 | 4.3          | 32.9       |
| 55-59         | -     | 11.7     | 4.6  | 11.3     | 28.3 | 8.4          | 64.3       |
| 60-64         | 18.3  | 17.1     | 4.8  | 12.6     | 33.8 | 12.9         | 99.3       |
| 65-69         | 57.0  | 23.7     | 4.4  | 12.7     | 37.0 | 19.0         | 153.7      |
| 70-74         | 97.8  | 36.1     | 4.7  | 14.6     | 45.9 | 30.5         | 229.5      |
| 75-79         | 165.9 | 54.3     | 4.8  | 16.3     | 55.5 | 48.4         | 345.3      |
| 80-84         | 263.9 | 77.3     | 4.8  | 17.6     | 64.2 | 72.8         | 500.6      |
| 85-89         | 396.2 | 105.3    | 4.5  | 18.1     | 71.3 | 104.5        | 700.0      |
| 90+           | 581.5 | 142.3    | 4.1  | 17.8     | 75.9 | 150.3        | 971.8      |
| Overall       | 26.8  | 10.1     | 1.8  | 4.8      | 14.0 | 9.2          | 66.6       |
| <b>Female</b> |       |          |      |          |      |              |            |
| 0-4           | -     | -        | -    | -        | 0.02 | 0.01         | 0.03       |
| 5-9           | -     | -        | -    | -        | 0.04 | 0.01         | 0.1        |
| 10-14         | -     | -        | -    | -        | 0.1  | 0.03         | 0.1        |
| 15-19         | -     | -        | 0.01 | -        | 0.1  | 0.04         | 0.2        |
| 20-24         | -     | -        | 0.1  | -        | 0.3  | 0.03         | 0.4        |
| 25-29         | -     | -        | 0.1  | -        | 0.6  | 0.1          | 0.8        |
| 30-34         | -     | -        | 0.3  | -        | 1.1  | 0.2          | 1.6        |
| 35-39         | -     | 0.4      | 0.4  | 0.2      | 1.9  | 0.4          | 3.3        |
| 40-44         | -     | 1.0      | 0.5  | 0.6      | 3.1  | 0.7          | 6.0        |
| 45-49         | -     | 2.1      | 0.8  | 1.3      | 5.5  | 1.5          | 11.2       |
| 50-54         | -     | 8.1      | 1.8  | 4.1      | 13.4 | 4.4          | 31.8       |
| 55-59         | -     | 27.1     | 3.6  | 10.7     | 28.4 | 11.5         | 81.3       |
| 60-64         | 23.6  | 35.1     | 3.9  | 13.8     | 34.4 | 16.8         | 127.6      |
| 65-69         | 70.4  | 44.3     | 4.0  | 17.3     | 40.1 | 24.5         | 200.6      |
| 70-74         | 124.1 | 61.3     | 4.7  | 23.8     | 51.8 | 38.3         | 303.9      |
| 75-79         | 216.3 | 83.3     | 5.3  | 32.3     | 65.4 | 59.3         | 461.9      |

| Age/ gender   | AMD         | Cataract    | DR         | Glaucoma   | RE          | Other causes | All causes  |
|---------------|-------------|-------------|------------|------------|-------------|--------------|-------------|
| 80-84         | 353.3       | 107.7       | 5.7        | 41.8       | 79.0        | 87.1         | 674.8       |
| 85-89         | 539.7       | 132.8       | 5.9        | 51.7       | 91.1        | 121.7        | 942.9       |
| 90+           | 807.5       | 158.7       | 5.8        | 62.2       | 100.3       | 170.5        | 1,305.0     |
| Overall       | 47.8        | 19.9        | 1.7        | 7.9        | 17.4        | 14.0         | 108.6       |
| <b>Person</b> | <b>37.4</b> | <b>15.1</b> | <b>1.7</b> | <b>6.4</b> | <b>15.7</b> | <b>11.6</b>  | <b>87.9</b> |

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

Table A.6: Incidence of sight loss or blindness per 100,000 population by condition, age and gender, VA <6/60

| Age/ gender   | AMD   | Cataract | DR    | Glaucoma | RE    | Other causes | All causes |
|---------------|-------|----------|-------|----------|-------|--------------|------------|
| <b>Male</b>   |       |          |       |          |       |              |            |
| 0-4           | -     | -        | -     | -        | 0.002 | 0.002        | 0.003      |
| 5-9           | -     | -        | -     | -        | 0.003 | 0.003        | 0.006      |
| 10-14         | -     | -        | -     | -        | 0.005 | 0.005        | 0.011      |
| 15-19         | -     | -        | 0.002 | -        | 0.01  | 0.007        | 0.02       |
| 20-24         | -     | -        | 0.01  | -        | 0.02  | 0.004        | 0.04       |
| 25-29         | -     | -        | 0.03  | -        | 0.04  | 0.01         | 0.07       |
| 30-34         | -     | -        | 0.1   | -        | 0.1   | 0.04         | 0.3        |
| 35-39         | -     | 0.1      | 0.2   | 0.1      | 0.5   | 0.1          | 1.0        |
| 40-44         | -     | 0.1      | 0.3   | 0.6      | 1.2   | 0.2          | 2.4        |
| 45-49         | -     | 0.2      | 0.3   | 0.8      | 1.6   | 0.4          | 3.4        |
| 50-54         | -     | 1.8      | 1.0   | 3.4      | 3.7   | 1.2          | 11.1       |
| 55-59         | -     | 8.1      | 2.6   | 10.7     | 0.9   | 1.3          | 23.7       |
| 60-64         | 8.2   | 10.8     | 2.8   | 12.6     | 1.2   | 2.6          | 38.3       |
| 65-69         | 40.0  | 8.1      | 1.6   | 8.2      | 0.9   | 3.3          | 62.2       |
| 70-74         | 67.3  | 10.7     | 1.7   | 9.6      | 1.1   | 7.0          | 97.5       |
| 75-79         | 112.3 | 14.0     | 1.8   | 11.1     | 1.4   | 14.7         | 155.3      |
| 80-84         | 177.3 | 17.6     | 1.8   | 12.3     | 1.7   | 29.1         | 239.7      |
| 85-89         | 267.2 | 21.3     | 1.7   | 13.1     | 1.9   | 55.3         | 360.5      |
| 90+           | 402.1 | 25.2     | 1.6   | 13.4     | 2.2   | 113.3        | 557.9      |
| Overall       | 18.0  | 3.3      | 0.7   | 3.4      | 0.8   | 3.2          | 29.4       |
| <b>Female</b> |       |          |       |          |       |              |            |
| 0-4           | -     | -        | -     | -        | 0.001 | 0.0003       | 0.001      |
| 5-9           | -     | -        | -     | -        | 0.002 | 0.001        | 0.003      |
| 10-14         | -     | -        | -     | -        | 0.004 | 0.001        | 0.005      |
| 15-19         | -     | -        | 0.001 | -        | 0.01  | 0.002        | 0.01       |
| 20-24         | -     | -        | 0.004 | -        | 0.02  | 0.002        | 0.02       |
| 25-29         | -     | -        | 0.01  | -        | 0.04  | 0.005        | 0.05       |
| 30-34         | -     | -        | 0.02  | -        | 0.1   | 0.02         | 0.1        |
| 35-39         | -     | 0.1      | 0.05  | 0.02     | 0.2   | 0.05         | 0.4        |

| Age/ gender   | AMD         | Cataract   | DR         | Glaucoma   | RE         | Other causes | All causes  |
|---------------|-------------|------------|------------|------------|------------|--------------|-------------|
| 40-44         | -           | 0.2        | 0.1        | 0.1        | 0.6        | 0.1          | 1.2         |
| 45-49         | -           | 0.4        | 0.1        | 0.2        | 0.9        | 0.2          | 1.9         |
| 50-54         | -           | 2.8        | 0.5        | 1.8        | 2.4        | 1.7          | 9.3         |
| 55-59         | -           | 12.1       | 1.0        | 8.5        | 0.9        | 7.3          | 29.7        |
| 60-64         | 10.4        | 14.8       | 1.1        | 11.5       | 1.1        | 9.5          | 48.3        |
| 65-69         | 47.3        | 11.7       | 0.7        | 10.3       | 0.9        | 8.1          | 79.0        |
| 70-74         | 80.9        | 15.3       | 0.8        | 15.2       | 1.2        | 11.4         | 124.7       |
| 75-79         | 138.9       | 20.0       | 0.8        | 22.3       | 1.6        | 16.0         | 199.7       |
| 80-84         | 228.5       | 25.4       | 0.9        | 31.8       | 2.0        | 21.9         | 310.4       |
| 85-89         | 360.7       | 31.4       | 0.9        | 43.9       | 2.5        | 29.0         | 468.5       |
| 90+           | 596.3       | 39.1       | 0.9        | 63.3       | 3.2        | 39.6         | 742.5       |
| Overall       | 31.9        | 5.6        | 0.3        | 5.8        | 0.7        | 4.3          | 48.6        |
| <b>Person</b> | <b>25.0</b> | <b>4.5</b> | <b>0.5</b> | <b>4.6</b> | <b>0.8</b> | <b>3.7</b>   | <b>39.1</b> |

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

# Limitation of our work

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